Cleft Craft: The Evolution of Its Surgery—Volume II: Bilateral and Rare Deformities

D. Ralph Millard Jr.
CLEFT CRAFT

THE EVOLUTION
OF ITS SURGERY

II
BILATERAL AND RARE
DEFORMITIES

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There has always been an inherent desire in man to look like his fellowmen and not to appear horrible, peculiar or even different. Centuries before Christ, in ancient India, a Hindu by the name of Susruta Samhita understood this, when he wrote:

The love of life is next to the love of our own faces and thus the mutilated cry for help.

There has been a marked variation in the ability of man to adjust to a deformity. Comedian Durante followed his great nose to fame and fortune while the swashbuckling Cyrano de Bergerac actually came to his death because of a nose of similar size. Between these extremes the rest of us muddle along to the best of our ability.

Thus a baby born with a congenital bilateral cleft becomes a #1 priority. Such an infant, usually normal in every other aspect, has only the clefts gaping between him and his share of happiness. This has challenged thousands of surgeons over many centuries to surpass the feats of previous surgeons in the evolution of cleft craft.
and imagine for the girls
how few arms are ever offered.

RMG '77
Yet I can dream how it would be to walk slowly in the moonlight with someone on my arm. Elated, I forget myself; but suddenly why there’s the shadow of my profile on the wall.

Edmond Rostand,  
*Cyrano de Bergerac*, 1897
I. Primary Deformity
BRADLEY PATTEN of the University of Michigan, after a lifetime of research, in 1971 revealed an expert's acceptance of the unknown:

Why clefts of the lip are sometimes unilateral and sometimes bilateral is not known. There seems no reason to suspect that their genesis differs in anything other than symmetrical or asymmetrical distribution of whatever the disturbing agent might have been.

The various embryological theories in vogue today have been discussed in some detail in Volume I. Whether it be failure in the fusion of Dursy-His, or failure of the mesodermal migration of Fleischmann-Veau-Stark, or failure of the merging of Patten, or a
A combination of these, whatever fails on one side in unilateral clefts fails on both sides in the bilateral deformity. At least in the standard bilateral cleft the site of the clefting is situated consistently along the embryonic grooves dividing the maxillary and nasolateral prominences from the nasomedial prominence. There can be varying but equal degrees of unsuccessful obliteration of these embryonic grooves on both sides or asymmetrical differences between the two sides.

The doubling of the fissures more than doubles the problem in the original deformity and its exaggeration during intrauterine growth and thereafter. The results of this will be discussed in Chapter 2 on anatomy.
PRIMARY AND SECONDARY PALATES

The primary palate and the secondary palate are delineated by the incisive foramen as the central landmark and sutures extending anterolaterally to the spaces between the maxillary lateral incisor and the first canine tooth on each side. This description was originally noted by Fogh-Andersen and later simplified and popularized by Kernahan and Stark.

As stated succinctly by Kernahan for Stark’s book Cleft Palate in 1968:

The classification was based on the evolution and mode of growth of tissues forming the primary and secondary palates. Briefly, the primary palate—comprising the central portion of the upper lip, premaxilla, upper incisors, and anterior nasal septum—forms between the fourth and seventh weeks of intrauterine life and extends to the nasopalatine canal site of the incisive foramen. The secondary palate—comprising the remainder of the hard palate and the soft palate posterior to the incisive foramen—forms between the seventh and twelfth weeks as a pair of shelves that grow toward the midline and fuse in a normally developing embryo.

In view of these findings, the genesis of both rare and common lip and palate deformities becomes obvious. Either the primary or secondary palate or both may be involved, resulting in a degree of malformation from a submucous palate cleft or a vermilion notch to a bilateral cleft involving all dimensions of both palates.

BILATERAL PECULIARITIES

Certain aspects that are peculiar to bilateral clefts deserve special consideration. In the complete bilateral clefiting the central frontonasal component is separated from both lateral elements. The middle segment seems thus to be released from any responsibility to the lateral elements, and they in turn, being somewhat passed by, withhold their usual contribution to the central element. Although the same cleft discrepancies occur as in the unilateral cleft, doubling the action compounds the effect on the central portion, including the prolabium, premaxilla, columella and septum.
THE PHILTRUM DILEMMA

Before Veau got Fleischmann and Hochstetter together on the mesodermal migration hypothesis, Thomas F. Mullen of San Francisco in 1932 made some interesting observations:

I have never been able to demonstrate any muscle in the parings from the margins of the prolabium in complete bilateral clefts of the lip. . . . A study of the reported cases of cyclopia in which the nasofrontal process fails to descend and enter into the formation of the mouth but remains above the single eye in the form of a proboscis reveals the fact in many instances that while there was an absence of the premaxillary bones, the lips were normal. Evidently in these cases the maxillary processes have united in the mid-line and the lips have been formed without any elements from the nasofrontal process (Craig, Malherke, Priano). I am of the opinion that the orbicularis oris never receives any fibers from the nasofrontal process but that the muscle elements grow into this area from the sides and there is never any muscle in the isolated prolabium of complete bilateral clefts. . . . The fact that the entire muscle bed from which this whole system is developed is confined to the area of the hyoid arch until the seventh week, whereas the lips are formed by the union of the maxillary processes with the median processes before this time, may account for the fact that there is no muscle in the tissues of the prolabium in complete bilateral clefts.

Miroslav Fara with histologist J. Smahel of the Plastic Surgery Clinic created by Burian at Charles University, Prague, finding no striated muscle fibers in the prolabium of complete bilateral clefts, concurred in 1967 with the earlier deductions by F. Burian, Albert D. Davis and I. Stanek:

The muscle fibers of the musculus orbicularis oris are not formed as a result of the transformation of the mesenchymal cells in situ, but . . . as a result of the growth of said muscles from the side toward the center of the philtrum. The formation of a complete cleft, which in embryogenesis precedes the growth of the muscular fibers, thus causes the sterility of the prolabium.

Union of the orbicularis oris muscle in the upper lip can occur independently of the frontonasal process participation. In cyclopia, the primitive proboscis projects above the single central eye, and the intact upper lip has muscle union below it. Yet this lip is not normal and presents no philtrum columns, associated vertical groove or cupid's bow. Thus I would like to hypothesize
that although the frontonasal component contributes no muscle
to the upper lip its participation in the "philtrum party" is
responsible for partial midline interruption of what would
otherwise be a flat, uninteresting end-on union of the lateral
muscle bundles. Instead, when the frontonasal component.normally enters from above, descending vertically between the
muscled maxillary elements, it causes ripples expressed in col-
umns, dimples and the curves of Cupid.

Just how this process takes place is still open to argument. In
1962 Monie and Cacciatore of the University of California, San
Francisco, after the first real research on this subject, reported no
evidence that the philtrum is related to the lines of fusion of
facial processes in the embryo. Rather, they said, it is associated
with increasing median density of connective tissue of the upper
lip apparent between the third and fourth months of fetal life.

One bilateral cleft closure in which I was able, without
tension, to bring three-quarters of a circle of muscle around a tiny
tethered mid-philtrum inverted into a dimple and persisted as
such. This serendipitous dimple led me to conjecture further on
the etiology of the philtrum configuration. Monie was requested
to review his bilateral cleft specimens to determine the time of
upper labial sulcus formation. The question was whether the
prolabium-philtrum is still totally tethered to the premaxilla
while the groove and eminences are being formed. Monie ex-
plained that his specimens had been cut on the transverse plane
to give the best view of the philtrum but unfortunately did not
show the labial sulcus.

Latham's research does not seem to confirm the findings of
Monie. He wrote in July 1973:

A look at some horizontal sections through the upper lip region of a normal
fetus made it clear that the philtral groove is not caused by fibers emanating
from the mid-palatal suture. The flared out posterior ends of the medial
crura of the alar cartilages do lie in the superior part of the philtral ridge;
however, a much more striking and obvious mechanism causing the philtral
groove was seen in the arrangement of the labial muscles. The sections show
muscle fibers arising from the alveolar bone over the lateral incisor, then
coursing anteromedially to an insertion in the medial philtral part of the lip,
just beneath the epidermis. This has been confirmed in another specimen
sectioned in the sagittal plane.
This readily explains why the lip of a bilateral cleft infant does not retract much when the underlying premaxillary bone is retracted—because there are no muscles in the bilateral cleft lip! This, incidentally, would also appear to support the recent view that muscle should be pulled into the midline. It would be nice if the right muscles could be brought in!

Finally in 1976 Latham, with T. G. Deaton, clarified his latest anatomical findings on the philtrum. What follows is a summary of these findings with some of the illustrations published in the *Journal of Anatomy*.

The course and insertion pattern of muscle fibres in the philtrum of the human upper lip were studied in seven postmortem specimens using serial histological sections and a reconstruction method using sheets of Plexiglas. The fibres of the *musculus orbicularis oris* entering the upper lip from one side were observed to decussate in the midline and proceed to insert into the skin of the opposite side lateral to the philtral groove. The philtral ridges appeared to represent the medial borders of bilateral muscle insertion zones of the lip in which the fibres of the *m. orbicularis oris* raised the level of the skin by splaying out and inserting into it.

Here are horizontal reconstructions of the upper lip musculature of an 18½ week fetus and of a newborn infant.

Contributions to philtral form also came from the *musculus levator labii superioris* as it descended as far medially as the philtral ridge to insert into the vermilion border lateral to the median groove, and from fibres of the *musculus nasalis* which inserted into the philtral ridges superiorly. The philtral groove corresponded to the more compact median decussation of the *orbicularis oris* where lip thickness was also reduced by the relative absence of muscle fibre insertions into the skin. The displacement of the vermilion border giving rise to Cupid’s bow appeared to result from the
lifting action of the *m. levator labii superioris* lateral to the median groove in conjunction with a depressor action by the *m. orbicularis oris* on the median tubercle.

Each of these theories could, I suppose, represent the residual effect of the muscleless frontonasal component's becoming overwhelmed, dimpled and ridged by the inflow of lateral musculature.

**PREMAXILLA**

Woo found from embryological studies that the premaxilla develops from two pairs of ossification centers. The principal pair forms the primordia of the lateral incisors, extends upward and with the maxilla proceeds forward to embrace the premaxilla on either side. This union is complete by the end of the third month.

*Time of protrusion*

In 1954 Stark presented a 60-day-old embryo of 46 mm. with bilateral clefts revealing advanced protrusion of the premaxilla. In 1966 Kraus, Kitamura and Latham presented three interesting embryos that seem to tag the time of protrusion. Their 41- and 43-day-old embryos showed no signs of premaxillary projection, but in their 47-day-old specimen protrusion was beginning to appear. Thus Latham in 1973 concluded that protrusion in bilateral clefts begins at about 45 days (10 days after the original clefting, which occurs at 35 days) and then develops rapidly for
25 days to reach proportions at 70 days (10 weeks) comparable to those seen at birth. Recently he has been working on a 13-week-old bilateral cleft fetus which reveals premaxillary protrusion equivalent to that of the 10-week fetus and in fact similar to that seen at birth. This timing is similar to what he noted in unilateral clefts in his 1969 Cleft Palate Journal study.

Cause of protrusion

Bone growth. There have been numerous theories as to the cause of premaxillary protrusion in bilateral clefts. In 1934 Victor Veau proposed a bone-centered concept of a forward growth force within the developing vomeropremaxillary stem thrusting the premaxillary segment into a protrusion position. Some surgeons have upheld fellow surgeon Veau’s belief in the excessive growth between the vomer and the premaxilla. In fact, in 1949 Denis Browne of London demarcated this zone from the quiescent vomer by "a cartilage-filled suture line" and designed his excision for "set-back" in this area of so-called overgrowth.

Muscle rupture. Many authorities point to the disrupted facial musculature as an adequate explanation of the cause of this skeletal deformity and thus advocate early restoration of the muscle continuity of the lip as a logical treatment. Pruzansky in 1954 and again in 1964 took this stand. Slaughter, Henry and Berger in 1960 noted the position of the philtrum and premaxilla displaced far anterior to the normal plane and accused:

This is due to the lack of restraining action of the normally constituted orbicularis oris and its accessory muscles. The unopposed, powerful action of the tongue is then free to exert itself, accentuating the deformity.

In 1967 Fara and Smahel stated:

The anatomical incompleteness and functional inefficiency of the musculus orbicularis oris in complete bilateral clefts contributes most probably to the formation of a marked protrusion of the premaxilla, manifesting its functional discordance in all the muscles of expression and the disturbance of the harmonious development of the whole middle facial region.

Cartilage growth. Others have placed a great part of the responsibility for premaxillary projection on the associated cartilaginous structures.
Patten queried as late as 1971:

The forward growth of the embryonic nose is a relatively late process. If the intermaxillary segment is not properly anchored by the time the nasal growth accelerates, might that be a factor in the way it is carried far out of its normal relations?

Yet it was James H. Scott, Professor of Dental Anatomy, Queen’s University, Belfast, who in 1953 redirected attention to the role of the nasal septum in facial growth. An indefatigable research worker with devastating logic and a dental liberal with a dry Ulster wit, he opened his lectures with

I’m going to speak to you about bone growth but there’s not going to be any newfangled histochemistry in what I say.

Short, stocky, with a big amiable face, he was crippled with rheumatoid arthritis which forced him to teach from a wheelchair. Even up to the end he bubbled with vitality and cheerfulness, stressing the role of the cranial sutures and pointing to the cartilaginous parts of the cranial base and nasal septum as the pace setter in skull growth.

According to Scott, the growth of the cartilage of the nasal septum acts as the force for growth of the upper facial skeleton in anteroposterior and vertical dimensions. The growing septal cartilage separates the suture lines, permitting new bone growth. It has been said to act as a kind of “epiphyseal plate” for the whole of the upper facial skeleton. This is the mechanism of growth from the latter part of fetal life through the first three years of life. Then for the rest of the first decade sutural growth diminishes as surface apposition and resorption gradually take over.

Another of Scott’s endowments to clefts was the inspiration of ardent students such as Burston and Latham. Burston actually went to Scott for a thesis topic and was given the cartilagenous part of the sheep. His work on this subject was later applied to cleft palate. In 1958 he reported the abnormal development following clefting and since then he has created a world-renowned cleft center in Liverpool, England.
LATHAM’S HYPOTHESIS. Under normal circumstances, the bony premaxilla is kept in place by its early fusion with the maxilla to form one bone and by the continuity of mucogingival tissues around the developing dental arch. The development of bilateral clefts creates havoc. Irish oral biologist Ralph A. Latham, originally of Belfast, trained by Scott, stimulated by Burston and now in research at the University of North Carolina School of Dentistry, has put it all together in a logical hypothesis. In 1973, both in the British Journal of Plastic Surgery and at the Foundation Cleft Palate Symposium at Duke University, he proposed:

In the bilateral cleft the premaxillary segment is under no restraint laterally either from bone or gingival fibrous tissue; consequently its attachment to the nasal septum by the septopremaxillary ligament becomes a dominant factor.

He also noted that in normal growth, as the nasal septum grows forward, it draws the upper jaw with it, but not at the same rate. In the bilateral cleft, the premaxillary segment is carried forward at the same rate as that of the growing septum to which it is firmly held.

For bone formation to occur at a skull suture, there must be tension between bone edges (Scott, 1948, 1953, 1954; Moss, 1954; Selman and Sarnat, 1957; Pritchard, Scott and Girgis, 1956). The premaxilla united to the forward-growing nasal septum but restrained by the vomer sets up a tension at the vomeropremaxillary suture creating a condition for bone formation. Indeed, the vomeropremaxillary suture is the major site of rigid hard tissue formation and elongation of this segment. Pruazansky confirmed this finding in 1971 with serial radiography following placement of metallic implants.

Yet, as pointed out by Latham, premaxillary protrusion is not driven forward by excessive vomeropremaxillary suture growth. Rather, the premaxilla is carried forward by its attachment to the nasal septum through the septopremaxillary ligament. To complete the picture Latham points out:

If bone may not push against bone it appears bone may push against soft tissue! Growth of the maxilla from late foetal life into the early years of
childhood is characterized by bone formation on the upper and posterior surfaces with progressive downward and forward progress of the upper jaw.

ROSS AND JOHNSTON. Orthodontist R. B. Ross, of the Hospital for Sick Children, Toronto, and geneticist M. C. Johnston, of the National Institute for Dental Research, Bethesda, Maryland, expressed a different opinion about the position of the premaxilla in complete bilateral clefts in their 1972 book, *Cleft Lip and Palate*:

The premaxillary segment appears to be tremendously advanced, protruding beyond the tip of the nose. This has often been cited as an illustration of the vigorous growth of the nasal septum and as confirmation of the theory that the cartilaginous nasal septum provides much of the stimulus for maxillary growth [Scott]. . . .

However, the premaxilla is tipped forward . . . and most of the protrusion is due to the forward rotation of the alveolus. The anterior nasal spine (which is a fairly accurate indicator of premaxillary position) is only mildly advanced, although pointing superiorly because of the rotation. Protrusion of the premaxillary segment is probably the result of normal tongue action against a flexible and relatively unsupported bone, without the opposing force of circumoral musculature to establish an equilibrium of forces. The tip of the nose is invariably tilted slightly at birth as a result of the position of the premaxillary segment. The base of each nostril is pulled laterally by the cheek musculature, giving the typical appearance.

Other aspects of protrusion: actual and relative

Much of the premaxillary protrusion is due to the abnormally anterior position of the alveolar process, which proceeds as forward alveolar growth for seven to eight months of intrauterine life. The fact that the teeth continue in a normal upright position suggests that the alveolar segment does not actually rotate but by expansion of the dental alveoli reaches a maximum at about four to five months. After that, alveolar protrusion persists as a static feature.

The degree of premaxillary protrusion may be exaggerated by the relative underdevelopment of the unattached maxillary segments, as normal forward development of the early maxillae is to some extent dependent on a forward pull from the nasal septum.
Underdevelopment of the maxilla

Intrigued by maxillary underdevelopment associated with the absence of the cartilaginous nasal septum, J. V. Harvey Kemble studied all such cases under age 20 years seen at Queen Mary's Hospital, Roehampton, London, in the past 10 years. The total was eight—three congenital, four traumatic and one unknown.

Kemble acknowledged three theories on the development and growth of the maxilla:

2. Latham's theory that the maxillae have inherent potential for growth which does not depend on outside influences (1968).
3. Sarnat's experimental findings that the normal nasal septal cartilage growth is necessary for full maxillary development (1963).

As Kemble concluded that his clinical findings confirmed theory 3, it is of interest to review his abstract of Sarnat's work:

Sarnat (1963, 1966) . . . deduced from experiments of extirpation of circum-maxillary sutures in monkeys and in rabbits, that because little or no deformity resulted when compared with controls, growth which occurred at sutures was of a secondary accommodating nature. Furthermore, he showed that extirpation of the cartilaginous nasal septum from growing rabbits produced smaller nasal and maxillary bones than in controls. The extent and severity of the deformities varied approximately in proportion to the amount of septum removed. Removal of cartilaginous septum from full-grown rabbits did not result in collapse of the snout, so that it seemed unlikely that it was lack of support that produced underdevelopment of the snout in growing rabbits (Sarnat 1967). From these experiments it would seem likely that the cartilaginous nasal septum is primarily responsible for forward and downward growth of the maxilla, and that growth at sutures maintains and consolidates its position, at any rate in experimental animals. The fact that Stenstrom (1970) found only minor deformities resulting from removal of septal cartilage from young guinea-pigs can only be explained on the basis of a species difference.

Latham's Irish reaction, in November 1973, to this stand is rather provocative:

There is good evidence that the nasal septum is an important determinator
of upper facial growth in the embryonic and fetal periods. Individuals with impairment of the nasal septum usually show underdevelopment of the upper jaw at birth. . . . It is obvious that the human face is capable of growth after birth in the absence of the nasal septum. . . . There must be a considerable period before and after birth into childhood when nasal se­ptum stimulus and intrinsic maxillary growth are complementary and working together. . . . There is a tendency for writers on this subject to want one mechanism to do the whole job. Kemble appears to think of three mutually exclusive mechanisms, each making their main contribution at a different time in a sequence. . . . Kemble's conclusion, however, is fair enough. It seems that the septum does make an important contribution both in growth and in structural support to the upper jaw and in its absence full maxillary growth will not be realized.

Latham, in conclusion, warned of the danger of evaluating maxillary underdevelopment as measured by the sella turcica-nasion-anterior portion of maxilla angle.

The septum, premaxillary bone and teeth all appear to come from the neural crest cells in the young embryo and if the septum is absent, the incisor teeth and bone are likely to be absent too. Such is the case in cyclopia and arhinencephaly. Then the SNA angle could be low because of the absence of these structures suggesting more underdevelopment of the middle third of the face than is actually present.

A combination of factors

Actually the premaxillary projection deformity must be the result not of one factor but of the interrelation of many factors—lack of bony continuity, growth at the suture, cleft of the orbicularis oris muscle, forward growth of the cartilaginous septum and expansion of the alveolar process.

THE NOSE

With the bilateral cleft deformity, the entire nose is deficient. In 1973 Stark and Kaplan reported tracing two bilateral cleft embryos to measure the ectodermal volume ratio of the primitive nose. They found extremely small measurements of $8.1:7.9$ cubic cm. for the 40.5 mm. embryo and $12.1:10.8$ cubic cm. for the 46 mm. one. These findings exhibit the great deficiency of ectoderm in the bilateral cleft lip nose, a horrendous lack of nasal germ plasm.
WHATEVER HAPPENED TO THE BABY COLUMELLA!

In 1974 R. A. Latham and C. Workman noted, in Georgiade and Hagerty’s volume on the transactions of the Cleft Lip and Palate Symposium held at Duke University:

In the bilateral cleft condition the anterior nasal spine nestles between the flared out ends of the medial crura. The present interpretation is that the spine is too far forward, not that the crura are too far back.

The premaxillary bones are clearly set farther forward on the nasal septum than normally. However, a large part of the problem with the columella is due to the forward expansion of the alveolar process beneath the medial crura of the alar cartilages.

Latham blames the total clinical absence of the columella primarily on failure of differential growth and secondarily on the invasion of the columella area by the forward growing and expanding alveolar process.

Normal development of the columella is dependent upon the fact that the anteroposterior dimension of the cartilaginous septum increases at a faster rate than the vomer and premaxilla, thus pulling an elongation of the columella and shoving a projection to the nasal tip. Latham explains it this way:

When bilateral clefts divide the primary palate, the counterbalance on the septopremaxillary ligament is vastly reduced. The septopremaxillary ligament then exercises a dominant influence on the premaxillary bones, which are held tightly to the anteroinferior border of the nasal septum. This would account for the forwardly placed basal part of the premaxillae. The forward growth differential between the nasal septum and premaxillary bone fails.

Thus, the loss of columella is due directly to the lack of this differential growth between the septum and the premaxilla. The nasal tip and its cartilages also must suffer the consequences. Like a tent without the insertion of its front pole, the nasal tip never rises, leaving the angle of its alar cartilages flattened and the feet of its medial crura splayed.

As further proof that the premaxillary segment persists in an embryonic relationship to the nasal septum in bilateral clefts, Latham found Jacobson’s organ as a pit in the septal mucous
membrane not in the full-term normal position *anterior* to the alveolar process but rather *above* and *behind* it.

When, in addition, the developing alveolus bulges forward during gradual anterior expansion of the incisor teeth and alveolar process to encroach upon the columella base, there is further obliteration of this nasolabial angle. The swindled columella is left relatively as well as actually destitute!
2. Bilateral Cleft Anatomy

In a single cleft, the premaxilla is normally attached to the maxilla on one side and this entire component is rotated outward varying degrees from the cleft side maxilla in an asymmetrical distortion. Double clefts present an entirely different configuration. In the complete bilateral cleft the premaxilla is unattached to either maxilla; thus there are three separate components which are more or less symmetrical in their distortion. The two maxillae are usually equal to each other in size and position while the central premaxillary element proceeds forward on its own, in different degrees but with symmetry within itself except for possible deviation.

The complete separation of the central frontonasal component of prolabium and premaxilla from the lateral maxillary segments abnormally influences the nose, philtrum, musculature, vascularity, nerve supply, growth and development of all three elements.

Where the cleft is incomplete on both sides, the deformity is less and is still symmetrical. In such a case there is usually a more or less intact alveolus and little or no protrusion of the premaxilla. The columella is likely to be longer than in the complete cleft but not of normal length.

Sometimes the degree of cleft varies on each side. Sometimes the incompleteness shows as only the slightest notch on one side
and a halfway or three-quarter cleft on the opposite side. Or there can be a complete cleft on one side and an incomplete one on the other, which condition exaggerates the exasperating aspect of asymmetry not only in the lip and nose but in the rotation of the premaxilla. The existence of some attachment on one side helps, of course, to check the uninhibited central projection of the premaxilla.

Even the most minor unilateral synechia working during the prenatal and postnatal period can curb some of the explosive thrust of the premaxilla, appreciably reducing its protrusion. Veau sketched and commented on this in the 30’s. Here is a case that demonstrates modest restraint by a tiny Simonart’s band.

SIMONART’S BAND

While at Rookdown House, Basingstoke, England in 1948-1949, I learned to refer to residual congenital skin bridges spanning the upper portion of lip clefts as Simonart’s bands. Holdsworth later referred to them as Simonartz bands. In recent years a search has been underway to discover the origin of this mysterious sobriquet. In 1976 Tom Gibson, intrigued by these terms, found that Gustav Simon in his 1868 book had presented an adhesion-type operation for bilateral clefts (Chapter 13) and deduced that someone subsequently must have written about repositioning of the premaxilla by creating the transverse bands of “Simon Arzt in Rostock.” This would be an operative band, not a congenital one. Meanwhile I turned to S. Anthony Wolfe and he turned to Sam Pruzansky who forwarded two lead references. Simonart: “Note sur les Amputations Spontanées,” Journal
des Connaissances médicales, June 1846, pp. 327-330, also Archives Médicales Belges, 1846, pp. 112-119. With these references Tony Wolfe wrote Richard J. Wolfe, Rare Books Librarian, Francis A. Countway Library of Medicine, Harvard Medical School, who sent photocopies of the first Simonart article. Then Tony Wolfe wrote his friend Michael Meesen, Liège, for information on Simonart and received a notice obtained from a Belgian registry which indicated there was a man named Pierre-Joseph Cécilien Simonart, professor agrégé at the University of Brussels, born in Wavre, May 20, 1816, died Wavre, December 19, 1846, age 30.

Simonart had been previously discussing cases of spontaneous amputations and deep grooving of the extremities due to encirclement by either umbilical cord or by amniotic bands. After reviewing the previous cases in the literature, he mentioned an interesting type of lateral facial cleft case seen in Brussels. Here are excerpts from his paper, “Notes sur les Amputations Spontanées” in Journal des Connaissances médicales pratiques et de pharmacologie, June 1846, pp. 328-329, presented in the original French and translated into English:

Chez un fetus recueilli, il y a peu de temps, a la Maternité de Bruxelles, la joue de chaque côté, a partir de la commissure labiale, est comme coupée dans toute son épaisseur par une bride de cette espèce, qui remonte vers l’occiput.

In a fetus obtained not long ago at the Maternite of Brussels, the cheek on each side, from the labial commissure, was cut in all its thickness by a band of this type which extended up to the occiput.

Later in his article he queried whether the amniotic bands represented intrauterine inflammatory processes. He also stated:

Les parties molles souscutanées sont déjà séparées et quasi coupées, que la peau reste encore intacte: celle-ci n’a subi qu’un léger amincissement.

The subcutaneous soft tissues are already separated and almost divided with the skin remaining intact: it has undergone only a slight thinning.

Thus it seems that as Simonart did indeed refer to congenital skin bridges in the area from the labial commissure and cheek to the occiput, over the years the name Simonart’s bands somehow became associated with residual skin bridges crossing the upper portion of lip clefts.
In 1954 Summerfield King described the anatomy of the bilateral deformity as two deep clefts continuous with the nostrils which separate a median tubercle from the paired lateral elements of the upper lip. The premaxilla has two large bulges containing the incisor teeth and the bone related to them. A narrow median ridge, the frenulum, attaching the premaxilla to the prolabium is formed of connective tissue covered by a thick, uncornified stratified epithelium. The inferior frenulum continues into a broad V-shaped red lip margin of the prolabium with fibrous connective tissue very richly vascularized. Its epithelium has a thin stratum corneum without glands or hairs. Between the red lip margin and the gum there lies, on either side, a narrow strip of mucous membrane with an uncornified type of stratified epithelium of moderate thickness represented as everted posterior surface of lip. The epithelium of the sulcus between prolabium and gum is similar but thinner. Superior to the red margin in the prolabium is a triangular or circular area covered with hairy skin. Near the red lip margin (mucocutaneous junction), although the epithelium is still clearly of ordinary skin type, hairs are scanty or absent.

The median tubercle contains the right and left premaxillae united by a median suture. Each premaxilla is enlarged laterally to carry two incisor teeth, a central incisor looking inferolaterally and a lateral incisor at a higher level looking posterolaterally. Their sockets are shallow, a great part of the tooth roots being covered only with soft tissue.

Extending posteriorly as an extension from the premaxillae is the subvomerine process, which produces a groove. In this rests the cartilaginous nasal septum and the long, narrow vomer.

The maxilla is represented on each side by a shallow alveolar process containing some milk teeth and by a frontal process and a pair of minute palatal processes. But there is no maxillo-premaxillary (incisive) suture, for the bones are widely separated.
LIP ANATOMY

Prolabium

The prolabium is the soft tissue end point of the frontonasal component. It may vary in size from a few millimeters to over a centimeter in height and width. In bilateral cleft it has been tragically shortchanged, possessing no cupid's bow, no philtrum dimple, no philtrum columns and no labial sulcus and is attached to little or no columella. And that is not all this little patch of skin and mucosa is lacking. The soft, flat prolabium sitting forlornly on the front of the unrestrained, aggressive premaxilla is evidence that muscle migration from the maxillary processes has not reinforced this minimal bit of the frontonasal process.

Muscle discrepancy

As noted intermittently by Mullen, Veau, Lee, Burian, Davis, Stanek, King, Stark, Ehrmann, Rees, Swinyard, Converse, Fara, Smahel, Latham, Duffy and others, there simply are no muscle fibers in the prolabium of complete bilateral clefts, although they are plentiful in the cheek and over the side of the nose. Muscle fibers are, however, found in the prolabium of incomplete bilateral clefts, and the amount varies inversely with the degree of the clefting—the less severe the cleft, the more muscle in the prolabium. These findings seem compatible with the mesoderm migration and merging theories.

In 1931 Mullen expressed suspicion that there was not any muscle, and in 1946 Lee documented the absence of muscle in the prolabium. In 1958 Stark and Ehrmann recognized that the prolabium contained normal mesoderm but without muscle.

It is interesting how "mod" Thomas Rees, son of a Mormon professor of biology at the University of Utah, got interested in the muscle of the prolabium. About 1955, while training with McIndoe at East Grinstead, Rees operated on a 15-year-old Irish boy with a complete bilateral cleft. The prolabium was so attenuated that he used it for columella, noting its absence of muscle. The following year McIndoe took Rees with him to his great wheat farm on the northern slope of Kilimanjaro, East Africa, and during this trip McIndoe, Rees and Michael Wood started a
plan that was later to develop into the Flying Doctors of East Africa. During other trips to Africa, Rees operated on two other adult bilateral clefts with attenuated prolabiums. As he wrote recently,

These three cases later stimulated me to look into the problem of muscle in the prolabium.

In 1962, with Swinyard and Converse, he reported electromyographic evidence of absence of muscle activity in the prolabium.

**Histological picture**

In 1967 Fara and Smahel made some deductions from the study of 330 cases of complete bilateral cleft lips operated on in recent years. Only 3 percent of the bilateral cases were clefts just of the lip and alveolus, and none were clefts of the lip alone. Their microscopic sections of the prolabium of stillborns and children five to seven months of age revealed concurrence in Veau’s original assertion that the prolabium suffers from muscular “sterility.” They noted no striated muscle fibers whether differentiated or in various stages of differentiation.

**Orbicularis oris muscle fiber direction**

In 1960 Wayne B. Slaughter, J. W. Henry and J. C. Berger of Loyola University, Chicago, noted that the muscular components in clefts do one of several things:

(1) Either they terminate in a rather indiscrète fashion leaving sarcolemma with vague unclear components present, or (2) they fade into connective tissue, or (3) the muscle fascicles predominantly turn toward the nostril.

In 1966 Pennisi, Shadish and Klabunde noted this same orbicularis oris muscle disorientation with its peripheral fibers running parallel to the edges of the cleft.

As early as 1965, Fara and Hrivnakova mentioned that the orbicularis oris muscle fibers parallel the cleft edges in incomplete
clefts. By 1967, along with reemphasizing the lack of striated muscle in the prolabium, Fara and Smahel noted immature, fine, collagenous, connective, felt-like tissue and a rich vascular network. In the lateral lip segments they found:

The muscle bundles run along the edge of the cleft, turning upwards . . . towards the line of the nasal wing where they nearly all disappear in the submucosal layer. Only rarely do the muscle fibers show a tendency to advance in a horizontal direction.

Further evidence was presented in 1968 by Fara, who reported the dissection of one bilateral incomplete and six bilateral complete clefts of the lip. He noted the same upward direction of the muscle fibers running parallel to the cleft edges in the lateral lip segments and the same vascular networks coursing along the edge as found in unilateral clefts. The prolabium of complete clefts, although possessing a rich vascular network, had no muscle and only collagenous connective tissue. In one incomplete bilateral cleft the muscle of the lateral segment crossed the bridge of the cleft quite smoothly into the medial lip prolabium, completely filling it. Fara, fortified with 28 excised bridges from bilateral incomplete clefts, reported them well filled with muscle fibers penetrating from the lateral segments into the medial prolabium and spreading open like a fan. He conjectured that the prolabium, partially isolated by the clefts and originally without any muscle fibers, directly absorbed the necessary tissue from the lateral richly muscled elements.

R. B. Ross and M. C. Johnston, in their 1972 book *Cleft Lip and Palate*, simplify the muscle anatomy in bilateral clefts:

The cleft of the lip has considerable influence on the myoblasts moving into the lip from the hyoid arch muscle plates. In the lip those myoblasts which will form the orbicularis oris encounter the cleft margin and turn upward toward the base of the nose either at the alar wings or in the anterior nasal spine region where they eventually form their attachments. This phenomenon suggests that myoblasts will not differentiate into mature muscle cells unless they find a skeletal or connective tissue structure to which they can attach.
**Muscle anatomy in bilateral clefts**

The fibers of the orbicularis oris muscle in each lateral lip element sweep up along the cleft edge toward the alar base. The lack of muscle continuity across the lip places the lateral elements at the mercy of the accessory muscles through the modiolus.

In incomplete bilateral clefts the orbicularis oris muscle fibers run parallel to the lateral lip edges but manage to sneak some fibers through the skin bridges which then fan out into the prolabium. With smiling and crying the lateral lip elements are partially restrained by the bridges, and the prolabium flattens and stretches from side to side at least to some extent.

In this bilateral incomplete cleft lip the bridges are so attenuated that very little muscle has been able to migrate across the clefts. Yawning therefore leaves the prolabium almost totally unperturbed.

In complete bilateral clefts the orbicularis oris muscle fibers in the lateral lip elements run parallel to the cleft edges toward the alar bases. The prolabium itself has absolutely no muscle. During expression of emotion by laughing and crying, while the lateral lip elements are jerked without restraint upward and backward by the unopposed accessory muscles, the prolabium sits solemnly on the premaxilla wholly unaffected.

**Sensory nerves**

In bilateral clefts the long sphenopalatine nerve passes down on each side of the vomer supplying its mucous membrane and that of the premaxilla. The anterior ethmoidal nerve passes vertically
Incomplete cleft

Complete cleft
down dividing into a medial division to the septum and a lateral division to the fossa anterior to the nasal concha, the upper part of the medial tubercle and the frenulum. The infraorbital nerves, besides splaying out to supply the cheek, give off two large trunks which cross the face to the side of the nose and arch inferiorly over the ala to reach the columella, where they form neurovascular bundles with divisions of the facial artery traversing the columella-philtrum region. The incisor teeth receive no nerve supply; this lack may account for their early insecurity.

Motor nerves

The branches of the facial nerve follow the distribution of the muscles but do not spread quite so far. As they approach from the sides, they are not affected by the cleft, except of course they do not cross the complete cleft. There is no muscle to serve in the totally isolated prolabium anyway. In incomplete clefts with varying amounts of muscle coursing the bridges into the prolabium a terminal nerve twig may sneak across if there is enough muscle to carry and merit it.

Vascular patterns in bilateral clefts

In the bilateral cleft specimens studied by Summerfield King in 1954, the right facial artery gave a descending branch to the ala and another branch to the dorsum of the nose but took no part in the supply to the medial tubercle. The left artery formed a horizontal arch which crossed the lower part of the nasal bone and then split as it reached the midline into two divisions that passed down the dorsum of the nose side by side to the philtrum region. Here each division gave a branch that wound over the body of the premaxilla to reach the shallow alveolus of the lateral incisors and entered the pulp. The two divisions then passed along the attachment of the frenulum and ended supplying the medial incisor teeth. They finally anastomosed with the sphenopalatine artery. The veins accompanying the arterial trunks were plexiform in arrangement with intercommunications.
Wayne B. Slaughter with pathologist James W. Henry and Jack C. Berger in 1960 in *Plastic and Reconstructive Surgery* compared the vascular patterns of normal people with those of four human specimens with clefts and serial microscopic sections from 20 cleft infants. They noted:

In the complete bilateral cleft the superior labial artery fails to unite with its fellow from the opposite side and contributes nothing to the blood supply of the philtrum. In addition to this, the arcade made up by the anastomosis of the posterior septal branch with the greater palatine artery through the incisive foramen is absent. The philtrum and premaxilla must, therefore, derive their blood supply from the posterior septal artery and to a lesser extent from the lateral nasal and terminal branches of the anterior ethmoid vessels which pass through the columella.

Dissection of cleft specimens indicate that there is usually one well differentiated vessel on either side of the premaxilla in the region where the incisive foramen should have been. Each of these vessels passes anteriorly and inferiorly into the philtrum. Within the philtrum they continue inferiorly and medially in an arc to anastomose across the midline in the inferior portion of the philtrum.

Dissection of the lateral segments in cleft specimens shows the superior labial artery arising in approximately normal fashion from the anterior facial artery at the level of the angle of the mouth. Being unable to pass horizontally through the lip because of the cleft, it passes superiorly and medially to a point approximately at the level of the lateral inferior attachment of the alar cartilage. Here it forms an effective anastomosis with the lateral nasal artery. This continuation of the superior labial artery probably represents the ascending septal branch which in the normal individual anastomoses with the anterior extension of the posterior septal artery.

In the areas immediately adjacent to the cleft, the normal mature vessel patterns are no longer present. Instead there are embryonal vessels having both venous and arterial characteristics of varying degrees. Although the vessel pattern is undifferentiated there is a tendency for most of the vessels to run parallel to the cleft.

The bilateral cleft vascular pattern here portrayed with several corrections is drawn from the research of Slaughter, Henry and Berger.
In 1968 Fara, using arteriography in one bilateral incomplete and six bilateral complete clefted mature stillborns, found poorer blood supply in the cleft sides of the philtrum but always a rich vascular central network starting in the septal and columellar arteries. In the lateral elements the arteries generally ran along the edges of the cleft, turning upward parallel with the course of the muscle bundles. In the lateral side they were usually stronger and formed denser networks than on the philtrum side.

**BILATERAL NASAL DEFORMITY**

In the normal person the premaxilla is held within the maxillary arch so that the growth thrust of the septum is cushioned in part by the anchoring of its union in the arch. The septal growth kick is responsible for forward growth of the maxillary arch, but its forward progress is not as great as that of the septum itself. The point of the septum is carrying the tip of the nose along with each angle of the medial and lateral crura of the alar cartilage and the columella. The proud advance of these structures is evidently dependent upon the distance the septum projects beyond the
premaxilla. Under these circumstances it might be conjectured that the most progressive nasal development is exemplified in the narrow high-bridged noses seen in British actors often playing the role of a butler, or even in the Middle East nasal humps and high nasal roots. By the same deductions the nasal flatness of the African Negro and the Oriental could represent a back step in nasal progress. It is interesting that in the nineteenth century reduction rhinoplasty was conceived and for over a century has been used and modified to produce noses that are neither too high nor too low but stand between these extremes.

In the complete bilateral cleft the premaxilla "hangs in under there neck and neck" with the septum, preventing the septum from going ahead. The effect of this lack of discrepancy on the nose is equivalent to what happens to a tent that never has its front center pole inserted. It appears to have fallen "flat on its face" when actually it has never gotten "off the ground" in the first place. Not only is the nasal tip flat, but the medial crura of the alar cartilages are left separated, their angles spread, and the columella, being unstretched, is almost nonexistent.

**SPREAD OF THE NASAL BASE**

The clefts through both nasal floors and the maxillary platform also have a devastating effect on the nasal base. Again, it is like a tent without its center pole, precariously pitched over two chasms of different widths with the central peninsula set at higher ground but varying in the height of its rise and the degree of its lean to one side or the other. The lack of integrity of the nostril and its sill sets the alar bases free to flap like unattached tent sides. Then, with the constant pull of the unopposed lateral lip musculature, the flaring and eversion of the alar bases are exaggerated and the shape, thickness and set of the alar wings are provokingly abnormal.

**ALWAYS AN EYE ON THE NORMAL**

The anatomy of the normal has been discussed in detail in Volume I, Chapter 2, but it is always a pleasure to review the
beauty of the normal and essential in order to use it as a guide in planning treatment and grading results.

Wise old owl Ivy, while shaving one morning in 1967, noted the conformation of the philtrum:

One has only to glance at one's own upper lip in the mirror to establish the fact that the midline vertical groove or philtrum is due to an interruption of continuity or direction of some of the orbicularis oris muscle fibers in this area, and that the orbicularis oris is not a simple sphincter like the orbicularis oculi. A rough measurement shows that, with the adult upper lip at rest, the total thickness of the lip laterally is about 11 mm., whereas in the central vertical groove it is about 7 mm. because of the absence of about 4 mm. in thickness of orbicularis oris muscle at this point.

Particularly pertinent normal anatomical aspects that have gone astray in the bilateral cleft deformity and must be sought, corrected or created are as follows: (1) an intact alveolar arch with teeth in occlusion, (2) a lined upper labial sulcus, (3) intact orbicularis oris muscle continuity with its fibers running in horizontal direction, (4) a central philtrum dimple, (5) symmetrical philtrum columns embracing the dimple and curving toward the columella to join each other below it or at its base and seldom running into the nasal floor, (6) a cupid's bow, (7) a midline vermilion tubercle, (8) a "white roll" lighted ridge topping the mucocutaneous junction of the upper lip, (9) an upper lip short enough in vertical length at rest to expose the lower third of the central incisors and with smiling and laughing more of these teeth until all is seen, (10) width of the philtrum less than one-quarter the width of the lip from commissure to commissure, (11) normal relation of upper lip in anterior eversion to lower lip, (12) an elevated slender nasal tip, (13) a graceful relatively elongated columella set at a natural nasolabial angle of 90 to 120 degrees, (14) symmetrical alar rims, (15) unflared alar bases turning in to form nostril sills across the front of intact nasal floors, and (16) bilateral patent airways. And all of these should be in proportions consistent with the specific age, race and sex.
NORMAL MEASUREMENTS OF NOSE AND LIP

Farkas and Lindsay measured 100 normal young Canadian adults, 50 males and 50 females, and found that columella length ranged from 16 to 10 mm. with a mean of 12.3 in the male and from 15 to 9 mm. with a mean of 12.2 in the female. They also found that the vertical length of the upper lip ranged from 18 to 26 mm. with a mean of 22 in the male and 16 to 24 mm. with a mean of 19.6 in the female. These findings correspond with those of Hajnisoova on central Europeans and of Hajnis on western Europeans.

Clifford and Pool reported in 1959:

The lips of 100 normal infants and children under the age of 5 years were measured. The vertical height was taken from the base of the nose to the peak of the cupid's bow at the white line of the vermilion. The average vertical height of a 1-month-old infant was 10 mm. At the age of 3 months this distance was 12 mm. At the age of 1 year the vertical height was 13 mm. A group of 50 adults was measured and their average vertical height was 17 mm. The adult lip, therefore, is only 5 mm. longer than the average child of 3 months of age. Surprisingly, many adult lips of normal appearance were only 13 mm. in vertical height.

Brauer, at the 1973 Duke Symposium, set the Cupid's bow width at about 4.5 mm. and the vertical lip height at 9 mm. or more in the infant.

Resident Tony Wolfe added further normal measurements of Americans to those of Gaston Schwarz to form this general guideline. It corresponds closely to the figures of all other investigators.

The comparison of the bilateral cleft deformity with the normal can be shocking and humiliative but the discrepancy must be taken as a challenge. It may not always be possible to achieve the ideal normal, for not even all normal lips and noses can be made truly beautiful. Yet our goal must be to mend these lips and noses so that their faces are not only in balanced proportion and attractive but capable of the gamut of expression, from the composure of the Mona Lisa to the joy of the Laughing Cavalier.
In the nobility of age, the depth of lip wrinkles challenge the philtrum groove and run in the same direction.
Female—Normal

Smiling a soft bow

Strong tubercles and white rolls

Strong

% exposed with smile

$\frac{3}{5}$ exposed with smile

Lower $\frac{3}{5}$ of incisors exposed at rest

Wide nostrils

All is shown with a laugh

Minimal bows and shallow dimples
Averages in cm.

<table>
<thead>
<tr>
<th>Age</th>
<th>Small Newborn</th>
<th>Normal Newborn</th>
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<td>Caucasian</td>
<td>Negro</td>
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<td>Negro</td>
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<td>Nose</td>
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<td>1. Columella height</td>
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<td>2. Columella width</td>
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<td>0.4 0.4 0.4 0.4</td>
<td>0.6 0.6 0.5 0.6</td>
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<td>3. Nasal width</td>
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<td>Lip</td>
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<td>4. Vertical height</td>
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<td>5. High point to commissure</td>
<td>1.4 (1.2–1.5)</td>
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<td>6. Cupid's bow width</td>
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<td>7. Commissure to commissure</td>
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<td>40 40 30 30</td>
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**ABNORMAL SURFACE ANATOMY FROM THE SURGEON'S VIEWPOINT**

In this deformity there are two clefts with double the varying amounts of missing composite tissue, bone, muscle, skin and mucosa. There is shortness in the vertical length of the entire frontonasal component from the nasal tip to the mid-inferior edge of the prolabium vermilion, the discrepancy being most noticeable in the length of the columella and prolabium. There is more than double the number of absent landmarks and double

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Averages: Newborn 5 year Adult
the amount of disarrangement of what anatomy is present. There is no vestige of the normal cupid’s bow, philtrum dimple and columns and nostril sill with which to compare or imitate; in fact, vestiges even to preserve are minimal.

In the vernacular: "It's a hell of a mess!"

THE VARIATION IN BILATERAL CLEFTS

In the bilateral incomplete cleft there is usually more tissue present, less distortion of the maxilla and the helpful aspect of symmetry. In the mixed bilateral with a complete cleft on one side and an incomplete cleft on the other, most of the discrepancies suffered by bilateral clefts are usually present but in addition there is the difficult aspect of asymmetry. In the bilateral complete cleft the deformity is at its zenith irrespective of the one favorable quality of symmetry for, as one might say, "It is better to have one of something than two of almost nothing."

IN THE COMPLETE DOUBLE CLEFT

The nose is flat and flared, lacking in the beauty of proud tip projection, graceful alar flow and nostril curve. The columella is short or absent so that the nasal tip is dragged down into the lip. The lip not only has no continuity but is actually divided into three parts.

The central portion or prolabium is thin, totally expressionless
and often convex in contour. It is round in shape and can vary in size from a minute (millimeters) nubbin to a large (centimeters) Ping-Pong paddle. It is composed of skin in front but is plastered to the premaxilla behind with little or no labiogingival sulcus. There is subcutaneous tissue in varying amount but no muscle present. Except where it is attached to the tip of the nose, the prolabium is bordered by a mucosal edge different in color and texture from the lateral lip vermilion. The mucocutaneous junction of the prolabium, running around the edge as a half circle or U, is so vague as to be difficult to discern and often sports no true “white roll” ridge, which is pronounced on the lateral lip elements.

The lateral lip elements vary in size, often being far longer in vertical dimension than the prolabium. Since they are attached to the retrposed maxillae, they are placed in a backward anteroposterior plane in relation to the prolabium. The alar bases join the lip elements in an abnormal direction. The vermilion of the free border is full laterally but thins out along the cleft. The mucocutaneous junction is vague along the cleft but rises into a true light-reflecting ridge laterally.

Although the lateral elements carry the only muscle in the lip, the arrangement is far from normal. There is often a groove of deficiency above near the join with the nose and a swell below where the muscle bulges in disappointment. The muscle fibers sweep from the bulge parallel along the cleft edge toward the nose. Lack of integrity of the muscles across the cleft places the lateral lip elements at the mercy of the accessory muscles through the modiolus. Smiling or crying pulls the sides of the lip up and back, widening the gaps and exposing normal and abnormal oral architecture, cleft alveoli, septovomer stalk, palate halves, tonsils and adenoids.

And out of all this distortion rises the premaxilla like a prehistoric reptilian head demanding priority. Through the ages the amount of projection of the premaxilla has had a great practical influence on how the surgeon has dealt with bilateral clefts of the lip. It is no mean fear, even today, to achieve a successful closure of both clefts at the same time if the premaxillary protrusion is severe.
Premaxilla projecting

Excision
- Primary Total
- Secondary Partial

Extraoral traction
- Headcap Fixed
- Cloth Elastic
- Prosthodontic assistance Intermaxillary wire and elastic band
- Prosthodontic assistance

Closure of lip
- Adhesion
- Muscle union
- Two stages
- One stage

Premaxilla after recessed in undercorrected position or nonprojecting
- Edges freshened
- Mucoperiosteal flap closure
- Bone graft
- Periosteal flap (boneless bone grafting)

Setback
- Compression fracture, Ugh!
- Resection of suture, Ugh!
- Subperiosteal resection of prevomerine area
- Toothed bar K-wire
- Keith needle
- Horizontal septal incision
- K-wire

Subperiosteal oblique section and sliding
- Subperiosteal resection of vomer posterior to suture

40
3. What "To Do or Not To Do" About the Projecting Premaxilla

HAMLET, Shakespeare's Prince of Denmark, having lost his father, seen a ghost and discovered a heinous crime, cried out in anguish with what might well become a plastic surgeon's ode to the projecting premaxilla:

The time is out of joint: O cursed spite,
That ever I was born to set it right!
Nay, come, let's go together.

No apologies are offered for the size of this chapter. Without a doubt the ominous shadow cast by the projecting premaxilla over its flanking maxillary segments and the obliteration of this shadow by the ultimate alignment of the "triplet" is the number one problem in cleft lip and palate surgery today. A review of the literature reveals what appears to have been and still is a frantic effort to equalize a giant and two dwarfs of the same age with anything available—mallet, rubber bands, chisel, saw, scalpel, plates, mechanical squeezers, muscles, growth and time. Yet it is essential to know what has been tried in order to know not only what to do and not to do but what is left still to be tried.

In bilateral clefs the position of the premaxilla is the keystone to the reconstruction. If it rests within the maxillary arch, closure of the lip clefs offers no great problem. This is the usual situation in incomplete bilateral clefs. In complete bilateral clefs, however, the premaxilla invariably extends in front of the premaxillary elements, and the projection can vary from insig-
significant to almost insurmountable protrusion often associated with deviation. This projection has been treated in numerous ways over the centuries.

**PRIMARY EXCISION**

Pierre Franco, a pioneer in cleft lip surgery, was the first to describe discard by primary excision of the projecting premaxilla in bilateral clefts. He also advocated surgical freeing of the lip elements off the maxilla to aid in the closure. In 1556 he wrote:

> There is another type of cleft lip which is commonly called hare’s tooth because there are teeth which protrude from the mouth in front of the maxilla, sometimes only one, more often two. And sometimes [they are] also accompanied on both sides by clefts of the maxilla. As for the method of treatment . . . when these teeth or mandibles are so large that they cannot be covered, there is no danger in cutting off the excess with a cutting forceps or with a small saw, leaving the flesh over them [prolabium] if there is enough: for it will be possible to sew the margins to it [the prolabium] on each side. And if the distance between the margins was so great that they could not be joined, it would be necessary to use incisions within the mouth [to undermine lip elements from their attachments to the maxilla].

In 1661 Hendrik Van Roonhuzze of Amsterdam advised cutting away with pincers the projecting premaxilla in “hare-mouth” so as to permit suturing of the bilateral cleft lip.

Georges de la Faye of Paris in 1733 removed the projecting premaxilla with scissors which had long blades and were made like a watchmaker’s chisel.

**Dupuytren**

Guillaume Dupuytren of Paris, known by some as the Napoleon of surgery, was also a pioneer in plastic surgery. He was 130 years ahead of Moyer with nitrate of silver in burns, 20 years ahead of Langer with lines of skin tension, 10 years ahead of Curling with his gastrointestinal ulcer and ahead of almost everyone on the contracture of the palmar aponeurosis. He also enjoyed self-aggrandizement, allowing his name to be attached to a powder to reduce “itch” and an ointment against baldness and even managing to get King Louis XVIII to make him a baron in 1816. Yet even his jealous enemies had to admit he was a hard worker. As Goldwyn noted, Monsieur le Baron would be seen still
making rounds on the wards at nine in the evening, "sloppily attired in an old green frock and socks over the tops of his boots," followed by an entourage of students and visitors from all parts of the world.

His contributions in bilateral cleft lip surgery were less remarkable for he showed the same impatience with the projecting premaxilla that he did with a troublesome patient. According to Dupuytren's American student, Jonathan Mason Warren:

If his orders are not immediately obeyed, he makes nothing of striking his patients and abusing them harshly! A favorite practice of his is to make a handle of a man's nose, seizing him by it and pulling him down on his knees, where he remains, half in sorrow, half in anger, until he is allowed to rise and describe his symptoms.

Like many a surgical pioneer, Baron Dupuytren was not only baffled but frustrated by the problem of the projecting premaxilla. By 1829 his exasperation had risen to such an extent that he took hold of this "malpositioned knob" and twisted it off, utilizing the prolabium to construct the columella. He did acknowledge later:

M. Malgaigne . . . thinks that this is liable to objections. The most serious, according to him, is the removal of the germ of two, three or even the four incisors.

Sims

J. Marion Sims of New York, deservedly better known for his "position" on vesicovaginal fistula than on premaxilla, removed this structure in "a most horrible case of harelip," preserving the prolabium. Thirty-seven days after premaxillary excision, he trimmed the cleft edges and the prolabium with scissors and approximated the wound edges with a single through-and-through needle and with several interrupted sutures which were later reinforced by a type of tape support.

Rose

William Rose of King's College Hospital, London, wrote in 1891:

To my own mind the disadvantages of the retention of the incisive bone so clearly outweigh the prima-facie advantages, that in my practice I have
followed the usual course adopted by the majority of British surgeons in removing the bone at the earliest opportunity. By this removal the operation of the lip can be more successfully accomplished, and as regards the profile effect the later introduction of a dental plate with artificial incisors will greatly improve the appearance, and enable the patient to bite in a satisfactory manner, far more so, in fact, than with the mobile os incisivum.

Objection to removal

Yet, as early as the latter part of the eighteenth century, Chorin showed remarkable insight by objecting to the primary excision of the premaxilla. Obviously by observation he recognized that the ultimate result was a tight lip, dish face of the middle third of the face and relative mandibular prognathism. He wrote:

It will leave a considerable space between the maxillary bones; it will deprive the lip of its point of support at the place where it is divided; and if the reunion takes place, in spite of the disadvantages of such an arrangement, the action of the muscles will soon lessen the space between the maxillary bones, and the upper jaw will become contracted enough to fall within the under one, a circumstance which, at the same time that it renders mastication very difficult, will occasion a fresh deformity.

What Franco, Dupuytren, Sims and others did on purpose and out of desperation, some surgeons do inadvertently. The results are still loss of the premaxilla and a central deformity of the face.

POSTERIOR TRACTION BY VARIOUS TYPES OF EXTRAORAL APPARATUS

Following dissatisfaction with primary excision, ingenious methods of external compression were devised. It seems to have been a tug-of-war between the Germans and the French as to who could tug the hardest on the premaxilla.

In 1686 German Johan Philip Hofman presented a headcap with cheek extensions armed with corset hooks at the sides of the lip. When laced with tension, this apparatus could serve both to press on the premaxilla and to relieve the tension of the bilateral cleft closure.

By 1768 Louis, a French surgeon, blamed the clefts on lack of muscle retraction rather than loss of tissue and advocated “a
uniting bandage” with the aid of a bonnet. Chaussier, another French surgeon, in 1776 designed a cheek compression bandage for cleft lip to obtain a greater number of cures “despite the continuous movements of the little patients.”

**Desault**

In 1790 P. J. Desault devised a rather elaborate cloth compression bandage which he applied against the projecting premaxilla for 11 days preoperatively to exert steady backward pressure. This is a description of Desault’s bandage on a five-year-old bilateral cleft lip by his junior surgeon, Chorin:

In order to bring the protuberance to a level with the lip, and to depress the projecting portion of the maxillary bones, M. Desault, who as the principal surgeon of the Hôtel Dieu, Paris, undertook the treatment of the case, had recourse to a linen bandage, which passed over the upper lip and was fixed at the back part of the neck. The good effects of this bandage in compressing the parts in question were so obvious, that its use was continued until the operation was performed.

**Malgaigne and Hullihen**

Malgaigne used a similar type of cloth compression bandage in about 1844. Simon P. Hullihen, American dentist of Wheeling, West Virginia, was another to use external retraction in bilateral clefts, also in 1844. As noted by Robert Goldwyn in *Plastic and Reconstructive Surgery*, September 1973, Hullihen urged “preparatory treatment” in all cases, especially when the lip deformity was accompanied by a “cleft of the alveolar and palatine arches.” His initial treatment, like that of Thiersch, was an “adhesive strap” from one cheek to the other, but he advocated cinching it constantly:

The strap should be kept perfectly tense. It is therefore necessary to tighten it every day or two, which may be done by cutting a small portion out of the narrow part, and then sewing it together, without disturbing its adhesion to either cheek. . . . The time generally required to close a cleft of the alveolar arch, depends more upon the age of the infant than upon the size of the cleft. It generally requires from four to six weeks to close the cleft in infants under five months old. . . . As soon as the cleft edges of the alveolar arch are brought together so as to touch each other in the slightest manner, the operation for the cure of the harelip may be properly performed.
The Germans and others

Then the Germans began to tug again. In 1868 Von Bardeleben used a compression bandage with a bonnet as shown. In 1875 Karl Thiersch of Leipzig, better known for his thin split-skin grafts, used rubber bands stuck to the cheeks with an adhesive. This course of events not only reveals the participation of famous general surgeons in the treatment of clefts in the nineteenth century but points out the value of their sound logic turned toward cleft correction in the early days.

By 1892 Von Esmarch and Kowalzig were employing an elastic band attached to a headcap, which is beginning to get quite modern.

The Americans joined the ranks again, and in 1907 oral surgeon G. V. I. Brown used adhesive tape pressure across the premaxilla. Needless to say, the skin did not take this too well. By 1922 Federspiel was using the elastic band, and Cronin advocated it still in 1964.

Hans Derichsweiler, at the 34th Congress of the European Orthodontic Society in Copenhagen, claimed that the bilateral cleft "premaxilla could be fused with the prevomerine segment by extraoral traction alone." This assertion stimulated Merton Griswold and Willis Sage of New Jersey in 1966 to develop an ultramodern bonnet of stout muslin on which a lip traction band made of a woman’s Playtex girdle (!) was hooked to exert 8 ounces of tension in babies and up to 14 ounces in older children. The apparatus was applied for six weeks to three months depending on the effect. To offset the maxillary collapse behind the premaxilla, they held the premaxilla in alignment while traction devices attached to the teeth were expanding the arch. With variations this general approach is probably the most popular preoperative treatment in use today.

CONTROLLED FIXED EXTERNAL TRACTION

In 1968 the Duke University Medical Center team of Georgiade, Mladick and Thorne suggested passing two Kirschner wires
horizontally through the cheeks, one through the premaxilla and
the other through the posterior maxilla. The ends of the wires
were bent into hooks, and rubber bands were applied to achieve
controlled posterior traction. Subsequent experience revealed that
wires tended to cut through the soft bone of the premaxilla.

Then in 1970 Nicholas Georgiade, part Greek, part Austrian,
armed with dental and medical degrees, cunning and as capable
in a casbah as on a college campus, devised a Dacron halter for
his controllable traction. I watched him place one on a projecting

Five days before closure of the bilateral cleft lip, under local
anesthesia, Georgiade passed one 0.054 Kirschner wire through
the cheek just distal to the maxilla near its junction with the
pterygoid plate of the sphenoid bone and distal to the tooth bud
follicles. The wire was thrust across the cleft and through the
opposite side of the maxilla until palpable under the cheek skin.
A later improvement in his design was the fashioning of a
premaxillary halter from a half-inch strip cut from Dacron arterial
material. This Dacron strip was split into a lopsided Y with one
prong extension several times the length of the other. The longer
extension was passed under the prolabium to hug the premaxilla
while the wider shorter extension was brought around in front of
the premaxilla and fastened by sutures to the other end coming
from under the prolabium. Thus the halter was complete, its two
bands encompassing the "head and nose" of the premaxilla and
leaving the two ends as restraining reins through which standard
rubber bands were threaded. The rubber bands were then looped
around Georgiade’s posterior transverse Kirschner wire exerting
the required tension to cause retropositioning of the premaxilla.
Five days later the clefts of the lip were closed, and the intraoral traction was maintained another two weeks following the lip surgery. This contraption interfered with surgery and was not completely controllable so a better traction device was sought.

The value of a combined dental and surgical effort in the treatment of clefts is not new to Nicholas Georgiade, who nearly 30 years ago, having completed dental school and oral surgery training at Kings County, started medical school at Duke University. During the summer and holidays he joined the team of Dunning and McCaffrey in New York City. Henry Dunning, M.D., D.D.S., was a charter member of the Board of Plastic Surgery, and McCaffrey, D.D.S., was an ex-all-American football player from Fordham. Georgiade, who fitted into this team well as he was a medical student and had played a little football at Fordham, found himself involved in the surgical treatment of two to three lip and palate clefts a day.

*Duke-Carolina game*

So important are the premaxillary and other cleft problems that arch-antagonists have buried gridiron rivalries and joined oral and plastic forces against a common enemy, the projecting premaxilla. Georgiade of Duke and Latham of Carolina have developed what they refer to as the Mark III coaxial arch alignment appliance, with two concentric knobs protruding from the mouth, one for arch expansion and the other for premaxillary retraction. The expansion component is composed of a prosthesis fitted on each maxillary element and pinned in position with a cross wire attached to a gearbox so that a turn of the thumbscrews spreads the segments of the maxillary arch apart. The retraction component is a saddle attachment straddling the anterior vomer and fixed with a pin through the area posterior to the dentition of the premaxilla. This attachment is operated through a hollow tube by a screw device passing posterior to a gearbox (jackscrew) on the center of the cross wire of the prosthesis. One millimeter of posterior movement of the premaxilla is achieved by every turn of this second thumbscrew, and a turn in the morning and
Latham wrote me on June 15, 1973:

Dr. Georgiade and I are satisfied with the cable-screw premaxillary retractors and the gear controlled expansion appliance as used in a bilateral cleft infant at Duke University Medical Center last week. Dr. Georgiade managed to do the gingivoperiosteoplasty as well as the lip although vertical relationships were poor. The anterior ends of the maxillary segments will have to be controlled in the vertical plane as well as in the horizontal—i.e. the usual expansion-collapse problem. . . . I hope that it will soon be accepted that an effort should be made to close the alveolo-gingival cleft at the same time as lip closure.

I am not sure we have all the answers yet as to how to handle the premaxilla but certainly when I review my past 25 years of experience in dealing with these infants, who received the best treatment according to our standard, and who are now adults with collapsed maxillae, and flat upper lips, I cannot help but hope that we have learned something. . . . I certainly believe this rather simple appliance. . . . must be a step in the right direction to prevent those horrible maxillary deformities. . . . Certainly this method of expanding the maxillary segments is a lot better than what the orthodontists have tried to force us to use with oral appliances that had to be turned in a screaming unhappy infant. The use of the cumbersome McNeil technique is not even in the same ball park as this simple apparatus.

In 1974 Georgiade sent me photos of an infant with his apparatus in action showing the retropositioning within a period of nine days. He wrote:

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By late October 1973 Latham reported:

We have now used this appliance three times with considerable success. In all three, to my great satisfaction, an attempt was made to put downward traction on the maxillary segments. This worked well on the first and not so well on the other two—but I’m dealing with some of the difficulties and I’m sure this is going to be a big part of the treatment.

Latham’s reasoning:

As the brain grows the cranial vault sutures are put under tension and osteogenesis occurs as required. You have two sutural surfaces separating and new growth occurring to keep the bone edges the same distance apart—say 0.2 mm. . . . In my work toward a Ph.D. in Liverpool in 1966 I found that in the rapidly growing facial skeleton of the fetus osteogenesis was not a feature of the sutures around the maxilla. It was obvious that at that time skull growth was most rapid. Then I came to what I regard as my most important observation: the bones were sliding past one another at the sutures, they were aligned in the direction of bone movement and bone formation was not necessary for this movement. The factor that would control such sliding would be the adjustment of the collagen fibres holding the bones together at the joint. It seems that such adjustment of the collagen fibres interlacing across the suture could allow much more rapid movement of the bones than if such movement were dependent upon the rate of bone deposition at a separating suture. Think of the continuously erupting incisor tooth of the rodent. The tooth is moving or sliding out of the socket all the time, while collagen periodontal ligament adjusts in the intermediate plexus where the fibres from the bone and tooth divide into a fine intermeshing network. Put the palms of your hands together with elbows outward. Now slide one hand over the other with elbows moving out. The hands may move in opposite directions for a great distance before contact at the inter-palmar surface is lost. Now to maintain that contact growth needs only occur at the finger tips. Such is the economy of bone formation in the rapidly growing skull.

Here is a coronal section of the zygomatic-maxillary suture from a three-week-postnatal infant offered by Latham to demonstrate the five layers which he says are indicative of the suture adjustment mechanism.

He noted:

The suture uniting the two bones shows five tissue layers: The periosteal, osteogenic and fibrous capsular layers of each bone respectively with a
middle loose vascular layer. The collagen fibers of the capsular layers are oriented mainly parallel to the bone margins and this facilitates the movement of one bone in relation to the other since adjustments occur mainly in the middle zone and at the periphery of the suture where uniting layers of fibers pass directly from one bone territory to the other.

Latham adds:

This means that sliding is a normal mechanism between two bone surfaces and this is what is being required of the vomero-premaxillary suture as retraction force is placed on the premaxillae. So we have to exploit this mechanism, work within its limitations. And that’s mainly why I didn’t like Dr. Georgiade’s rubber bands. The screw mechanism allows us to do this job in a series of steps; at each step we would push the collagen as far as it would adjust and stretch within the bounds of normal physiology.

Maybe you will begin to see why I am keen to put the maxillary segments exactly where we want them, because I’m confident that they will move—when given some reason to move!

Latham and Workman in the 1974 Symposium on Management of Cleft Lip and Palate and Associated Deformities further justified the Mark III positioning of the premaxilla by rapid compression:

The columella cartilages are covered and obscured by the alveolar process of the premaxillary segment. The position of the medial crura is probably correct and should be preserved. The close relationship between the medial crura and the bony alveolar process is one of gradual acquired approximation. They are not firmly united one to the other and may be readily separated by posterior traction. The premaxillary segment may be moved to
a more normal position, at the same time uncovering the columella cartilages. . . . It is to be hoped that this rationale will tend toward the manifestation of normal relationships and appearances in the lip and columellar region with later growth.

Finally in July 1975, Georgiade and Latham again promoted their pinned coaxial screw appliance.

Because the protruded premaxillary segment may be retracted rapidly in 7 to 10 days, and this may be scheduled at the same time as lip surgery, orthopedic management of this formidable malformation is now practical and, therefore, available to all such infants as a routine procedure.

**SIMPLE EARLY CLOSURE OF LIP CLEFTS TO SERVE AS MOLDING ACTION**

The reconstitution of the normal restraining muscle band gives satisfaction in a good percentage of cases. In fact, when the premaxilla, in addition to the projection, is rotated to one side, the closure can be staged to advantage. By closing the lip cleft across the widest gap, one can pull the premaxilla into a straight position in preparation for lip closure on the second side. DeHaan admitted, in Stark’s 1968 *Cleft Palate*, that surgeons disagree on whether the premaxilla should be recessed primarily but concluded:

We have not found the prominent premaxilla a serious problem; once the lip is closed it usually exerts sufficient pressure for the desired retrodisplacement. We feel that operative recession of the premaxilla may well interfere with growth of the central third of the face.

Bauer, Trusler and Tondra in Indiana in 1959 and Glover and Newcomb in Ohio in 1961, all as a result of long-term reviews, decided against surgical setback of the premaxilla as their best results were with simple soft tissue closure.

As early as 1954, there appeared an interesting report. Slaughter of Loyola University and the University of Wisconsin, and PruZansky of the University of Illinois College of Dentistry realized the importance of muscle closure across the cleft.
Accompanying the cleft lip repair is the simultaneous reestablishment of the prime function of the orbicularis oris muscle—that of a sphincter-like action, plus the accompanying changes of the accessory muscles of the immediate vicinity. This is the prime motivating force responsible for favorable reconfiguration of the bony skeleton of the middle one-third of the face.

Slaughter and Pruzansky's main theme was that the surgery should not be allowed to have an adverse effect on the future growth patterns. They acknowledged:

Since the cosmetic results immediately following repair of the bilateral lip cleft may be less than desired, it is significant to note that serial studies have indicated that the differential processes of facial growth tend to minimize the deformity and provide a more desired end result. In some children such spontaneous correction of the premaxillary protrusion may occur rather early and in others at a later age. Of course, there are rare exceptions in which there is no such improvement in facial profile. In such instances section of a portion of the nasal septum may be required but only as a last resort . . . and based on documented serial observation (cephalometric roentgenograph) over a period of at least five to six years.

In 1972, from the Center for Craniofacial Anomalies at the University of Illinois Medical Center, Hans Friede, D.D.S., and Samuel Pruzansky, D.D.S., summed it up with cephalometric radiographs and dental models in a longitudinal study of 54 complete bilateral cleft lip and palate cases. Their conclusions were:

1. The common denominator that characterizes this cleft is the marked protrusion of the premaxilla, resulting from an overgrowth at the premaxillary-vomerine junction.
2. Considerable in-group variation existed, in the extent to which the premaxilla protruded ahead of the palatal shelves.
3. The degree of premaxillary protrusion first observed in the unoperated infant is a useful prognostic indicator of later changes in his profile.
4. In cases operated by closure of the lip without premaxillary setback, the facial profile approximated the averages for the non-cleft population by the time the children reached early adolescence.
5. The amount and direction of mandibular growth is a significant factor in the ultimate improvement of the facial profile.

Twelve years after their switch from surgical setback Bauer, Trusler and Tondra reported candidly in 1971:

Surgical retropositioning of the premaxilla in our hands has consistently resulted in severe growth disturbance of the middle third of the face. Since excellent results with surgical retropositioning of the premaxilla in selected cases have been reported by Cronin and Monroe, it may be assumed that our technique was in error. If the lip is repaired in two stages, it is our belief that surgical retroposition is unnecessary. The motor force of the repaired lip will eventually bring the premaxilla into proper relationship with the mandible. Recent articles on this subject by Berkeley, Glover and Skoog have been in agreement with this approach.

It is interesting that the Indiana group closed the first side at two weeks of age and the second side two months later.

Skoog of Sweden in the same 1971 tome summarized:

Surgical correction of bilateral clefts is accomplished by operating upon one side at a time, the first operation being done at the age of 3 months. . . . In asymmetrical deformities the most severe cleft is repaired first. Three months later the other side is operated upon.

EXCISION OF THE PREMAXILLA SECONDARILY

Professor Kilner of Oxford closed the lip of his bilateral clefts in two stages, trusting the pull of the united muscle to reduce the prominence of the premaxilla. Actually this muscle pull was responsible for the swinging in of the maxillary processes which trapped the premaxilla in front of the alveolar arch and necessitated its removal in about 90 percent of cases. He did not approve of a wedge osteotomy of the septum, explaining that it was dangerous to the growth of the premaxilla, which he preferred to maintain as a lip rack during facial development. At the age of five to seven years, however, if it was wobbly and useless, he removed it and substituted a denture.
A PARTIAL PREMAXILLARY EXCISION

In 1957 a compromise was suggested by Gillies, who was familiar with the premaxilla, which often fails to gain union and becomes a wobbly prow with abnormal teeth deserving discard. He posed the possibility that

the anterior mucous membrane be peeled back from the premaxilla and the anterior bone and tooth-buds be rongeured away. This leaves a posterior strip of bone sandwiched between two layers of mucosa. If this bone strip is now moved back and introduced snugly into the cleft, the edges of which have been freshened to bone, there is the better chance of bony union across the gap and preservation of the full arch.

In 1968 in the British Journal of Plastic Surgery John Potter explained his change to a more radical handling of the premaxilla somewhat like that of Gillies. In 1959 he had been faced with twins each having bilateral clefts of the lip and palate. In the girl he had used the standard closure over the projecting premaxilla, retaining the prolabium in the lip. The boy twin, who had developed a tumor of the premaxilla in the first few weeks of life, underwent excision of the tumor. A pathological report by Professor R. Willis is of interest:

This is a typical specimen of the pigmented epulis of infancy. The upper incisor region is its commonest site; but your specimen is of special interest in that it came from this site in a case of cleft palate. In spite of its extent and infiltration, it is essentially a benign lesion, which is readily cured by local excision and which has not metastasized in any of the reported cases.

Subsequent surgery involved a two-stage union of the lip to prolabium. The result of this forced reduction of the anterior premaxilla impressed Potter with its better nasal tip, columella and lip. In fact the twins' mother remarked that she wished the girl had had this type of repair instead of the boy! After three years' observation, Potter decided:

It was worth making further efforts in an attempt to obtain a better nasal tip at the original repair.

In fact, 14 years later he was still pleased with the nasal tip. In 1968 he presented a report on the twins and a third case
which was handled in a manner greatly influenced by his experience with the twins. He started out:

The problem is that before the repair there exists a flattened nasal tip with a short columella and wide nostrils, because the pre-maxilla bulges into the nostrils.

He then explained that no matter what the surgery this condition "leads to obstruction of the airway and a chronic catarrh." His surgery involved elevating the premaxillary mucosa, and he continued:

The anterior plate of the premaxilla was exposed and removed in the upper two-thirds, the tooth sacs were removed, the central septum was leveled back, in order to get it into what was thought to be its normal relationship with the nasal spine. . . . The soft tissues were allowed to settle for eight weeks and then the floor of the nose and the lip were repaired in one stage. . . . The procedure gave a good nasal tip, a good airway, and no chronic nasal discharge. The lip is good but may need an Abbe flap.

Potter mentioned loss of the upper incisor teeth, and three years later the profile was already showing definite retroposition of the premaxillary area. He did use a small Abbe flap eventually. In 1974 Potter wrote:

I have a new case to begin and I hope to save the teeth.

A secondary rendition of this rather radical approach was presented in 1973 at Duke University by Frank Masters of Kansas City and published with D. B. Apfelberg in 1974. When the premaxilla is otherwise useless because of malposition, mucoperiosteal flaps of the premaxilla and maxillae are opened on each side of the clefts and sutured together to form one long trough into which bone from the premaxilla is packed as cancellous
chips. Then the flaps are closed to form a reduced alveolar ridge on which a dental plate can be fitted.

**PROSTHODONTIC ASSISTANCE**

It was the experience of lip closure followed by maxillary arch collapse that led to the 1954 work of C. Kerr McNeil, who advocated delicate but continuous forces to influence the direction of the growing bone. Burston soon joined these forces. They proposed as an ideal approach the prosthodontic techniques of early stimulation of the maxillae by a changing prosthesis until they are in alignment with the protruding premaxilla and thus alleviate the necessity to section the vomer.

The elaborate setup that Burston has in his anatomy department in Liverpool cannot be duplicated many places in the world. Thus, Hagerty and Mylin improvised pinning in a screw plate which, if fitted in the early days of life, can be maintained with relative ease and can have a great influence in positioning the maxillary elements. The jutting premaxilla still poses a problem.

**Spring plate and rubber band**

In 1967 William M. Manchester of Middlemore Hospital in Auckland, New Zealand, in his typical direct manner crowned the bilateral cleft the most difficult modern surgical problem, not excluding cardiac surgery, and blamed the premaxillary protrusion on lack of muscle restraint and abnormal tongue pressure. To combat this deformity he enlisted the services of orthodontist J. H. Peat, who developed an upper dental plate divided in two halves joined by a spring. The plate has two segments which overlap each other so that when the apparatus spreads, under its own slight spring tension, there is still an effective roof to the mouth. This plate is used in conjunction with rubber band traction and prevents the tongue from counteraction. After five months in a case with a protruding premaxilla, "the alveolar arch forms a continuous horseshoe and the premaxilla is acting as a stable keystone between the maxillary segments."
LIP ADHESION

In a frantic attempt to obtain some kind of closure over the projecting premaxilla in bilateral clefts, Simon in 1864 cut two lateral cheek flaps, transposed and sutured them to the sides of the prolabium in what was probably one of the first adhesion procedures ever done. Once the pull of the flaps had partially repositioned the premaxilla, Simon proceeded with his second-stage definitive lip closure.

The next examples of adhesions were more sophisticated. In 1955 Johanson of Göteborg used a type of adhesion to create a tissue bridge for the insertion of bone grafts. By 1958 I was using early lateral vermilion attached to the inferior prolabium for blood supply to that component, but in the process, of course, some premaxillary molding occurred. By 1961 Johanson had become suspicious of primary bone grafting but intrigued by the beneficial effect of the early adhesion. In 1963, encouraged by the effect of the early adhesion in bilateral clefts, I used a high mucosal adhesion in a severe cleft specifically as a stalling tactic and a molding device. My report was published with other refinements in 1964.

In 1965 Randall advocated a modification of this adhesion with more sacrifice of lip skin expendable only in his type of cleft lip closure. Takahashi of Tokyo in 1970 diagramed both the "Millard" and the Randall adhesions and published some interesting bilateral cases in which he had used lip adhesion procedures in two stages prior to a forked flap columella lengthening.

In 1971 Hamilton, Graham and Randall reported the "lip adhesion" in 14 complete bilateral clefts and on the complete cleft side in four cases with the incomplete cleft on the opposite side. In the complete clefts one side was joined at a time and at the average of 3.5 months of age, the opposite side being joined about 1.2 months later. The adhesions were maintained for approximately six months, and then a definitive lip closure was performed.

A few extracts from Randall and Graham summarize their use of the adhesion procedure:

"Broad-based rectangular flaps [were] constructed from tissue that is ordinarily discarded.... Extraoral traction on protruding premaxillae has not
been necessary. Osteotomy to reposition a protruding premaxilla has seldom been needed. Any lateral soft tissue undermining has been rare and minimal. . . . For two years the lip adhesion operation has been carried out on all complete unilateral and bilateral clefts at the Children's Hospital of Philadelphia. . . . When considerable separation of the lip margins is present, particularly when associated with bony distortion . . . the operation seems to have merit.

Finally, in 1973 Randall incorporated early columella lengthening with a primary forked flap during one side of an adhesion procedure at three months and three months later created an adhesion on the other side of the lip.

Highest

A variety of adhesions have been advocated over the past 20 years. In 1962 Celesnik of Ljubljana proposed simple closure high up in the nasal floor on each side as a first stage. This approach was presented in Copenhagen in 1973 by his previous student M. Perko of Zurich. After orthodontist Margaret Hotz creates alignment of parts, Perko makes a Celesnik I nasal floor adhesion at six months and one month later carries out a bilateral Veau or Manchester definitive lip closure. Here is one of their cases followed through an impressive orthodontic and adhesion staged premaxillary alignment, later published in the 1975 Scandinavian Journal of Plastic and Reconstructive Surgery.
Since 1967 K. Hollmann of Austria, in a desire to avoid the chances of maxillary growth retardation by mucoperiosteal dissection, has been carrying out a one-stage inferior lip adhesion almost identical to the one I used for several cases beginning in 1958. Hollmann attaches mucosal flaps from the cleft edges of the lateral lip elements to the inferior prolabium vermilion. His variation is a tucking of the tips of the lateral flaps under the central prolabium rather than overlapping it. He postpones his definitive lip closure until two years of age.

Personally, since my earliest cases I have not been particularly interested in using the adhesion procedure for traction in bilateral clefts. Usually there is not the problem of asymmetry—in which I find an adhesion most beneficially equalizing. The definitive lip surgery is relatively easy as soon as the rubber band traction has adjusted the premaxilla. I prefer to skip the adhesion and close both clefts in one operation. In those rare cases in which the rubber band is ineffectual, I would favor a bilateral mucosal flap adhesion to a surgical setback.

**Two-stage adhesion without undermining**

In 1966 Walker, Collito, Mancusi-Ungaro and Meijer of East Orange, New Jersey, advocated the ultraconservative combination of elastic extraoral traction followed by lip closure without undermining:

In effect, the elastic band substitutes for an intact lip and creates the antagonistic forces of a normal orbicularis oris muscle. In the absence of lip surgery and intraoral appliances, elastic traction decreases the severity of the lip and palate defects. ... Thus, the bony foundation is established for lip closure with minimal or no undermining of the soft tissue.

They feel that undermining the lip elements from their attachments to the maxilla changes the muscle environment and that the scarring produced is deleterious to the growth of young bone. A far greater number of surgeons seem to be concerned for the freeing of the abnormal attachments of the muscles so that the tension of lip closure will be reduced.

In 1971 Dutchman Robby Meijer of the Peer Group and dentist Michael Collito of East Orange, New Jersey, reported on
a five-year follow-up of the use of the C-W technique with a series of 20 unselected, consecutively treated cases. The preliminary lip adhesion was carried out from two days to over five and one-half months of age, while the definitive lip closure was completed between ages two months and one and one-half years. The original alveolar gap averaged 10.2 mm., but following the adhesion alveolar process approximation with contact occurred in 65 percent of the cases. The remaining 35 percent showed approximation without contact. In no instance was there overlapping of the segments. Comparison of these results with those published in 1964 by Pruzansky is of interest. The latter found 42.4 percent achieving favorable approximation without contact and 39.5 percent showing overlapping of the segments or collapse. As noted by Meijer and Collito:

Of special significance, however, is that in our group all cases continued developing into a favorable arch form while 60 percent of the Pruzansky cases deteriorated.

Here is a case sent by Meijer in 1974 which had a preliminary lip closure on the right 3-19-65 and on the left 6-23-65. A definitive lip closure was done on the right 11-5-65 and on the left 12-21-65. The soft palate was closed 6-1-66.

**SHORTENING THE SEPTOVOMERINE STALK**

*Compression fracture*

In 1833 Gensoul in Paris is reported to have seized the projecting premaxilla with a strong forceps and forced it back with sufficient
In 1844 Pancoast of Philadelphia illustrated his method of positioning the premaxilla. He explained his sketch in the following manner:

This represents the forcing backwards with a pair of flat-bladed forceps of the prominent portion of the jaw, in which the two incisor teeth are lodged. This attempt to bring the teeth down to their proper level is commonly attended with slight fracture of the bone.

In 1961 Cyril O. Innis, off in North Borneo and faced with two projecting premaxillae in nine-year-old Chinese children, revived the idea of compression fracture of the vomer. He then wedged the mobile unit back between the lateral alveolar segments and closed the lip on both sides using no further fixation. He concluded:

This method has, I feel, the advantage of simplicity [agreed]. There is minimal disturbance with growth centres of the premaxilla [?]. . . . The disadvantage probably lies in that by this method, obstruction of the nasal airway might result and it is difficult to correct excessive downward displacement in relation to the rest of the alveolar arch of the premaxilla.

According to Fomon, about 1873 Drachter was nicking the neck of the premaxilla, forcing the bone into contact with the alveolus and repairing the corresponding side of the lip. At the second stage he repeated the process on the opposite side. This maneuver not only tilted the fragment backward, causing the teeth to erupt lingually, but displaced the septum backward, flattening the alae and retracting the columella.

Full-thickness resection of vomer

In 1842 Blandin retroposed the protruding premaxilla by resect-
ing a triangular piece of vomer bone and mucosa in a rather unsophisticated setback.

**Subperiosteal section of vomer**

Adolf Von Bardeleben of Germany was the first to section the vomer subperiosteally, in 1865. Through a 1 cm. incision along the free border of the vomer behind the premaxilla the mucoperiosteum was elevated on both sides so that scissor section of the septum as high up as possible allowed the sectioned septal ends to glide past each other without buckling as the premaxilla was repositioned. There have been many modifications of this design but Von Bardeleben’s approach remains the basis of the operations in use today.

**Another backward overlap**

John F. Binnie of Kansas City, Missouri, in his 1916 edition (the seventh) of *Operative Surgery* noted:

Some surgeons advise that the misplaced intermaxillary bone be entirely removed. . . . Undoubtedly it is wise to retain the bone and replace it in its proper position. . . . Sometimes instead of excising a wedge from the septum it is sufficient to make a vertical cut through it and slide that portion of the septum anterior to the cut back alongside the posterior portion.

Binnie used a drawing from Von Esmarch and Kowalzig to demonstrate this method of overlapping the septum.

**Pichler**

In 1918 H. Pichler of Austria dissected the mucoperiosteum from the vomer, divided the denuded vomer 2 cm. behind the premaxilla and, during the premaxillary setback, slid the septal fragments side by side. Instead of closing the mucoperiosteum over the sectioned and overlapping septum, Pichler ingeniously
turned these flaps laterally and tucked them under the palatal mucoperiosteum which he had elevated from the hard palate.

Federspiel

Matthew N. Federspiel, Professor of Oral Surgery and Orthodontics at Marquette University in Milwaukee in 1927, described a variation of premaxillary "set-back." He freshened the edges of the alveolar cleft, then through a longitudinal incision in the mucoperiosteum over the vomer achieved an oblique sectioning of the vomer so that with a slide back there was overlapping but reduction in premaxillary protrusion.

Vaughan

Vaughan described a similar method of premaxillary positioning in 1946. Through a submucosal dissection, beginning 1.5 cm. posterior to the premaxilla, an oblique section of the vomer was achieved with a chisel. This cut was extended upward into the cartilaginous septum in an area where the premaxillary blood supply was in no danger. The premaxilla was then slid posteriorly and overlapped without rotation on its transverse axis and without blocking the nasal passages. The vomer overlap was fixed with a silver suture and the mucosa closed.

Schultz

In 1946 Louis Schultz of Chicago set back the premaxilla and mentioned the numerous problems faced, such as time involved, lip scarring from tension, lack of bony union, fistulae and poor bite if setback was not done.

All these undesirable factors are avoided if the intermaxillary bone is brought to its normal position when the child is about one month old.

He suggested two ways to mobilize the premaxilla, one by V resection of the vomer and the other by diagonal sectioning and
sliding of one vomer segment over the other in a manner described originally by Federspiel and by Vaughan only two months before his own presentation.

*Subperiosteal resection of the vomer*

In 1868 Guerin retroposed the premaxilla by subperiosteal resection of a triangle of vomer bone combining the principles of Blandin and Von Bardeleben.

In 1911 Reich supplemented the vertical wedge resection of the vomer (A) with horizontal septal cartilage division (B) to reduce the premaxillary prominence but at the same time prevent septal and nasal tip collapse and avoid what he referred to as "a blunt and bull dog nose." This general approach is similar to what Cronin advocated later.

*Veau*

In 1922 Veau described resection of the neck of the premaxilla as a prelude to displacement of the bone, "as one would close a drawer." To promote union at the alveolus, the bone ends were freshened and sutures were used for stabilization.

Yet in 1938 Veau reviewed 208 cases of bilateral clefts which he had treated surgically in different ways and decided against operation on the premaxillary prominence.

Veau's final feelings are expressed more poignantly in French, I guess:

Le malheur de cette chirurgie est que nous ne pouvons tirer un enseignement de notre operation que plusieurs années après l’avoir pratiquée.

*St. Louis soundness*

Most surgeons today still agree with the wise words of Brown, McDowell and Byars of 1947:
Briefly, the problem of the premaxilla is that it is nearly always too far forward in the newborn baby, but only with considerable effort can it be kept from being retruded too far backward in the adult.

They set forth a sound plan:

As a rule, the premaxilla is not disturbed or set back if the lip can be closed with it in its original position unless: (a) it is badly tilted or rotated or (b) it is so far forward that the elastic pressure of the closed lip might bend the septum and occlude one or both nasal airways. If the premaxilla is to be set back, it is set back the least possible amount necessary to allow successful closure of the lip. This is done by splitting the mucosa over the bottom of the vomer and resecting a block of the vomer just back of the premaxilla. The premaxilla is set back until it is in contact with the vomer again and immobilized by a wire suture through both fragments, or better by nailing a straight Keith needle directly backward through the center of the vomer. . . . Bony union between the premaxilla and vomer is rarely obtained but the fibrous union helps a good deal in keeping it centered.

Twenty years later McDowell, having reviewed the cases over those years, stated that the situation with the premaxilla continued as predicted. He recalled their advice to set back the premaxilla surgically the minimum amount to make immediate successful closure of the lip possible and concluded:

Various surgeons expressed fears that this would be followed by various types of disaster, but these have not occurred when the work was carefully executed.

**Huffman**

In 1949 Huffman and Lierle at the State University of Iowa repositioned projecting premaxillae by quadrilateral resection of vomer. At the same operation they attached the already elevated vomerine flaps to the medial incised palatal flaps in a first-stage palate closure, a feat not always possible, which leaves the sectioned vomer in the open.
Other forms of quadrilateral resection followed. Thomas D. Cronin of Baylor University College of Medicine, Houston, thoughtful and always searching for a better way, was a promoter of the vomer resection. In 1957 Cronin reported that, out of five early cases of triangular wedge resections of vomer, in one the premaxilla was loose and displaced posteriorly, in another there was tooth removal and two showed surgical displacement and slight movability. These findings led Cronin to his rectangular sliding pushback of the premaxilla, similar in principle to Reich’s approach. He described the method as follows:

A 2 cm. incision is made over the inferior free border of the vomer about 1 cm. posterior to the premaxilla. The mucosa is elevated from each side of the vomer. . . . The amount of protrusion is measured and 3-4 mm. less than this amount of vomer is removed as a rectangle, using a sharp osteotome to get clean cut surfaces. . . . With a right angle palate knife a horizontal cut is made in the septal cartilage toward the bridge of the nose, so the premaxilla can be slid straight back without tilting of the teeth. . . . The prolabium is lifted up with a hook and a .035 Kirschner wire is drilled through the premaxilla and vomer out through the cut surface. The two vomerian fragments are lined up carefully and the wire is driven into the posterior portion with a mallet. . . . The resected piece of vomer is cut into small chips and packed around the junction to help insure bony union. Six to eight weeks later the wire is removed and the lip is repaired over the solid premaxilla.

In 1964 Cronin called attention to two important anatomical aspects pertinent to projecting premaxillae that had been noted by Scott. The lower edge of the septum lies in the vomerine groove where it is separated from the bone by a mass of fatty fibrous tissue. On the inferior margin of the vomer there is a bulge about 1.0 to 1.5 cm. posterior to the premaxilla. This is the site of a suture between the vomer and the prevomerine bone and is, doubtless, where forward growth of the premaxilla occurs. Cronin points out that surgical procedures should avoid damage, not only to this suture, but to the all-important growing septal cartilage. He advised the setback only for marked protrusion that seriously compromises repair of the lip. He also noted that a modification suggested by Burston and Kernahan of Liverpool in 1961 might possibly be less likely to cause any disturbance in
growth of the septal cartilage. Instead of making the Cronin horizontal incision in the cartilage, they advocated freeing the septum from the groove in the prevomerine bone with a septal elevator and sliding the premaxilla backward after making an oblique cut through the prevomerine bone. The premaxilla is then skewered onto the vomer with a Kirschner wire.

In 1960 Kahn and Winsten, from New York Mount Sinai Hospital, advocated the Cronin type of premaxillary retropositioning, stating:

If properly performed, no growth retardation of the nose, nor instability of the central section of the lip will occur. We set back about 50% of the cases.

Yet they cited only a three-year follow-up of the cases.

In 1971, for *Cleft Lip and Palate*, Ray Brauer gave the latest Texan reflections for the Cronin surgical setback.

Cronin and Brauer have relied on this procedure in the past, and though some degree of retrusion has appeared in these patients, it has been no more than that seen in patients in whom no operative setback was done. In those patients in whom retrusion and collapse have appeared, response to orthodontia has been excellent. . . . The mucosa is carefully elevated off the septum, and a rectangular segment of bone is removed . . . usually 5 mm. less than would be required for a complete setback. A right-angle knife is used to make a horizontal cut through the septal cartilage from the side of the resection toward the tip of the nose, to allow the premaxilla to move straight back. It is then fixed by a longitudinally placed 0.035 inch Kirschner wire.

*Monroe*

In 1965 Clarence Monroe published a report on “Recession of the Premaxilla in Bilateral Cleft Lip and Palate.” He has remained a staunch but conservative defender of this action ever since and at many a meeting has been called to the rostrum to justify or explain his stand. He has since been joined at Chicago’s Children’s Memorial Hospital by suave orthodontist Sheldon Rosenstein, and in the spring of 1973 at the Foundation Symposium at Duke University they presented their combined approach. Rosenstein advocated “doing something early to improve the late results” and expressed conviction that a prosthesis, arch molding
and bone grafting with maintenance of the prosthesis until palate closure at 15 to 18 months produce "occlusion and arch form better than before." Monroe repeated his belief that, when necessary at three weeks to three months, primary recession is not harmful if done correctly. He proposed the rectangular resection of septum posterior to the enlargement suture combined with horizontal incision in the septal cartilage to allow premaxillary pushback and fixation with a Kirschner wire. The setback should undercorrect, and as an example he mentioned a case of 18 mm. protrusion which received a recession of 13 mm., or 5 mm. short of complete inset into the maxillary arch. Monroe reported in his quiet unpretentious manner that 15 out of 19 cases of early surgical setback showed good occlusion but admitted that in spite of this 75 percent with good results he rarely does one today. Since 1964 he has set back only three premaxillae: (1) a severe projection in a mentally retarded patient; (2) a 15 mm. projection which use of a prosthesis and cleft closure failed to affect, so a 6 mm. setback was executed; (3) one with so much protrusion that recession was required for lip closure.

Monroe, who as early as 1959 proposed recession of the premaxilla, in the October 1974 follow-up clinic summarized:

Even though we do not have evidence that our operative procedure appreciably alters the growth pattern in these children, we are no longer doing the operation in the newborn. Our orthodontists have been able to guide the position of the premaxilla better with a prosthesis in the mouth than we were able to do it by surgical means . . . . After closure, the muscular lip will usually restrain the premaxilla and the prosthesis in the cleft will usually maintain the width of the maxillary arch until the premaxilla comes back into it. If the premaxilla does not come back properly by the time of palate repair (one to two years)—and it occasionally does not—we then recess the premaxilla before repairing the palate.

N. John Wilde of Valley Children's Hospital, Fresno, California, in 1960 expressed preference for removing a quadrilateral section of vomer but advocated fixation of the premaxilla using bilateral transpalatal cross-needles. He noted that

the position of the premaxilla in relationship to the vomer and to the lateral palatal processes, is readily maintained . . . . The use of two needles prevents
rotary displacement [and] does not permit the premaxilla to slip. ... The only disadvantage is the possibility of damage to tooth buds in the premaxilla.

**Prevomerine bone excision**

A more anterior quadrilateral resection was used in London. Sir Denis Browne, a pediatric surgeon, was orthopedic in his thinking. His reasons and design for setting back the premaxilla are interesting. As he wrote in 1949:

For some mysterious reason, when there is a cleft of the gum, new bone begins to form in front of the vomer, between it and the premaxilla, so drawing the latter forward. The vomer itself does not grow, and the division between it and what may be called the prevomerine bone is marked by a cartilage-filled suture line.

He felt that if the premaxilla were not moved into normal position and fixed firmly there would be great difficulty closing the lip over it, a very ugly profile like that of an animal snout would occur and it would be extremely hard later to fit a denture over a wobbly gum. He refused to accept the claim of others that closure of the muscle in front would position the premaxilla. He admitted:

Replacing the premaxilla has got a bad name because of the erroneous way in which it has been carried out. For instance, if a wedge is taken from the vomer, as usually advised, the foundations of the nose are ruined and it goes flat on the face.

To get a good result, he explained:

1. Cut the soft tissues of the lip away from the premaxilla right back to the nasal septum.
2. Make a longitudinal cut over the prevomerine bone and remove it submucously with narrow biting forceps. This should allow the premaxilla to be forced straight backwards into the normal line of the gums. It is preferable to leave it a little too far forward rather than to force it too far back.
3. With an awl carry a stitch of very strong suture through the alveolar ridge on either side of the gap. Bring this through the holes in the spiked bar, force this bar into the narrow upper part of the raw surface of the premaxilla and tie it so that this is fixed firmly in position.
4. Cut the mucosa off the posterior and lateral sides of the premaxilla. This is to give a raw surface to receive mucoperiosteal flaps cut from the...
anterior ends of the hard palate. These flaps are sutured with linen.

5. Leave the plate in position for a fortnight.

One disadvantage of the method, he admitted, was possible damage to the tooth germs by the sutures through the alveolar ridge.

The dynamic and articulate David Matthews, also of the Hospital for Sick Children, London, and in a position to make an unemotional evaluation of Browne’s approach, stated in 1952: Denis Browne now has a very large number of children who have grown up without any secondary distortions appearing and the excellence of his results has convinced me that premaxillary reposition is a satisfactory procedure and is indicated in the more severe cases of protrusion.

Matthews’ setback was similar to Browne’s except that he used a bayonet-shaped pin rather than the bar and carried out the nasal floor and anterior palate closure of Veau on one side at the same time. Three weeks later the opposite side was closed similarly. His 1973 comments are of interest:

In answer to your question about Denis Browne’s push-back of the premaxilla in bilateral clefts, I have seen a good many of his cases and of mine and there is no doubt at all that if the swelling on the septum a centimeter behind the premaxilla, which Denis Browne described as the prevomerine suture line, is encroached upon, there is retardation of subsequent development of the premaxilla. I have not, however, seen this happen if this prevomerine suture line is undamaged. If one restricts the operation to the very severe cases of protrusion, septal resection in front of the prevomerine suture does bring the premaxilla back far enough to produce a good arch alignment with the lateral segments. It is, therefore, my invariable rule to put a primary rib graft between the premaxilla and the lateral segment on both sides in the case in which I set the premaxilla back. With the stabilization of the premaxilla obtained in this way, not only does the premaxilla seem to grow satisfactorily but the “dog-mouth” deformity is avoided and the arch remains reasonably good. On occasion, as you know, the tooth buds migrate along the line of the bone graft.

**Prevomerine bone graft**

In 1960 in Munich, Oberniedermayr advocated surgical retro-positioning of the premaxilla, stabilization with Kirschner wire transfixation and the use of the resected prevomerine bone for grafting. Although this was an economical maneuver, evidently it
was in vain as most of this bone was reputed to be lost from infection.

Then in 1962 Gerhard Pfeifer of Hamburg, while working under Professor Schuchardt, developed a method of triple osteosynthesis for exceptional cases of bilateral cleft with extreme protrusion of the premaxilla. Mucosa was turned to form a bed for the transplants. A cylindrical piece of prevomerine bone was taken, split into two pieces and inserted into both alveolar clefts to fix the alignment of the retroposed mobile premaxilla.

Gerhard Pfeifer

Pfeifer claimed a stable union with symmetry. Yet to get enough bone for effective grafting there might be overcorrection of the premaxilla. Including the septovomerine suture in the bone graft certainly increases the chances of retardation of central facial growth. When enough prevomerine bone, however, is available to supply sufficient graft and still undercorrect the premaxillary projection, this operation has some appeal.

_Absence of cleft palate makes a difference_

There is a projecting premaxilla that offers an unusual problem. As noted by Antia of Bombay in the _British Journal of Plastic Surgery_ in 1966:

Clefts of the lip associated with cleft alveolus but not of the hard or soft palate represent a common type of cleft in India. The premaxilla in this case may vary from a small, grossly inadequate element to an excessively large bony prominence. The general development of the alveolar arch is not affected by paring of the excessive premaxillary element due to the normal fusion of the hard palate behind the incisive foramen. It is recommended that bony excision of redundant premaxilla be undertaken.

I agree with the recommendation as I did exactly this excision
in November 1958, and alveolar alignment and tooth development are excellent today, as shown in Chapter 18.

To push or not to push

Despite the many frantic, conservative and ingenious methods of dealing with a projecting premaxilla, it is still *well out in front* as the most controversial and difficult problem in lip and palate work.

**Early and late disapproval of setback**

In 1916 Binnie noted:

Lane thoroughly disapproves of all these attempts to replace the intermaxillary bone.

This comment is interesting as Sir Arbuthnot Lane’s treatment of cleft palate by turning large mucoperiosteal flaps and leaving huge raw areas was by no means conservative otherwise.

After 15 years’ experience with bilateral cleft lips using the methods of Vaughan and Brown for premaxillary setback, Bauer, Trusler and Tondra decided:

There should be no surgical retropositioning of the premaxilla because of interference with growth and development of the face.

LeMesurier used his orthopedic logic in his 1962 *HARE-LIPS and Their Treatment*:

Except in the few cases where the premaxilla is too prominent to allow the clefts to be closed over it, it is much better to leave the septum intact; if any resection has to be done, it should be only of the amount necessary to allow the clefts of the lip to be closed.

Various methods for sectioning and repositioning the vomer, in Georgiade’s experience at Duke University, have led to an unstable premaxillary segment in some patients and eventual "tilting" of the premaxilla lingually with resultant malposition of the permanent incisor teeth in others:

Decreased growth of the premaxillary segment has also been a consideration following wedge resection of a portion of the vomer.

Fara and Hrivnakova noted in 1965 in *Acta Chirurgiae Plasticae*:
A total of 506 patients have been treated for bilateral total cleft at the Prague University Department of Plastic Surgery. In 31 out of 317 cases with marked protrusion of the premaxilla, surgical retroposition was undertaken, mostly as a secondary operation. In most patients this led to damage to the growth of the premaxilla either alone or together with developmental retardation of the entire maxillae. Marked signs of atrophy often develop many years after the operation, in some cases up to 11–13. We must, therefore, regard surgical retroposition of the premaxilla as a risky procedure which should, as far as possible, be made unnecessary by conservative treatment. We consider osteotomy of the vomer as a primary operation in infants to be harmful without exception.

They mentioned their interest in Karfik's suggestion of study of the blood supply of the central segment of the maxilla to consider restriction in development of protrusion of the premaxilla by palliative operations on the arterial network with slight disturbance of the growth zone in its neck.

Bill Holdsworth of St. Thomas' Hospital, London, and Queen Mary's Hospital, Roehampton, in his 1970 edition of Cleft Lip and Palate, set two lines, X and Y, for division or resection of the septum in the surgical reduction of the prominent premaxilla. He then summarized rather well:

Among patients who have had the operation [surgical setback of the premaxilla] early in life flat faces abound, and its protagonists are a diminishing band. Matthews uses it only for extreme protrusion. Barsky reported its use in some 50 percent, and in most hands it is reserved for gross and neglected cases. When a child with a double cleft and a prominent premaxilla is not seen until late, closure of the soft tissues, even if possible, may be insufficient to bring the premaxilla into line, and there may be no alternative to surgical reposition.

Experiments in the hare

Clinical concern about the middle-third growth of the face is fortified by experimental evidence.

Bernard G. Sarnat of Cedars-Sinai Medical Center, Los Angeles, studied growth of the rabbit snout with A. J. Selman following extirpation of the frontonasal suture in 1957, and with M. R. Wexler after dislocation of the nasal septal cartilage in 1965 and after resection of the septal cartilage in 1966. They
reported growth arrest of the upper face in rabbits after resection of the septovomerine region at four to five months of age and the cartilaginous nasal septum alone at 21 to 48 days of age. Their 1967 report from 18 to 131 days after cartilaginous nasal septum resection revealed a significant early deceleration of growth of adjacent bones. This growth arrest of the upper face leads to a relative mandibular prognathism with malocclusion of the incisors. The deformities become more pronounced in the postoperative survival period.

At the Rome Congress in 1967 Sarnat summarized:

Although it was found that the frontonasal suture was a site of active growth, extirpation of it did not affect grossly growth of the snout. Dislocation of the cartilaginous nasal septum likewise did not affect grossly growth of the snout. In contrast, however, resection of cartilaginous nasal septum produced a severe and striking growth arrest of the snout.

From these experiments it is concluded that the frontonasal suture is a secondary or accommodating site of growth whereas the cartilaginous nasal septum is a primary site of growth. This conclusion has important implications and applications in relation not only to the basic problem of the growth of bones but also to the clinical problems of surgery of the nose and palate.

**INHIBITION OF GROWTH BY STAPLING**

The dapper John Curtin, from the Center for Craniofacial Anomalies, University of Illinois, with Pruzansky, noted at the Melbourne Congress in 1971:

Longitudinal growth studies on more than 50 patients with complete bilateral cleft lip and palate have indicated that overgrowth of the premaxillary-vomerine suture contributes to the characteristic deformity of the mid-face.

Borrowing from the orthopedic surgeons' technique of stapling across the epiphyseal plate to retard growth of long bones, they devised an instrument and a method of stapling across the premaxillary-vomerine suture. A mucosal flap designed to wrap around the stapling was based laterally on one side with its distal end on the other side. It was elevated without disturbing the
periosteum, the staples were "seated" across the suture and the flap was replaced. Their animal experiments were inconclusive, and the number of infants was too few. Furthermore, the staple often acted as the foreign body that it is and tended to be rejected. Nevertheless, they propose stapling as a possibility, postulating these tempting advantages:

(a) Stapling inhibits growth at the premaxillary-vomerine suture reducing the severity of the deformity; (b) it is a reversible technique; (c) the staple can be removed without injury to bone or periosteum; (d) growth may continue following removal of the staple.

When I first heard of this stapling plan I was hopeful and must admit disappointment that the results so far are inconclusive. I wrote Curtin in June 1973 asking for the latest on his stapling in bilateral clefts, and he scribbled on the bottom of my letter,

Nothing new—still in research form awaiting maturation to substantiate results by "Pruzansky" documentation.

This principle seems to offer an appealing solution to a difficult problem, but as one thinks about it there emerges a major flaw besides the foreign body rejection phenomenon. Ideally, its use should be *intrauterine*. By the time of birth with the projection already developed it is too late to do much more than what can be done with elastic traction or muscle closure.

**Personal Struggle with the Premaxilla**

My personal experience with the projecting premaxilla has been varied to say the least. At Boston Children's Hospital in the mid 40's, I observed MacCollum merely "tweak" the premaxilla with a forceps prior to joining the lip across it.

While still in the Navy in Nashville in 1946, I had the good fortune to scrub on two major surgical procedures a day with William Core, a large general surgeon with a huge practice. Every morning before the U.S.N. Recruiting Office required my services, we did hysterectomies, gastrectomies, cholecystectomies,
thyroidectomies and even an occasional bilateral cleft lip with protruding premaxilla. I was impressed with his speed and skill and, considering his limited plastic surgical training, amazed that he could get these little creatures' clefts closed. Still vivid in my memory, however, is the large round intestinal needle carrying a 0 chromic catgut suture which, having taken a bite through one maxilla and passed through the premaxilla, exited with a dejected tooth bud impaled on its point like a martini onion on a toothpick.

Then during 1948–1949 on Saturdays I visited Kilner at Alton, England. Here I observed bilateral lip clefts closed in two stages without premaxillary setback and a number of wobbly premaxillae excised and replaced with a denture at age five to seven years.

On Tuesdays during this same period I visited the Hospital for Sick Children at Great Ormond Street, London. It was only after several rather trying experiences in heavy fog that I finally located the hospital hidden just off Russell Square. On the eighth floor Denis Browne, renowned pediatric surgeon, was scrubbing for a bilateral cleft lip. He was so much taller than anyone else in the room that at first I thought he must be standing on a stool. His headlight was attached to a battery swinging from his hip so that he need not be plugged to the wall. He nibbled away the “bony overgrowth” between the septum and the protruding premaxilla and, after freshening the edges, set the premaxilla back in the alveolar arch and fixed it with an anterior toothed metal bar.

Between cases I cornered him to ask how he dared take this approach, when many considered the deformity in the underdevelopment of the maxilla rather than the overdevelopment of the premaxilla. He pointed out that in his opinion the vomer was of normal dimensions, but between it and the premaxilla new bone had formed, driving the latter forward. By removing this bone, he was able to replace the premaxilla and obtain union bilaterally in 70 percent of cases—on one side in 100 percent—which he claimed prevented shriveling of the premaxilla.

Then, during my training time in St. Louis, I had a chance to watch Barrett Brown push back a jutting premaxilla and pin it
with a Keith needle. The simplicity of this maneuver was impressive.

When I got to Korea, my first cleft case was a bilateral cleft in which the oral surgeon had already lost the premaxilla.

During my early years in practice in Miami I tried the Brown pushback and did one Gillies partial excision with less than partial success. I then used the Cronin approach or the Burston-Kernahan modification, either of which I favor today if the projection is tremendous. In 1960 my attitude toward the premaxilla was expressed:

There is justified controversy as to what to do with this jutting premaxilla. For the present a compromise is preferable. If the premaxilla is well in the arch, then by turning mucosal flaps a fibrous union can be achieved. If the premaxilla is jutting far out on the end of the nose, then a septal resection, which is designed to affect growth as little as possible and still let the premaxilla back in undercorrected position, seems warranted. Between these extremes are premaxillae protruding varying distances and many can be maneuvered successfully by lip moulding and orthodontics.

At this point our unit was honored by a visit from Burston, and our prosthodontist, George Balber, attempted to follow his directions and produce wedge plates to pound the maxillary elements forward, but without the proper facilities he was unable to duplicate Burston’s results. Then, after a visit by Hagerty and Mylin, Balber began to construct and pin screw plates, which in certain cases, when inserted soon enough, seem to work well. The untimely death of Balber caused this approach to be discontinued.

Meanwhile, and for some time, I had joined forces with Samuel Berkowitz, a Pruzansky-trained orthodontist. He lulled me into a semicoma toward the premaxilla by promising that if I closed the lip over the premaxilla he could spread the maxillary elements later for its reception and bone graft fixation. The buckling of the vomer and the anteflexion of the premaxilla did not seem to cause him great concern. An occasional severely projecting premaxilla has not gone back, and here Berkowitz has been quite amenable to a setback at about five years of age.
AN OUTSTANDING EXAMPLE

Bilateral cleft of the lip with protruding premaxilla but without cleft of the palate was treated in infancy in Alabama with approximation of the lateral lip elements to the prolabium. As we mentioned earlier in this chapter vomer resection was indicated early here to place the premaxilla into normal position. The patient was first seen at 4 years with this frightening projection.

The mucoperiosteum of the vomer stalk was incised and dissected so that a quadrilateral block of bone could be resected from the vomer. Then mucoperiosteum was turned from both lateral edges of the premaxilla and each cleft edge of the maxilla
so that these flaps could be sutured after the premaxilla had been set back. Bone chips from the vomer were used to fill the alveolar gaps between the mucoperiosteal flaps and a Kirschner wire was run from high up in the midline of the premaxilla back to fix it to the vomer.

Patient now needs forked flap medial advancement of the alar bases and lip revision.

Yet to condemn children to suffer with a projecting proboscis, looking not unlike a dog’s mouth or a wolf’s snout, during their early years seems cruel. Determined to bypass this phase, we finally changed our general approach to bilateral clefts in favor of immediate elastic traction to the baby’s headcap. This has been dramatic in some cases and of moderate value in others, but adequate in all so far when seen soon after birth to allow primary lip surgery without the necessity of surgical setback.

When the extreme protrusion of the premaxilla persists and muscle-to-muscle approximation is forced over this projection, it can be accomplished but the ultimate attenuation of the prolabium and stretching of the scars are discouraging. It might be better in such severe cases to bypass this non-profit process with a bilateral mucosal adhesion maintained until better premaxillary alignment facilitates lip closure.
4. **Optimum Time for Bilateral Cleft Lip Surgery**

**DISAGREEMENT** as to the best time for closure has been even greater with regard to the bilateral cleft than with regard to the unilateral cleft. Some of the reasons are similar; some are different. The commonest arguments for early closure have been parental concern, improvement in sucking, avoidance of emaciation from starvation and reduction in premaxillary and maxillary bone gaps. It is interesting that each of these can be controlled effectively today without surgery.

**KEEPING THE TEETH OUT OF IT**

In 1844 Joseph Pancoast of Jefferson Medical College, Philadelphia, wrote down his thoughts about the age at which the operation should be performed:

This is a point mooted by the older writers and which is not yet so well settled as to lead to uniformity in practice. Dionis, Lassus, Sabatier, etc. deferred the operation till the child had reached its third or fourth year. Sharp, Ledran and Heister advised its performance from a few days to a few weeks after birth. Between the ages of two and four years, children are found so indocile, and so apt, however closely watched, to pull upon the sutures and disturb the process of union, that a great portion of modern surgeons have with good reason recommended the performance of the operation between the second month and the second year after birth. . . . The author gives a decided preference to the period under six months, as we then avoid the necessity of having to extract any deformed teeth, and are less likely to
be troubled with the irritation attendant upon the teeth making their way through the gums, which acts unfavorably on the union of the parts.

A MATTER OF LIFE AND DEATH

Congenial Francis Mason of St. Thomas’ Hospital, London, wrote in 1877:

In some bad cases of double harelip, the operation ought, in my opinion, to be done within the first three months, or even earlier; in fact, as soon after birth as possible, in order to save the life of the child.

Modern improvements in general pediatric care, gavage feedings and antibiotics have taken the urgency for survival out of the surgery.

EARLY SURGERY MAY STILL BE THE ONLY HOPE

As in all of surgery, there are extenuating circumstances under which the usual rules must be set aside temporarily so that one can deal intelligently with a specific problem. For instance, in underdeveloped countries the multitude of people often overwhelms all reason to the point that the value of a single lip is not of great concern. An infant with a bilateral lip cleft cannot suck at the breast, and very little ingenuity will be evoked to perpetuate what to the parents is a frightening and monstrous mistake with almost no hope of correction. Thus, such an infant, if not operated on after birth before he leaves the hospital, may never return for a second chance. I have witnessed this tragedy time and again in certain areas of the Orient and the West Indies.

PARENTAL CONCERN

In 1947 Brown, McDowell and Byars in St. Louis stated:

The child with a double cleft of the lip has a very difficult feeding problem, produces much psychic shock to the parents, and incites so many exclamations of curiosity and pity from others that an early closure is necessary. A fairly satisfactory rule is to close it as soon as possible after the baby weighs ten pounds.
Donald MacCollum, who closed hundreds upon hundreds of bilateral clefts at Boston Children’s Hospital through the 40’s, 50’s and 60’s, was content to operate at six pounds. Most other surgeons have followed the 10-pound standard of Brown.

Few deformities strike parents with the same shock and shame as a severe bilateral cleft lip does. They are almost frantic in their efforts to have corrective surgery started immediately. For the sake of the child parental concern must be a secondary consideration. Usually if the reasons for postponement are kindly explained, the parents are quite willing to wait whatever interval is suggested. They will get different times and different reasons from different surgeons.

FOR EARLY MOLDING ACTION

Claire Straith of Detroit used to close his bilateral clefts in the first couple of weeks of life so that the muscle band could restrain the premaxilla, as he said,

before the premaxilla and vomer had ossified enough to resist displacement.

He felt so strongly about early closure that as late as 1950 he was using local anesthesia to bypass the dangers of non-endotracheal general anesthesia.

A multitude of surgeons through the years have looked to lip closure as the creation of a physiological restraining band. Wayne Slaughter, who trained with Straith, and his Chicago cohorts Brodie and Pruzansky all have confidence in the molding muscle action after lip closure. Slaughter did not operate as early as Straith but postponed bilateral clefts a month or two for the first side and several months for the second side.

Evidently feeling an urgency to operate early on complicated bilateral clefts to restrain the premaxilla without section of the septum, Barros Saint-Pasteur of Caracas in 1964 reported his surgical timing. After blood studies of coagulation and bleeding time, red blood count and hemoglobin, he used local anesthesia for a Veau closure of the lip and anterior palate on one side during the first 36 hours following birth and on the second side 16 to 30 days later. At 15 months the posterior palate was closed and the lip corrected secondarily.
Fara and Smahel of Prague have a more ethereal concern. They believe that postembryonic mesenchymal penetration of the “sterile” prolabium from the lateral lip elements has a better chance if the lip closure is carried out during the early months.

**EMERGENCY NO LONGER**

In bilateral clefts, the sooner the lip muscles can be joined across the gaps the better. Yet special devices take the urgency out of the surgery. An Asepto syringe fitted with 1½-inch rubber tube extension, when placed over one side of the infant’s tongue and with the infant in bolt upright position, can facilitate feeding remarkably. Rubber band traction when attached to a headcap can be effective in restraining the projecting premaxilla. This takes the pressure off the need for early surgery, which now can be postponed until the patient is really ready.

**PROCRASTINATION RECONSIDERED**

There are those who would postpone surgery conscientiously for years and years. This is probably a sophisticated overreaction to the fact that for centuries surgeons obsessed with closing the hole resorted to drastic procedures until eventually dentists, facing unbelievable alveolar distortions, started an anti-surgery protest. Both surgeons and dentists turned to unoperated adult clefts for the answer. Ortiz-Monasterio of Mexico found that in adults with untreated clefts the original deformity *did not increase* during the natural process of growth. Pitanguy of Brazil went him one better by claiming that these cases actually *improved with aging* and had his findings confirmed by Innis in North Borneo and Mestre, Jesus and Subtelny in Puerto Rico. The same is suggested by the unoperated adult bilateral cleft shown here, seen in Jamaica. It is generally accepted, however, in most civilized societies, even by dentists, that patients suffer more from being left with uncorrected facial clefts through childhood waiting a possible improvement than from having them closed earlier by modern *atraumatic* methods.
Skoog of Sweden in 1965 agreed that cleft lip surgery is not an emergency but added:

Surgeons may differ concerning that specific age [for surgery], but this in itself is not an important issue as long as repair is carried out early enough to utilize the existing growth factors for gradual correction of the deformity. This principle of reconstructive surgery is especially important in the case of complete bilateral cleft of the lip and alveolus.

AN "E A R L Y" C O N F L I C T

Although most modern surgeons begin operating on the bilateral cleft lip between the early weeks and the third month of age, it is interesting to study the two extremes of this timing as expressed in two books, Stark's 1968 Cleft Palate and the 1971 Cleft Lip and Palate by Grabb, Rosenstein and Bzoch.

A matter of weeks

DeHaan, for Stark, admitted avoiding the operation during the first 24 hours of life because of the high perinatal mortality but advocated closure in the early weeks.

The very young infant who still has immunity from the mother and high resistance to infection tolerates surgery well and requires minimal anesthesia.

He mentioned other advantages such as solving the sucking problem, protection of the nasopharyngeal mucosa as a deterrent to respiratory tract infections and early union of the orbicularis oris musculature to act as a biological orthodontic band on the premaxillary and maxillary segments. DeHaan cited an example of postponing lip surgery in a 4-pound premature bilateral cleft infant. The tiny patient not only failed to gain weight but developed an upper respiratory infection at two and one-half weeks with loss of one-eighth of his total body weight. Corrective lip surgery at seven and one-half weeks was followed by a prompt gain. DeHaan concluded:

In retrospect, deferring surgery because of prematurity was a mistake, as our pediatric colleagues agree.
DeHaan also strikes down the argument that one should wait for increase in the size of the lip to facilitate closure:

We have not found this to be true and, in fact, feel that the slightly longer lip at the age of 3 months is no easier to correct.

Or months

Ray Brauer, for Grabb et al., cited the common causes delaying lip closure:

protruding premaxilla; collapse of the lateral palatal segments; the presence of other congenital anomalies such as congenital deformity of the heart; and poor general nutrition. . . .

Babies with poor general nutrition simply fail to thrive, and until the general nutritional status is one of steady improvement, surgery should be delayed.

Brauer concluded:

Today most surgeons prefer to wait until the child is 2 to 3 months old and weighs at least 12 pounds before starting lip repair. This allows time for sufficient development of the prolabial and lateral lip segments and makes both planning and execution of the surgery easier. During this period, maxillary orthopedic procedures can be used.

A bit of both

In a 1970 Russian handbook A. A. Kolesov of the Moscow Medical-Stomatological Institute stated in reference to the primary lip operation in bilateral clefts:

In the first stage, only one side of the cleft is closed. The first stage in most children can be carried out while they are in the nursery. The other side of the cleft is closed after two to two and one-half months.

THE PRELIMINARY LIP ADHESION

The simple, quick, bloodless procedure of creating a preliminary minor lip attachment across the cleft makes it possible to achieve some benefits quite early. This of course is the appeal of the adhesion, and its real value, it would seem, lies in its early use.

Bengt Johanson and I employed the preliminary adhesion for
various primary reasons but both of us enjoyed some premaxillary manipulation from our adhesions. Césèn in 1962 proposed a preliminary alveolar and nasal floor closure at four months of age to be followed with prosthodontic manipulation and definitive lip surgery no sooner than six months later. Randall, at first enthusiastic and now more selective, uses preliminary adhesion in two stages but not until three and six months of age in bilateral clefts. Walker and Collito approximated lip cleft edges without undermining on a conservative combination of adhesion-closure but with good molding of the maxillary segments.

Evidently all of these adhesions and the fear that surgery will stunt maxillary growth led one Austrian surgeon, K. Hollmann of the University of Vienna, to propose in 1973 a sequence of operations with a variation in timing that he has used since 1967. At one week of age he creates an adhesion with mucosal flaps from the lateral lip segments sutured under the inferior prolabium vermilion and lets this stimulate soft tissue growth of the labial stumps in the clefted area.

At one year the soft palate is closed, and not until two years of age is the definitive closure of the lip accomplished.

PRIME TIME

In the rare case with a very severely protruding premaxilla which cannot be positioned properly by rubber band traction or coaxial screw retraction, an adhesion may be the best preliminary maneuver and can be executed at the time of soft palate closure. Yet in most complete bilateral clefts I prefer to bypass the adhesion and achieve the earliest practical one-stage definitive closure in order to create an intact muscle band across both clefts as soon as the rubber band traction from a headcap has reduced the projection of the premaxilla to a reasonable degree. This operation is usually possible at one month or earlier provided the baby is well and gaining weight. I do not feel that Musgrave's "rule of 10" need be enforced with regard to the 10 pounds in weight in bilateral clefts, but his other standards are essential. As cited years
ago by Oxford’s Professor Kilner, at least 10 gm. of hemoglobin and no evidence of upper respiratory infection are essential to ensuring a smooth postoperative course with optimum wound healing.

TRIPLE ACTION

At the time of bilateral lip closure two other aspects of the cleft syndrome, otitis media and cleft palate, are also treated. As usually indicated, the E.N.T. actions of bilateral myringotomy, suction of fluid and insertion of tubes are carried out. A mouth gag is then inserted and as much soft palate cleft is closed as possible by simple edge splitting and approximating with sutures. Early muscle closure of the velum provides at the back of the cleft the same molding contracting muscle action that the lip closure achieves up front. Not only will the velar atrophy of disuse be avoided but there must be beneficial effects from the early coordination of velar and pharyngeal musculature. Thus these two additional procedures, being quick and bloodless and taking so little time from the primary lip operation, are more than justified by the assets that eventually accrue.
5. The Surgical Evolution of Bilateral Lip Clefts

The evolution of the surgical treatment of bilateral clefts of the lip has been influenced by several fundamental factors: the inability of the infant to suck breast or even a bottle nipple, the amount of projection of the premaxilla, the size of the prolabium and the shortness of the columella. Yet, even when the palate is intact so that feeding is not quite such a problem and when the premaxilla does not project, when the prolabium is of adequate size and when the columella is long enough (rare!), this deformity still presents difficulty.

Most cleft lip surgeons through the ages, with or without good cause, have adapted their unilateral cleft design to bilateral cleft cases simply by doubling it. Many of us at some time have participated in this expedient ruse, but it becomes more and more apparent that it is nonsense. The deformity of a bilateral cleft is not merely a right or left unilateral fissure with its mirror image on the opposite side. It is an entirely different entity with different requirements deserving a different approach.

A Bilateral Boxing Ring

Through the ages, bilateral cleft lip surgery, beset with controversy, has progressed painfully and in spite of many heated battles raging on its every aspect. As already noted, there are numerous ways to deal with the premaxilla, and each has its merits, its discrepancies and its enthusiastic champions. The presence of the
projecting premaxilla and how it is to be handled has always been
and continues to be a difficult variable and at the core of some of
the controversies. There are such questions as whether to close
the clefts in one or two stages and whether to use the prolabium
in the lip, in the columella or in both. There is also the question
of whether to bolster the prolabium with tissue from the lateral
elements, and the variations of design for this aspect are legion.

ONE- OR TWO-STEP CLOSURE

Closure of soft tissue over the projecting premaxilla can be
responsible for great tension which increases the chance of disrup­tion. Besides their direct but varied attack on the projecting
premaxilla, surgeons have varied their approach to the lip. There
are some who prefer to close one side first and wait for healing
before closing the opposite side. Yet, there have probably been
more surgeons, and just as early in history, who preferred to close
both sides at the same time.

THE DESAULT PLAN

After premaxillary compression by a bandage, Pierre Joseph
Desault, as early as 1790, advocated surgical closure of both clefts
simultaneously, using the prolabium for the central portion of
the lip. Translation of Desault's work by E. D. Smith of South
Carolina College in 1814 reproduced sketched diagrams of Marie
Dehannes, a five-year-old girl with a severe bilateral cleft who was
admitted to Hôtel-Dieu, Paris, September 7, 1790. Desault's
classic cloth compression bandage was applied before and after
the surgery. Once the compression had retracted the premaxilla
sufficiently, Desault pared the cleft edges and approximated lip
elements with through-and-through needles wrapped with wax
thread in figure-of-eight fashion. The compression bandage was
 reapplied over the suturing until healing by the tenth day. The
illustration of the result recorded use of the prolabium in the lip
and even sketched the production of a cupid's bow and a phil­trum dimple. Both bow and dimple, however, were only a
figment of the artist's imagination and the surgeon's dream.
AN EARLY CLEFT CENTER

Hôtel-Dieu of Paris is probably the oldest hospital in Europe, having been founded about A.D. 651. In the twelfth century it was rebuilt adjoining Notre Dame cathedral on a branch of the river Seine. All extremes of human misery have been suffered within its walls, and at times during the French Revolution it contained 9,000 inmates with as many as eight huddled in a bed with no regard for sex, disease or, for that matter, death itself. Here, through the centuries, cleft lip and palate surgeons have pioneered this specialty. Ambroise Paré served on its staff, as did Blandin, de la Faye and Desault. The Clinical School of Surgery which Desault instituted at Hôtel-Dieu attracted great numbers of students from France and abroad; he frequently had an audience of about 600. Later, Dupuytren became known as the Brigand of Hôtel-Dieu.

Gensoul was responsible for the use of ether, and for the first recovery room in this hospital. In his time, to serve as a surgeon major at Hôtel-Dieu one had to remain unmarried and live in rooms on the premises on a very small salary. Gensoul rebelled against such regimentation and turned the hospital into the “Hotel” its name suggests by charging on the side for the rooms. When his unusual means of increasing personal income was discovered, he was threatened with dismissal. Demonstrating a resourcefulness befitting a plastic surgeon, he evaded the penalty by marrying the administrator’s daughter and continued in service until his expanding private practice made it impractical. Roux also worked at Hôtel-Dieu and did many of his early palate operations there.
A common scene by the side of Hôtel-Dieu, even in the depth of winter, was a group of Augustinian sisters who, having broken the ice on the Seine, were standing up to their knees in the freezing river water washing the soiled hospital linen. Among the sheets, pillowcases and towels would have been Desault’s string head bandages used to restrain and maintain the projecting premaxilla in his bilateral cleft cases.

MORE CONTROVERSY

Many early surgeons seem to have followed Desault’s format. Yet the controversy has been and is still being waged, and various regimens gain and lose favor from year to year. In 1939 Fomon reported what he called the general consensus among surgeons at that time but what actually were the teachings of their field leader, Victor Veau of Paris:

[in] clefts in which the premaxilla protrudes markedly early surgery is imperative, otherwise the bones can no longer be molded by pressure of the reconstructed lip muscle . . . and are best repaired in three or more stages, one side of the lip and anterior palate first, the second side four weeks later, and finally the posterior palate, third.

Veau also noted that

in these complicated bilateral cases, closure of the entire defect at one time is too formidable.

Thus the haste to close had influenced the amount of closure possible.

Brown and McDowell in St. Louis set the premaxilla back and closed both clefts at once while Kilner of Oxford left the premaxilla projecting and closed one side at a time. As Holdsworth of Britain said:

Each cleft is closed at a separate operation with an interval of about one month. The narrower cleft is closed first.

There are many, including the Americans Cronin, Bauer, Trusler and Tondra, who prefer to close one cleft at a time but favor the wide cleft first in order to pull the deviated premaxilla into the midline.
Russian Kolesov in 1970 acknowledged that years ago S. D. Ternovskiy and others recommended a two-stage closure of the lip in bilateral clefts. He then gave his reasons for following this plan:

As the experience of many clinics has shown over many years, closing both sides of bilateral clefts at the same time when the alveolar ridge and palate are also cleft does not obtain a good functional and cosmetic result. The complex anatomical interrelationships of the maxillary bones and the defect of soft tissue interfere with this.

Slaughter, Henry and Berger of Chicago, concerned about the blood supply to the philtrum, feared that the extensive undermining, excisions and incisions of tissue bordering the cleft required for a one-stage closure could be compromising. They stated:

It is, therefore, logical to assume that only one side of a bilateral cleft should be repaired at a time. This allows for a revascularization of the area in a manner compatible with accepted plastic surgical procedures. The double cleft is thereby first converted into a single cleft.

Clarence Monroe of Chicago, renowned for his work on preliminary premaxillary recession in infancy, by 1974 was hedging on this aspect and compensated with:

Where we formerly closed the bilateral lip at a single operation, we now do it in two steps, if necessary.

Manchester of New Zealand and Broadbent of Utah prefer a one-stage closure while for various specific nasal and labial reasons Skoog of Sweden and Guerrero-Santos of Mexico both favor two stages.

It is not of great importance to record each surgeon's stand on the number of stages he uses for bilateral closure. In 1972 I estimated the probable general percentage and gave arguments for a one-stage closure:

If a poll were taken today, certainly there are surgeons on both sides but probably the two-stagers outnumber the "all in one." The general regime advocated by Desault—early external compression followed by closure of both sides of the lip at the same time—will eventually be the method of choice. I consider this best because it maintains symmetry and enables better
muscle union across the cleft primarily and eventually more effective
columella lengthening. A key factor is the actual craftsmanship of the
surgeon to accomplish the lip closure in one stage and this is easier than it
seems.

As it turned out there has been more progress along this line
than was predicted, probably because of the reasons already noted.
A survey reported in June 1974 by resident John Osborn of
Toledo revealed that in 80 residency training programs in the
U.S.A. and Canada the approach to bilateral cleft lip closure is
divided, with both sides being approximated at the same time in
about 60 percent and approximation on one side at a time in 40
percent.

**DESTINY OF THE PROLABIUM**

There have been as many fisticuffs over how to use the prolabium
as over what to do with the premaxilla or in how many stages to
close the lip. At least Englishman James Cooke of Warwick took
a positive step in 1693 when he advocated saving the prolabium:

The lip sometimes is double cleft. There remaining only a piece between
both, which unless it be callous, it need not be taken away.

American Joseph Pancoast, in his 1844 *Treatise on Operative
Surgery*, logically planned his operation for "double hare-lips"
around the specific prolabium.

The mode of proceeding in the cure of this variety of deformity will depend
upon the size of the intermediate part. If it be less than a third of an inch
broad, and thin, it should be excised near its base, and the operation
proceeded in as in ordinary cases of single hare-lip.

If the prolabium was larger, Pancoast used it to form the center
vertical portion of the lip, but if it was short, he was content to
bring the lateral lip elements together below it.

Since those days the prolabium has continued to be hustled in
every direction—pushed up into the columella, pulled down into
the lip, chopped up along each side, high, low and in the middle,
had flaps stuck along its lower border and even shoved behind its
backside. This poor, innocent, little soft tissue termination of the
frontonasal component, the oyster of bilateral clefts, has been exploited in so many ways by so many surgeons that one is tempted to allegorize the probalam in the words of Lewis Carroll. Like any couple of surgeons in a cleft palate clinic—and that could be Dieffenbach and Langenbeck, Franco and Paré, Kilner and Peet or any of us today—

"The Walrus and the Carpenter
Walked on a mile or so,
And then they rested on a rock
Conveniently low.
And all the little Oysters stood
And waited in a row.

"Now, if you’re ready, Oysters dear, We can begin to feed."

"'But not on us!' the Oysters cried, Turning a little blue. 'After such kindness, that would be A dismal thing to do!"

"'I weep for you,' the Walrus said; 'I deeply sympathize.' With sobs and tears he sorted out Those of the largest size."

"'O Oysters,' said the Carpenter, 'You've had a pleasant run! Shall we be trotting home again?' But answer came there none—"
Prolabium to

Nose
  - Columella
    - Primary
    - Secondary

Lip
  - Simple side-to-side
    - One stage
    - Two stages
      - Lateral flaps below prolabium
      - Lateral flaps above prolabium
        - Triangular (R-A)
      - Triangular
        - Quadrilateral
      - Lateral flaps interdigitated into sides of prolabium
        - Triangular
        - Quadrilateral

Both nose and lip

Primary
  - As forked flap
    - Columella
      - Banked in nasal floor
    - Columella

Secondary
  - As transposed flap across columella base
  - Nasal floor and alar base advancement into columella
    - Midvertical V-Y advancement to columella
    - Transposed flap at columella base
    - Forked flap
      - Columella
      - Banked in nasal floor
      - Columella

Columella Banked in nasal floor
Columella
6. Sliding the Prolabium into the Columella

For well over a century a scattered band of surgeons, small in number but none the less dedicated, have sympathized with the plight of the nose and have maneuvered the prolabium up into the columella. Reviews of the champions of this approach reveal that it has been predominantly a French trick. With this small soft tissue termination of the frontonasal process so completely a part of the depressed nasal tip and in the absence of a columella, it seemed to some the expedient thing to do. Then, when histologists began reporting no orbicularis oris muscle in the prolabium, the argument grew stronger for a nasal destiny for this "muscleless" tag.

Georges de la Faye of Paris in 1743 wrote Observations on Cleft Lip which has been translated by Mary McDowell for The Classic Reprint in Plastic and Reconstructive Surgery 1976. His first bilateral cleft lip operation was carried out in 1733 in the presence of several elite surgeons such as Francois de la Peyronie of "Peyronie's Disease", Jean Louis Petit of "Petit's triangle" and "Petit's hernia" and Sauveur Francois Morand of cleidocranial dysostosis. In front of this austere audience de la Faye removed the premaxilla and brought the lateral lip elements together behind the prolabium which he left hanging free on the end of the nasal tip. He held the lip elements together with 2 pins, one passed up near the nose and the other down near the edge of the lip. Over these pins he wound strands of silk in figure-of-eight fashion. As he explained,
The pins I used were the German ones—flexible, long and slender; they are better for this purpose than pins of gold, silver or steel (and better than those one calls "larding pins").

Georges de la Faye discussed relaxing incisions sensibly.

When the separation of the two parts of the lip is very wide, Celsus, Quillimeau, Thevenin, etc. advise . . . that one make an incision on each cheek in the form of a cross. Some others prefer in such a case, to make incisions inside the mouth. However, the incisions in the cheeks produce a deformity from the scars which I think useless.

He reinforced the pins by crossing linen bandages under the nose and fixing them to the cheeks with plaster of Andrew of Cross. For postoperative treatment he reported

A slight fever the next morning obliged me to bleed him.

All pins were removed by the 9th day but the linen bandage maintained. His evaluation of his result is pertinent.

On this lip there is still a very small cleft which is the result, not of a faulty union, but because I could not cut close enough to the mounds. (These mounds are semicircular and it is necessary to cut into them if one wishes to unite the lip without leaving any cleft.)

In 1839 in Paris Baron Dupuytren excised the premaxilla but used the prolabium to form the columella. Having dispensed with the obstructing premaxillary nob he was able to pull the lateral lip elements together beneath the prolabium in a midline vertical closure. One cannot but flinch at what must have been the flatness of these final faces.

Even his Parisian colleague, Malgaigne, attacked him for discarding the premaxilla with the tooth buds but joined him in his columella lengthening. Malgaigne used Desault’s preoperative cloth compression repositioning of the premaxilla and then shifted the prolabium into the columella.

L O R E N Z

Another French surgeon obviously obsessed with the short columella and depressed by the flat nasal tip was Lorenz, who in
1907 slid the prolabium into the columella and closed the lip segments in the midline beneath it. Not only did the side-to-side tension of the lip closure produce a tight lip but in time the lip became abnormally long in the vertical dimension. With any finesse it would seem that a surgeon should be able at least to improve the nose by feeding needed tissue into the deficient central zone of the columella. Yet here are a couple of cases presented by Veau of Lorenz' technique in which neither the lip nor the nose had benefited by this radical shifting of the prolabium.

**OMBREDANNE**

Renowned French surgeon Ombredanne was reputed to possess a great black beard in his later years which, when preparing for surgery, he parted in the middle and tied up over his operating cap. He reversed this principle with the bishop's cap redundant foreskin in the treatment of hypospadias. In 1934 he mimicked his beard and the bishop's cap principle in bilateral lip clefts by shifting the prolabium up into the nose and suturing the lateral
lip elements, with assistance from the cheeks, together in the middle beneath it. The result was an excessively long lip. Obviously Ombredanne made more of a contribution in hypospadias than he did in cleft lip.

**LINDEMANN**

German oral surgeon August Lindemann had such overwhelming early experiences during World War I on wounded jaws that he wrote a book which was obtained and used even by Gillies in the enemy camp. In 1941 he advocated utilization of the prolabium of bilateral clefts for the columella and designed the shifting of “war-like” nasolabial cheek flaps to assist the lateral lip elements in the construction of the upper lip. This procedure, of course, created the same vertically long upper lip as seen in the French renditions.

**FORKING IT**

It is interesting that in 1967 Rio’s Ivo Pitanguy advised the same proportioning of tissues in Brazilian adults with unoperated bilateral cleft. His modification bisected the entire prolabium into a “forked flap” and advanced most of it along the septum into the columella. Then, with the aid of circumalar incisions, he approximated the lateral lip elements together in a midline union without a philtrum. The freed alar bases join the tips of the prolabial forks much as I have described in a modification of the original standard forked flap.

**GABARRO**

Another champion of moving the prolabium into the columella is Catalanian Pere Gabarro of Barcelona, who was with Gillies during World War II and learned to be daring with flaps! He also developed the chessboard grafts for the war burned. We became friends in 1948, and I wrote in "Plastic Peregrinations" in 1950:

Hitch-hiking in Europe is an interesting method of travel. It may mean anything from the front cushion of a Dalahaye to a sack of onions in the
In 1967 Gabarro, having had to correct secondarily the short columella in a multitude of bilateral clefts, advocated shift of the prolabium as a primary procedure. Often feisty, he completed his paper with a typical flourish:

I like to finish ... by saying that I think I have proved:

1. That it is not necessary to use the soft tissues of the prolabium for the reconstruction of the central part of the lip.
2. That it is better to use the prolabium to build up a proper columella from the very beginning, avoiding the pitfall of a short columella and the lowering of the tip of the nose.
3. That the triangular flap from one or both cheeks at the same time, may give us all the necessary and proper tissue for the reconstruction of the lip, its central part included.
4. That because those flaps can be raised at the same time from both cheeks, repairs which were advised to be done in two stages, can be done in one operation with this technique.

In 1974 Gabarro wrote:

The cheeks are very good areas to provide for the necessary tissues for the reconstruction of the lips, without much damage to the donor area. ... In cases where there is a big defect, to try to cover it with a very limited local plasty, may not be so successful. ... I believe, as Kilner did, that the prolabium belongs rather to the columella than to the central lip. Let me tell you about one of my cases which is a dramatic example of this approach. A girl, 14 years old, came to the out-patients clinic at the "Hospital de la Sta. Creu i de St. Pan" in Barcelona dressed in black, like her mother, dirty and looking like the worst possible hippies. The girl holding tightly the hand of her mother, crying and trying to hide her face into her mother's skirts. She did not want me to see her.

Gabarro used his method to lengthen the columella and close the lip.
Honest John Potter of Stockton-on-Tees in the Newcastle region in 1968 attributed much of the bilateral nasal problem of flattened nasal tip, short columella and wide nostrils to the fact that "the pre-maxilla bulges into the nostrils." He predicted that after any standard surgery there would be "obstruction of the airway and a chronic catarrh."

Experience with a complete bilateral cleft of the lip and palate with a pigmented epulis involving the premaxilla had forced him to remove the front of the premaxilla during the tumor excision. The result was an early, better than usual, nasolabial angle which inspired Potter to simulate this approach in the standard projecting premaxilla.

Thus, in 1963, he operated on a new case which did not have a severely projecting premaxilla. He attacked the premaxilla by removing its anterior plate in the upper two-thirds, tooth sacs and central septum to bring it back in relation to the nasal spine. He then shifted the prolabium partially out of the lip and into the columella, bringing the lateral lip elements together in the midline.

Potter was genuinely encouraged three years later by the nasal improvement in flatness and the lack of obstruction, as he expressed in the *British Journal of Plastic Surgery*, April 1968. As he
had avoided nasal obstruction, he cited Proetz' 1953 work as further defense of this approach and elaborated:

Because the air passages are distorted, deposits occur on the nasal mucosa beyond the obstruction. This causes local drying, a loss of cilia and consequent infection. There is a chronic condition of discharge and frequent acute exacerbations. Usually these children are mouth-breathers with a chronic nasal discharge.

As taught by his chief, Wardill, Potter followed his case faithfully and, although still convinced that the gain had been worth the price, he candidly expressed regret over the loss of the upper incisors and the retroposition of the premaxillary area, probably requiring an Abbe flap. In fact, an Abbe flap must have been used subsequently, as suggested by the donor scar, but evidently was too small to construct an adequate philtrum. A 10-year follow-up kindly forwarded by Potter is available for your evaluation.

SKIN GRAFT TO THE PROLABIUM DEFECT

British-trained Jack Penn of Johannesburg, South Africa, sculptor, six-day Israeli war expert and wild animal reserve guide, conceived a way to poach the prolabium for the columella and avoid a serious price of this action: lip tension. His observation when teaching cleft surgery is provocative:

Remember, a cleft palate is also a cleft nose, and its correction is equally important at a very early stage. This applies to the flattening of the nostril in

Jack Penn
the unilateral cleft and to the shortening or loss of the columella in the bilateral cleft. I deal with both of these problems at the first stage of three months.

At the Melbourne Congress in 1971 Penn proposed his way of dealing with the problem of the flat nasal tip in the bilateral cleft. He advocated moving the total prolabium into the columella, joining the turndown flaps of lateral lip vermilion to form a free border and suturing the mucosal edge of the lateral elements to the mucosal edge of the premaxilla. This procedure leaves a defect of the philtrum backed by the raw premaxilla posteriorly. Penn covers this area with a full-thickness free graft of posterior auricular skin, which he maintains will give a philtrum appearance and maintain a short upper lip. He also mentioned that this graft can later be elevated and grafted behind to form a labial sulcus. For those who think that the orbicularis oris muscle is important, he gives this assurance:

The fact that there is no muscle in the prolabial element does not interfere with the function or the appearance of the lip.
The fact that Penn received a major portion of his plastic surgery training from Sir Archibald McIndoe, who himself was renowned for his free skin grafting of burned Battle of Britain pilots, probably explains this unusually demanding performance of a free skin graft. The three interesting cases included here, forwarded by Penn from South Africa, although they are relatively early results, do indeed show a nose with the tip well up. It is important, however, to note the possible discrepancies of such an approach. In the male, it is not so much that the hair-bearing prolabium might produce a "bristling" columella as that the newly grafted philtrum will be noticeably bald. The lack of labial sulcus is unfortunate, but even with a skin-grafted one secondarily there is a most serious diastasis of the orbicularis oris muscle and the likelihood in time of severe flattening and horizontal spreading of the muscleless philtrum.

In general, the prolabium's primary duty must be to the lip. To shift it totally into the columella may offer a definite dividend to the nose, but this is overshadowed by the loss to the lip. Joining the composite lateral labial elements together in the midline with one vertical scar produces a bizarre lip shorn of its central philtrum. The side-to-side tightness will give an inartistic flatness which eventually will result in a long lip in the vertical dimension. If no attempt is made to join the muscles, the lack of muscle continuity becomes the deformity. Neither is natural.
7. Prolabium as the Full Length of the Upper Lip in Straight-Line Closure

In bilateral clefts without premaxillary protrusion it does not take much imagination to think “lip” for the prolabium. It is sitting demurely between the lateral elements, and to join the three seems quite logical. If the premaxilla protrudes in front of the maxillary elements, carrying the prolabium farther away from its lateral counterparts, the solution is not so obvious. And when the prolabium is actually projecting off the tip of the flattened nose, it is easy to sympathize with those surgeons who, in desperation, used it as a columella to satisfy the nose and were willing to pull “like hell” to get the lateral elements joined to each over the premaxilla.

Of course the early surgeons merely chopped off the premaxillary knob in an expedient ruse to facilitate lip closure. This was Franco’s approach in the sixteenth century, but he had the ingenuity to undermine the lateral lip elements and to incorporate the prolabium in the lip.

Georges de la Faye of the Royal Academy of Surgery, Paris, whose portrait has been obtained by courtesy of the Boston Medical Library in the Countway Library, wrote about his operation for bilateral cleft lip in 1743. Translation of his work by Mary McDowell for *The Classic Reprint in Plastic and Reconstructive Surgery*, 1976, indicates that his second operation was a more classical design incorporating the prolabium as the center of the reconstructed lip. He noted,

I did not remove any of the jaw, because none projected

and proceeded to attach the lateral lip elements to the sides of the prolabium and transfix them with pins wrapped with silk in
figure-of-eight fashion and reinforced with linen bandage. He bled the boy postoperatively several times for fever and reported Twenty days later the lip was all perfectly healed; the scar was in the shape of a Y.

The accompanying commentary by editor Frank McDowell as always was interesting.

By de la Faye's time surgery, even plastic surgery, had come in out of the streets and become a respectable occupation—one suitable for gentlemen who wore powdered wigs and truffles and had portraits made. Moreover, the elite knew each other, then as now, and on occasion they watched one another operate.

In 1842 in New York, J. Marion Sims also removed the premaxilla but preserved the prolabium for the central portion of the lip. At a second operation five weeks later, he pared the lateral lip and prolabial edges, brought all elements together, and fixed them for one week with a single interrupted suture across each cleft, further stabilized with a through-and-through needle.

In 1844 Joseph Pancoast of Philadelphia expressed preference for use of the prolabium as the full length of the lip.

The patient is to be seated in a good light, with the arms and feet well secured, and the head pressed against the chest of an assistant, who with his hands compresses the facial artery of each side under the edges of the jaw, and with the thumb pushes the cheek in toward the midline. . . . If the intermediate substance be a larger dimension it must be preserved, as it will be of great importance in the reconstruction of the lip. . . . The operation may be completed at once . . . by detaching the frenulum, paring the edges of the middle portion . . . excising the margins of the two lateral portions—and introducing the pins so as to bring fairly together the four raw surfaces, causing one or more of them to traverse the middle portion.

In 1877 Francis Mason of Grosvenor Square, London, described the method of Sedillot, which, aided by removal of the premaxilla, incorporated the prolabium as a V in the full length of the upper lip, bringing only the mucosa of the lateral lip elements together in the midline. William Rose stated in 1891:

I cannot but think . . . that the nasal distortion is less easily remedied by this plan.
It required both insight and courage for early surgeons to save the obstructing premaxilla and still incorporate the prolabium into the central portion of the lip.

In 1897 Julius Wolff realized the importance of pressure from the united lip to retropose the premaxilla. He also advocated use of the entire prolabium for the full length of the central upper lip.

In 1844 Joseph-François Malgaigne of Paris wrote *Du Bec-de-Lievre*, which was translated from the French by Robert H. Ivy and published as a classic reprint for *Plastic and Reconstructive Surgery*. His portrait from F. H. Garrison’s *History of Medicine* shows him as a young man.

Using the standard approach of his day, Malgaigne pared the edges of the cleft and used pins to approximate them but was constantly disappointed by the resulting notching. He wrote for double harelip the atrophy is still more striking; generally, the median lobe of the lip is shorter than the other sections, and it cannot contribute to reconstruction of the labial border; the median notch is, therefore, much deeper than in unilateral cases.

He was first to conceive and publish the cutting of flaps off the edges and using these to prevent notching.

As he said,

In a word, the freshening of the harelip should only be done by cutting from the skin a few parings—and it is the utilization of these lost cuttings that constitutes the new method. I say method, with the understanding that the harelip operation which is now classified as chielorrhaphy becomes so transformed that it enters the classification of cheiloplasty. Instead of becoming a seam, it adds a piece. . . . If one were dealing with a double harelip, it is easily understandable how one could, for the creation of a median tubercle, take advantage of these two floating flaps which will always offer more than the necessary amount of substance.

It later was brought to Malgaigne’s attention by Roux that M. Clemont of Rochefort had described to him a similar operation.

As explained by editor Frank McDowell, there had been no illustration in Malgaigne’s classic article and the diagram shown here labeled "Clemont-Malgaigne procedure" was published later in a book by Broca.
Matthew Federspiel in 1927 published his method, which incorporated the entire prolabium into the center of the upper lip. Also, he modified the method by discarding the prolabial vermilion and transposed lateral vermilion flaps across under the prolabium to form the free border. He interdigitated these flaps in an attempt to create a cupid's bow.

Too few cases were published to allow evaluation of his method, but the principle of his variation has merit. In the past, Federspiel has been maligned unjustly by some surgeons, including myself, as it had been taught that he was a prime advocate of
the miserable principle of introducing lateral flaps including skin beneath the inferior border of the prolabium. Actually, his flaps were only mucosa, and an apology is herewith offered for this misunderstanding.

**VEAU III**

During his time, Victor Veau had a greater influence on lip and palate surgery than any surgeon before him. He was the "big name" among the surgeons who incorporated the entire prolabium as the central vertical component of the upper lip. In his 1938 book, *Bec-de-Lievre*, Veau described in detail the application of his unilateral closure in bilateral clefts. In the incomplete bilateral cleft he maintained the mucocutaneous junction plus a small cuff of vermilion on the inferior border of the prolabium and brought lateral vermilion flaps together below it. He used a wire retention suture to encompass the muscle of each lateral lip element, passing it through the muscleless prolabium and tying it posteriorly without freeing the prolabium or bringing the muscles together.

Incorporation of the total prolabium in the lip caused the nasal tip to be dragged down by the short columella.

In complete bilateral clefts Veau operated first at from two to five months of age and closed one side at that time, including the anterior palate cleft, with his method. This involved turning a
flap off the vomer like the leaf of a book and suturing it to the freed mucosa of the lateral edge, then overlapping this closure with a mucoperiosteal flap for a partial second layer. Three months later he closed the second side. Other points of interest in his method were that he did not section the vomer, he did not free the prolabium from the premaxilla and he placed great emphasis on his "métallique suture musculaire," which passed over the anterior premaxilla, picked up the lateral lip muscle and, when tied, relieved the tension of the closure. Of course, the volume of his cases was fantastic, and the results shown in his book revealed a reasonable lip with an occasional "whistling deformity." Yet, invariably, the short columella had resulted in an extremely depressed nasal tip.

When I visited him in 1948, I confirmed these same observations.

Here is a similar case treated along the same principle by Milivoj Perko of Zurich. First orthodontia was instituted by Margaret Hotz. Then a Celesnik adhesion of the alveolar area and nasal floors was followed by a second-stage Veau-type lip closure.
About the same time, in 1941, the great German surgeon Georg Axhausen also used the entire prolabium for the center of the lip. After sectioning the vomer and retroposing the premaxilla, he closed the lip in one or two stages. His technique emphasized closure of the nasal floor and constructed no upper sulcus by avoiding freeing the prolabium from the premaxilla. He maintained the inferior prolabium vermilion and, in a variation from other methods, conserved as well the lateral prolabial vermilion as flaps based distally which he used to bolster the lateral segments. This bilateral operation gained some popularity in certain parts of Europe.
It is interesting that the first to describe this lateral transposition of mucosa from the prolabium was an Englishman named Smith. In the December 28, 1867, *Lancet* Thomas Smith presented a method for bilateral clefts of the lip in which he pared mucosal flaps from the sides of the prolabium based inferiorly and inserted them into mucosal releasing incisions along the lateral lip elements. Rose commented on this approach in 1891:

Evidently it can only be of use where the soft tissues are abundant.

**VAUGHAN**

Harold S. Vaughan, who came to the United States from Nova Scotia in 1889, preceded Ivy at the University of Pennsylvania School of Dentistry by two years, received his M.D. from the College of Physicians and Surgeons of Columbia University and lived for an active 93 years. A note to Ivy from Vaughan’s granddaughter Catherine is enlightening:

Grandad was a man of genius and eclectic interests. A rugged individualist and Nova Scotian through and through, he succeeded at whatever he undertook—painting, etching, horticulture, the study of business and finance. . . . He understood profoundly the human character. . . . His sense of humor was subtle and extremely teasing. . . . He loved arguing. . . . did not believe in idle flattery . . . a very human human being.

This Harold Vaughan of Columbia University in his 1940 book agreed with G. V. I. Brown and Warren Davis of Philadelphia that the lower prolabium vermilion should form the central border of the lip. His method incorporated the prolabium vermilion in part but overlapped lateral vermilion to fill out the tubercle. This is a general approach that is still popular in many clinics today.
TERNOVSKY

An early Russian surgeon, S. D. Ternovsky, in the spirit of Veau, Brown and Vaughan included the prolabium, its inferior mucocutaneous junction and a small cuff of vermilion as the central portion of the lip. He brought the vermilion of the lateral lip elements together in the midline below the fringe of prolabium vermilion.

THROUGH-AND-THROUGH STRAIGHT-LINE CLOSURE

In all of these early bilateral clefts in which the prolabium was used to form the full length of the upper lip a through-and-through straight-line closure was used bilaterally. The scars are unimaginative, unnatural and partly responsible for some of the well-known secondary stigma of bilateral clefts. Yet as late as the early 1970’s two plastic surgery giants with impressive bilateral cleft track records have come to opposite conclusions.

Tom Cronin with Penoff in Texas in 1971 emphatically stated his preference for the Veau III or straight-line closure with preservation of the prolabium ridge, claiming:

It is simple, forms a cupid’s bow, and is not difficult to revise. There is a tendency for lack of protrusion of the vermilion border.

Ray Broadbent with Woolf in Utah in 1972 enumerated the disadvantages of the standard straight-line closure:

Additional experience with the straight line repair (20 cases) reaffirmed the old problems of a straight scar—often associated with a grooved nostril floor (presenting the dirty nose appearance), a whistling deformity with an adherent prolabium.
As late as 1974 Donald Kapetansky of Southfield, Michigan, advocated simple, total incorporation of the prolabium in the center of the lip. His one modification was preservation of cleft edge parings, including vermilion and skin, as lateral flaps based superiorly. During the side-to-side approximation of the freshened lateral lip elements to the prolabium these side flaps (L) were inserted bilaterally into a membranous septal incision “to relieve tension of the upper lip.”

Kapetansky is not concerned that the result of such an operation will present a short columella, flaring alae, spread prolabium with bulging lateral lip elements, lack of muscle continuity, absence of an upper sulcus, visible preservation of bizarre prolabium vermilion and a whistling deformity.

He is content to wait until five years of age, at which time he advocates his effective muscle transfers by bilateral pendulums followed with a columella-lengthening procedure and nostril correction, either by Millard flaps or by Cronin nostril-floor pedicles.

AN ANATOMICAL ARGUMENT FOR THE PROLABIUM IN THE LIP

The vomeronasal organ was first described by Ruysch in 1703 and finally in 1811 by Jacobson, a Dane, for whom the organ was named. It has been claimed that phylogenetically and embryologically the prolabium represents the rudimentary organ of Jacobson, and, as the latter is part of the nose, the prolabium belongs at the lower septum to aid in the formation of the columella. In New York Stark and Ehrmann proved otherwise when they found, out of six embryos with cleft lip and palate,
only three with the organ of Jacobson, and even in those three it was 1.0 to 1.5 mm. posterior to the cutaneous surface of the lip. Thus the conclusion was that neither prolabium nor premaxilla is the seat of Jacobson’s organ in bilateral clefts. Coexistence of a well-defined Jacobson’s organ far posterior in the nasal septum to the well-defined prolabium precludes such a possibility, and the absence of the organ in the prolabium of embryos further vitiates the claim. In 1958 Stark with Ehrmann confirmed use of the prolabium in the lip program:

The prolabium is a lip structure. It should be used in its entirety as the central lip element in repair of bilateral cleft lip. If the prolabium alone is used a normal philtrum will develop. If the prolabium is placed onto the nose as columella, the columella will be hirsute in the male, and the lip will be greatly elongated and will develop bereft of its philtrum.

In general principle, use of the prolabium as the central figure of the lip is sound as far as it goes and is the basis of most modern methods today. Yet to insist that it be used in its entirety and only in the lip and that it form the total central vertical portion of the lip is shortsighted! Eventually the columella must be lengthened, and the prolabium, which may be too wide originally or as a “muscleless blob” later stretched too wide, can share in the columella lengthening either primarily or secondarily. Then, too, in order to form the entire vertical length of the lip, the prolabium’s inferior vermilion and mucocutaneous junction must be preserved as such and this often leaves much to be desired.
8. Transposition of Lateral Flaps
Below the Prolabium

Many cleft lip surgeons of the last half of the nineteenth century and the first half of the twentieth, conscious of the overall vertical shortness of the frontonasal component, focused primarily on what appeared to be a short inadequate prolabium. As Pancoast stated in 1844 in reference to the handling of the prolabium in bilateral cleft lip:

If the middle portion, as is very commonly the case, should not be long enough to reach the labial margin, the wound left after the introduction of the hare-lip pins will have the shape of the letter Y.

Bolstering the prolabium from below with skin flaps from the lateral lip elements seemed to realize two immediate assets: (1) The prolabium was lengthened; (2) because the prolabium was not forced to form the complete vertical length of the center of the lip, less downward pull was exerted on the entire frontonasal component, permitting the base of the short columella to ride a bit higher with an insignificant release of the depressed nasal tip. The result was a kind of labial and nasal communal sharing of tissue, neither component being satisfied. This tempting compromise with apparent but inadequate advantages encouraged a host of surgeons over a century to adapt in the bilateral cleft by doubling their unilateral lateral flap. As it turned out, this principle, not being correct in unilateral clefts, compounded their error in bilateral clefts, the damage being far more than twice as much.
William Rose of King’s College Hospital, London, in 1891 described his approach to bilateral cleft lip, which, as he wrote, should be carried out according to the principles enunciated for the single harelip operation. . . . The central tubercle is pared in a V-shaped manner, and the lateral segments by curved incisions from above down to the mucocutaneous junction, and then obliquely upwards and inwards. Only the apex of the central portion is included in the completed lip. The long cross lines represent the position of the wire stitches, and the short ones of the catgut sutures.

He advised lateral undermining:

A free detachment of the lip from the maxillae by undercutting should be the first step, and this must be accomplished thoroughly in these bilateral cases.

Rose also defended the logic of his use of the prolabium:

The treatment of the central part of the upper lip demands special notice. In the first place, it is quite evident that to attempt to draw it down to any extent between the flaps would have the effect of depressing the point of the nose and producing an unsightly lateral dilatation of the nostrils, for it must be remembered that this stunted portion of tissue represents in most cases not only the central part of the lip, but also the columna nasi. . . . Consequently, it is only the extremity of this philtrum which needs preparation, and this is effected by cutting it into a V-shape. . . . The outer segments can then be brought together in the median line.
There was a similarity between Rose's approach and the later Thompson method.

Then Binnie designed an even more frightening procedure.

One-stage Veau II as diagrammed by W. G. Holdsworth, 1951

**BARSKY**

Arthur Barsky has long been known for his teaching. According to Bernard Simon, one of his students, Barsky’s philosophy was exemplified by the saying:

*Give a man a fish and he will eat for a day. Teach a man to fish and he will eat for a lifetime.*

At New York Mt. Sinai Hospital, while treating the Japanese girls burned in the Hiroshima atomic bombing, he took the precaution of having two teams of Japanese surgeons working
with him. Then in 1966, acutely aware of the ravages of war, he followed the old proverb

It is better to light a candle than to curse the darkness

and started Children’s Relief International. He designed, built and staffed a children’s hospital in Saigon devoted to the treatment of victims of war and congenital anomalies, with the ultimate plan of eventual Vietnamization.

Arthur Barsky’s early training with J. Eastman Sheehan, who he said “would try anything, sometimes not always advisable,” plus his own skill and zeal for teaching possibly backfired in a minor way in bilateral clefts. In his good 1938 book Barsky published a bilateral lip design which achieved union of the lateral skin and vermilion flaps beneath the inferior edge of the prolabium after repositioning of the premaxilla by the method of von Bardeleben.

From 1952 for many years, Barsky was Chief of Plastic Surgery at Mt. Sinai Hospital and later at Albert Einstein Hospital. His teaching in the New York area had great influence on many surgeons treating bilateral clefts and was partly responsible for perpetuating this unnatural approach. Finally, in 1964, in a book with Sidney Kahn and Bernard Simon, he changed the design slightly, calling it the Barsky-Hagedorn operation, and made special mention that the lateral flaps were rectangular in shape. The prolabium vermilion was used for lining if needed. As the principle remained the same, so did the results.
The majority of cleft lip surgeons, as previously mentioned, with or without good reason, had been forcing their unilateral designs on bilateral clefts with more or less unsatisfactory results. When Blair modified Mirault and Brown modified Blair, most surgeons joined the St. Louis "bandwagon" and along with Brown introduced a pair of triangular flaps under the inferior border of the prolabium.

In 1947 Brown, McDowell and Byars admitted that the surgical repair of double cleft lips is about twice as difficult as in single clefts and the results are about half as good.

In principle, they stated,

The prolabium is the central segment of the lip and must be used in this position in the closure. The upper part of it is sometimes advanced secondarily into the columella at three or four years of age, but it is best not to do this primarily.

Many of the features of the modified Mirault operation for single cleft lips were adapted for closing the double clefts.

They described variations:

When the prolabium is unusually large or long, so that the Mirault flaps under it might result in too long a lip, 2 or 3 mm. of skin can be excised from the bottom of the prolabium to shorten it. If the prolabium is tiny, the lateral flaps may be designed in a rectangle to elongate the lip.
In 1966 Frank McDowell reviewed six late cases of bilateral clefts (13 to 23 years) treated by the 1947 Brown-McDowell-Byars double triangular flaps. In reference to incomplete bilateral clefts he stated:

These are probably the most difficult of all cleft operations. Partial double clefts have attenuated vermilion generally placed in the wrong direction, and a great tendency for single or double whistling deformity to result.

In complete bilateral clefts, when compared to the original deformity, the late results were reasonable. The lip lacked a cupid's bow and natural contour, but because of the smallness of the triangular flaps at least the lip was not usually too long in vertical dimension. Either the columella was a little short of ideal or it had been elongated to near normal length at the expense of a midline lip scar left in its wake. McDowell did admit:

Occasional patients will have tight upper lips and loose lower lips in spite of all surgical intentions to the contrary, and improvement will result from cross-lip flaps.

This simplified Brown-McDowell-Byars approach, taught with blue-dot clarity, attracted students from all over the world, and many have clung to the method ever since. Fogh-Andersen was in St. Louis in 1950 when I was, and evidently Barrett Brown's dogmatic teaching was deeply ingrained. Over all these years he has had a monopoly on the clefts of Denmark and, having never veered from the double triangular flaps, now has a 20-year controlled series. If you wish to see how bilateral clefts were once treated in St. Louis when it was the cleft lip mecca, take a trip to wonderful, wonderful Copenhagen.

In 1959 Bauer, Trusler and Tondra, having used the "Brown" approach for years, cited horizontal and vertical shortness with vermilion thinning in late results, which finally forced them to discard this method.

Padgett and Stephenson in 1948 at the University of Kansas School of Medicine endorsed the same principle but advocated the Mirault-Blair design, which placed more skin beneath the prolabium.
W. G. Holdsworth in 1951, while still at Rooksdown House, Basingstoke, diagrammed what he called a one-stage Veau II, noting:

This operation is feasible if there is little nasal deformity.

LEMESURIER

Following his dramatic entrance on the plastic surgery scene in 1946 with the Hagedorn quadrilateral flap in unilateral cleft lip, A. B. LeMesurier began to apply the same principle by doubling it against the prolabium in bilateral clefts. Theoretically, shaping the distal end of each lateral quadrilateral flap slightly wider could produce the effect of an artificial cupid’s bow and gave the method a slight edge over other similar procedures.

Evidently LeMesurier did not use this trick and actually kept his lateral flaps extremely narrow. Surgeons who were pleased with it in single clefts quickly adapted it to double clefts. The criticism of this approach was the same as of all other methods which employ lateral skin flaps transposed below the prolabium. It left unnatural scars and inferior transverse narrowing of the lip, usually with excess vertical lengthening.
LINDSAY MEASURES LEMESURIER

At the 1973 Cleft Palate Congress in Copenhagen, William K. Lindsay of Toronto gave a late follow-up evaluation of LeMesurier's bilateral cleft lip and palate cases treated by his double quadrilateral flap. From the podium, as light reflected from his snow-white hair, Lindsay explained with a whimsical twinkle that these were mostly LeMesurier's cases, as he himself was too young for such long-term results. He reported a general grading of the appearance of the lip and nose as 18 percent good, 64 percent fair and 18 percent poor. The upper lip often revealed a side-to-side tightness, an unnatural quality and a flatness as compared to the relatively protuberant lower lip. Surprisingly, in LeMesurier's cases, he did not find the vertical length of the lip longer than normal. The noses, with typical bluntness of the tip, wideness of the alae and both shortness and width of the columella, rated less well and were the source of more complaints from the young adult patients.

LeMesurier's trick for preventing a long lip with his flaps can be deciphered in excerpts from his 1962 book:

But in some cases the lip may be made too long and may later become still longer. To avoid this excessive length, the lip, at operation, should be made shorter than the average but still within acceptable limits. This can be done by making the vertical cuts lateral to the clefts reasonably short. These cuts have to extend down far enough to make the usable parts of the flaps of sufficient length to cover the cut end of the prolabium, but the prolabium does not have to be kept particularly wide. In most cases, with extensive freeing on both sides the two lateral parts of the lip can be sutured to the cut sides of the prolabium with little tension, even if the prolabium is cut as narrow as 8 to 10 mm. With the prolabium fairly narrow, the flaps do not have to be long... With the flap operation, the lip can usually be made slightly shorter than average, with no great vertical fullness of the lateral parts and no great tendency to increase later in length.

Here are photographic records kindly forwarded by Lindsay of a bilateral cleft lip operated on by A. B. LeMesurier himself at the Hospital for Sick Children, Toronto. The operation was carried out at age six months, which was later than usual. The follow-up at 13 days postoperative, then at 11 years and finally at 18½ years gives a fascinating progressive study of the result of his operation on this patient.
Of course, LeMesurier himself, unlike many others using his method, was able to avoid undue vertical lengthening of his lips by the conservative width of his lateral flaps. Yet transposition of his quadrilateral skin flaps below the prolabium not only accounts for transverse lip tightening but depletes the lip skin bank for columella lengthening and explains the flat nose and short, wide columella.

**EMPHASIS ON ALAR CORRECTION**

As in his unilateral clefts, Jean-Lucien Grignon of Hôpital Saint-Antoine, Paris, stated:

> In our hands the Mirault-LeMesurier quadrilateral flap appeared particularly satisfying for the inferior part of the lip.

He then turned his attention to the persistently flaring ala. He expressed his feeling that the nasal deformity caused by the
original retroposition of the alar base attached to the cleft side of the maxilla increases with growth and gives argument for his "disinsertion" of the alar base, "hyper-rolling up" of the ala and insertion of its tip into a subcolumellar notch. Circumalar incisions free the alar bases from the lip elements. Then, as he explained,

Nasal mucoperiosteum, attached to the ala, is cut along the pyriform and lateral bone segment edge as to be rolled up with the ala.

He makes a subcolumellar incision for the advancement of the tip of the alar base and says, in clarification:

This notch, of which the depth is variable, establishes a complementary lock for the closure, receives the ala and fixes it in a suitable rolling up position.

In one primary procedure Grignon detaches the alar bases from the lip and maxilla and advances them into subcolumellar incisions. In the bilateral cleft he can achieve symmetrical and narrowed nostrils but with only minimal columella lengthening. Unfortunately, he chooses to introduce quadrilateral lateral lip flaps below the prolabium, incurring the same disadvantages of lengthening the lip vertically, tightening it horizontally and placing scars in unnatural positions.

**OBUKHova**

In 1955 Lidiya Obukhova of Samarkand adapted her long lateral triangular flap to bilateral clefts. After trimming the prolabium to a box square and without downward tension on it, she not only transposed two triangular flaps below it but interdigitated them! Although Obukhova's bilateral nasal tips would not be the flattest, it is conjectured that her lips must be the longest, if not the grandest, in all of Russia.
Professor Alexander Limberg, winner of the Order of Lenin, created a plastic surgery unit in Leningrad sparked with satellites of enthusiastic women including his own daughter. He was in the habit of keeping three tables working in one room, and invariably at least one held a cleft lip patient.

Probably the most artistic of this category of operations is the bilateral lip plan of Limberg. An impractical aspect of the procedure entails lengthening of the lateral lip components even though these elements are usually too long in the first place. His design ingeniously creates a Collis flap for the nasal floor and a small Mirault-Blair-Brown flap for the lip, with skin scars resembling those of Denis Browne and in fact a Browne-type exaggerated cupid's bow. Whatever else this operation achieves, the creation of an inferior pointed skin triangle in the center of the cupid's bow deserves consideration.

The most conservative modification of this general design seems to be that presented in 1970 by Georgiade of Duke University Medical Center. At least he de-epithelialized the skin he introduced below the prolabium. In principle, his modification is similar to the method described by Cronin in 1957, especially the variation accredited to his preceptee, T. A. Cresswell, which denuded the vermilion flaps and introduced them beneath a triangle of prolabium vermilion. Georgiade turns down flaps of mucosa and skin from the sides of the lateral lip elements. Yet, instead of introducing these flaps below the prolabium in toto, he
de-epithelializes the skin portion, turns up the prolabium vermilion and interdigitates his lateral flaps "half way" under to bolster the central portion of the free border vermilion and prevent a "whistling deformity." The lateral lip muscle and mucosa have not been united behind the prolabium, the columella has not been lengthened and a patch of prolabium vermilion is still visible.

A HAPHAZARD HYBRID

In March 1973 an article entitled "Single-Stage Repair of Bilateral Cleft Lip" was published in the Archives of Otolaryngology. During a quick perusal of the diagrams I could not believe my eyes and found with relief that the author was unknown to me, a C. T. Yarington, Jr., of the Department of Otolaryngology, University of Nebraska Medical Center, Omaha. My great respect for the recent Nebraska football teams caused me to reserve final judgment.

Yarington started out quite well by noting the eight rules cited by Cronin and Penoff in 1971 for bilateral clefts and then proceeded to break at least four of them. Worse, he ignored other more fundamental plastic surgery principles which Cronin would take so much for granted he would never even bother to enumerate them.

Let's study this hybrid procedure, which seems to be a frantic attempt to incorporate a little bit of everyone and ends up with a maze of irreversible scarring. The skin and mucosa of the cleft edges are trimmed as lining flaps and are sutured together in what Yarington loosely refers to as "creating gingival-labial sulcus." The misconception here is that the prolabium is still plastered to the premaxilla obliterating any true upper labial sulcus. Then lateral flaps of skin and mucosa are transposed to each other below the squared prolabium and over the turndown flap of inferior prolabium vermilion. At this point the plan is no worse than all other unfortunate methods that introduce composite flaps below the prolabium. Even his next step could pass: "The cleft on the less severely deformed side is closed in a straight line primarily." Then comes the unbelievable unilateral Z-plasty: "A
transposition of triangular flaps is applied on the more severely deformed side.”

Yarington presented one truly severe bilateral case with his results just three months later already revealing flared alae, short columella and wide prolabium with unnatural scars. It can be predicted that someone is going to be doing quite a lot of secondary surgery. The method has not created a usable upper labial sulcus, has not planned correction of the short columella, has not fashioned the prolabium as a philtrum, has not placed the scars in philtrum column positions but, most important of all, has shown complete disrespect for the coveted characteristic of symmetry which is possible even in asymmetrical bilateral clefts. Yarington’s conclusion gives his presentation a tone that I unaffectionately refer to as one of a sort of verbal “patent medicine cure-all.” It reads:

Although this type of repair utilizes a simple rotation-advancement of triangular flaps and straight-line closure incorporating many of the principles described by Millard and Yules in their reviews of various methods of repair, we believe that this presentation might be useful to those desiring a safe method of single-stage repair of the bilateral cleft lip over a mildly protruding premaxilla or in single-stage repairs following retropositioning of the premaxilla.

This is not a personal attack on C. T. Y., Jr., of Omaha as I do not know the gentleman. My tirade is included specifically for the sake of any E.N.T. men determined to close clefts who read this book and might take his design seriously. Cleft surgeons must be trained in plastic surgery principles; plastic surgery is an art unto itself but both applicable to and essential for the correction of deformities in all regions of the body.

After forwarding a copy of this critique to Yarington and requesting his rebuttal, I was encouraged by his response, as expressed in these excerpts, from Omaha:

I do not believe that it is unique for individuals to publish in medicine and find considerable criticism and opposition from others so, indeed, to later change their minds and alter their procedures. . . . I believe that your points are well taken in many instances. . . . I do agree that symmetry is of extreme importance and that the prolabium should be fashioned as a
philtrum and that the scars should be placed in a philtrum column position. In reviewing most recent cases, I find that in most instances these goals have been obtained. . . . While the procedure as described has been subject to modifications which in general bring it closer to the principles which you outlined . . . I see no reason to write a rebuttal.

**NOT AN "IN" OPERATION**

Methods bolstering the prolabium inferiorly with lateral flaps consisting of skin and mucosa really "scramble the egg." The prolabium is lengthened unnecessarily and often excessively. Unnatural scars are produced against normal lines, and this damage is irreversible. The side-to-side tightness is exaggerated by the vertical length. The columella, although not drawn down quite so vigorously, is still short, deserving further lengthening. Although it can be said that methods introducing the least amount of skin with the lateral flap produced the better results, this principle should, except for rare instances, be stricken from the list of recommended procedures.
A year before I was born, George V. I. Brown had the good sense to object to the principle of sticking lateral flaps of skin and vermilion below the inferior edge of the prolabium. He noted in 1918 that incisions as advocated by Von Langenbeck, Mirault, Maas and others were undesirable:

This method of operation creates an ugly deformity by making the lip too long, and should be avoided.

At least he had the courage to speak out against methods that were popular among surgeons of his day. In spite of his early stand this principle continues to have sporadic popularity among the unenlightened even of today.

ANOTHER HEATED DISSENTER

Then in Chicago in 1951 the fiery Milton Adams of Memphis in his inimitable style pulled the pin on a grenade labeled “The Misuse of the Prolabium in the Repair of Bilateral Cleft Lip” and tossed it into the meeting of the American Association of Plastic Surgeons. The main blast of the explosion was aimed at primary surgical procedures wherein the prolabium is shifted up to build the columella and the upper lip is formed wholly or in part by suture of the lateral labial segments in the midline—or Maas, König, Rose, Thompson and Hagedorn. Unscathed were the methods of G. V. I. Brown, Vaughan, Axhausen and Warren Davis, wherein the prolabium alone is utilized for the total vertical lip. This presentation, co-authored by the Adams brothers
Milton and Lorenzo from Tennessee, was published in 1953 and became a classic.

Milton Adams admitted that 14 years earlier he had first shifted an infant's prolabium into the columella to avoid the flat-tipped nose and had closed the lip side to side beneath it. The Memphis fireball blamed being tempted into this trap on his happier experiences with the same principle in adult cases.

True to his mottoes "It is often as necessary to know what not to do as to know what to do" and "A good surgeon should always be his own severest critic," Milton pointed out his findings:

It is difficult to explain why the upper lip of an adult repaired by suture of the lateral segments together in the midline will remain as constructed while in an infant it will be followed by practically twice the normal lengthening of the lip.

The Adams boys conjectured:

Perhaps, the extra length in the infant is developed by repeated drawing of the lip down over the premaxilla, whereas in the adult, the teeth support the lip.

They admitted:

The prolabium is often small, even rudimentary and one may thus be tempted.

But they hastened to reassure:

Indeed, the development which takes place in even a rudimentary prolabium is amazing.

They advised staging the repair rather than sectioning the vomer and advocated correction of the nasal deformity after the child acquired an adult facies.

In 1973, more than 20 years later, Lorenzo Adams reconfirmed their previous stand:

It is my impression now that the information in the article presented by Milton and me on the misuse of the prolabium in repair of double cleft lip in infancy is valid. It is now my impression that in cases of double cleft lip and palate after attaining maturity of the facial features in postadolescence, flaps from the lateral segments may be utilized above or beneath the
prolabium without resulting in excessive elongation in the vertical dimension of the lip. This is in contrast to the results of the same procedures in infancy.

A CHECK

Whether this 1951 Adams stand started a trend or put a brake on previous trends, it brought to the fore what many surgeons were beginning to realize. Here is an example. In 1954–1955 while I was at “A Med” with the First U.S. Marine Division, Korea, Sten Stenstrom of Sweden was down at the Swedish Hospital in Pusan. During his time there, he used the LeMesurier quadrilateral flap to introduce skin and mucosal tissue beneath the prolabium on 18 Oriental bilateral cleft cases. He stated in his 1957 preliminary report:

Only by long observation can the procedure be fully evaluated.

Whereupon Bromley Freeman of Houston, Texas, responded in 1958:

About seven years ago, I tried this combined LeMesurier technique on a small number of patients for bilateral lip repair and have been able to follow them a little longer than Dr. Stenstrom. I have found that the lip grows entirely too long, as typical of the older methods of repair. . . . While I was doing a secondary repair, it occurred to me that I should bring this to your attention, so that the younger men could be apprised of the fact. . . . In informal discussion with several of my colleagues I find that they have met with similar difficulty.

A MASTER’S SECOND THOUGHTS

LeMesurier had adapted his modification of Hagedorn for the treatment of bilateral lip clefts and was sliding two quadrilateral flaps along the lower border of the prolabium. He began to realize from follow-up observation that when the prolabium was long primarily, his approach could only produce longer upper lips. Thus, in his 1962 book, he outlined his selective plan:

If the prolabium is long enough to make the central part of the lip of decent length and if there is enough mucous membrane available to make the vermilion border thick enough, it is probably better to bring the prolabium
down and use its lower edge to form the central part of the lower border. . . . In bilateral cases in which the prolabium is too short to make the central part of the lip sufficiently long, or if its mucous membrane is extremely thin, it is better to turn down flaps from both sides and suture them together in the midline below the prolabium.

Then he charted the design for each general category of bilateral lip clefts and included an alternative approach incorporating the whole length of the prolabium as the central component of the lip.

LeMesurier in typical candor stated:

It must be admitted that no matter which operation is done, the results obtained in the complete bilateral cleft of the lip are always far from perfect.
LeMesurier's comment on his results of incomplete type of bilateral clefts was:

No matter which operation is done, the results are usually better than in the other types of bilateral hare-lips.

A S A L T Y C R I T I C I S M

In 1972 Broadbent and Woolf of Salt Lake City evaluated the use of the LeMesurier method in bilateral clefts and reported unimpressive results whether done in one or two stages, disappointingly long lips, a false and irregular cupid's bow, a prolabium still adherent to the premaxilla, a whistling deformity and a flat nose. The length of the two sides of the lip were often unequal, and

At times, the scar pattern resembled a sketch of a Christmas tree more than a normal philtral ridge.

O B J E C T I O N S F R O M T E X A S

Tom Cronin of Houston, Texas, joined the Adams swing in 1957 and retold the story:

Adams and Adams, at one time, used all of the prolabium in the initial repair for lengthening the columella, but they found that within a year, such lips were becoming entirely too long vertically and that this tendency continued with the growth of the child. They now strongly advise against this procedure and I agree with them completely.

In reference to previous methods which turned flaps of skin from the lateral lip elements beneath the prolabium to increase its vertical length, Cronin explained:

This practice has obviously arisen because the prolabium appears to be shorter than the lip fragments on each side. All prolabia, in their isolated position, appear smaller than their actual potential when incorporated in the lip. In the first place, the prolabium actually is thinner than the lateral lip tissue and, secondly, as there are no attachments to stretch the prolabium out, it shrinks down to the smallest area possible.

Cronin went on to describe his premaxillary setback and a rather simple bilateral lip closure in one stage with the prolabium used
to form the full vertical length of the middle of the lip. This procedure of course left the columella short and the nasal tip depressed and merely set the lip groundwork for his later columella lengthening.

By 1971 Cronin was even more decisive against inferior skin bolstering and even lateral interdigitations of the prolabium. With Penoff, he fired some broadside shots:

The Veau II. or Barsky type operation is an obsolete procedure resulting in a lip which is too long vertically and too short from side to side. The tightness contributes to retraction and lingual tilting of the incisor teeth. . . . The Barrett Brown procedure removes all of the prolabium vermilion bringing the vermilion of the lateral segments together in the midline, thereby tending to constrict the prolabial skin in a circular manner, as well as making the lip a bit tight from side to side. . . . Only one adaptation of the LeMesurier operation was done. This procedure was wasteful of tissue, tended to result in side to side tightness and noticeable scars.

THE HORIZONTAL VERSUS VERTICAL LIP GROWTH OBJECTION

Ernest N. Kaplan of Stanford Medical Center has measured horizontal length of unilateral clefts in the newborn and the adult and found that the lip length doubles its original horizontal dimension (100 percent). Similar measurements of vertical philtrum height in the newborn and the adult indicated a proportional growth of the prolabium, with only 50 to 75 percent vertical growth potential from the newborn to the adult. He noted in 1974:

When the 50-75% vertical growth is compared to the 75-100% horizontal growth, we can appreciate that a cleft lip can grow twice as much in the horizontal direction as it can in the vertical direction. Therefore, any operative procedure taking tissue that is horizontally arranged and transferring it in the vertical direction must account for this potential growth differential. This, we believe, explains why the Asensio and the LeMesurier repair can grow too much on the cleft side when the procedure is performed in a newborn, but little or no discrepancy is seen when the procedure is applied to young children and adults.
A CAUSE OF INCREASED VERTICAL LIP LENGTH

Although Kaplan's studies have been confined to the unilateral cleft, of course they also apply to the bilateral cleft, and doubly so. Thus, any vertical flaps transposed horizontally, as so often noted, usually will be responsible for abnormal increase in vertical lip length; this is another sound contraindication to the use of such flaps.

In spite of these wise warnings by experienced surgeons for over half a century, operations are still being done in which lateral flaps are introduced below the prolabium. The invariably unacceptable results being seen in many cleft clinics and the severe difficulties encountered during their secondary correction warrant stamping these actions OBSOLETE and DANGEROUS and having their use outlawed.
10. Interdigitations into the Sides of the Prolabium

Following close upon the quadrilateral flap of Hagedorn, modernized by LeMesurier for unilateral clefts, had come the inferior triangular flap of the Tennison Z-plasty. The improvement in the cleft lip evolution had been a step from creating an artificial cupid’s bow to preserving what bow was already present. In the prolabium of bilateral clefts there is no residual cupid’s bow, so the surgeon is back in the position of trying to find the best way to construct one. The LeMesurier method, already established as a cupid’s bow maker, probably had the edge over the Z method, which depended on nature’s residual bow. Yet the purchase of a bow with quadrilateral flaps below the prolabium was not worth the price of the scars and a long lip.

Although I never heard directly that Tennison applied his inferior Z-plasty to bilateral clefts, it is quite possible he did so. Certainly other surgeons, infatuated with the Z in unilateral clefts, reveled in the chance to double it against the poor prolabium. Fortunately this principle did not add flaps below the prolabium but merely interdigitated flaps into its gaping sides and did not tend to cause vertical lengthening of the central segment. Rather it produced an odd pair of zigzags unreproduced anywhere in nature. Take, for instance, Skoog’s design, which, while interdigitating medial flaps across the base of the columella, interdigitates lateral flaps in the spirit of Tennison into the sides of the prolabium. Maisels and Littlewood of Liverpool at the Rome Congress in 1967 commented on Skoog’s approach:
Not only is the columella lengthening achieved by this method somewhat limited, but also it seems desirable to repair both sides at the same operation.

Bauer, Trusler and Tondra of Indiana stated in 1971:

We consider that lengthening the lateral borders of the prolabium by the Z-plasty type of closure has produced scars that are less noticeable than the straight-line scars. Also, the increased length in this area has produced more normal contour to the vermilion border.

Then Kolesov endorsed the Indiana interdigitations with slight modifications for his Russian rendition.

Yet their arguments for this line of union seem quite illogical. A zigzag scar runs against natural skin lines, and lengthening the sides of the prolabium and leaving the center short explains the common occurrence for them of a central notch (whistling deformity) requiring secondary surgery.

A probe into China by Gaston Schwarz of Montreal in 1974 was answered by a plastic surgeon in the Peking Medical College:

Since 1963, we have been using . . . the Tennison principle for bilateral harelip.

Several of the world’s best cleft lip surgeons had a go with this approach but eventually became disenchanted.

GOOD INTENTIONS

The Allentown team of Marcks, Trevaskis and Payne in 1957 proposed a campaign: “Be Kind to the Prolabium,” suggesting preservation of the prolabium in its entirety, including the skin vermilion ridge, and not prescribing introduction of skin inferior to its lower border in the hope that the scarred and distorted prolabium would ultimately be a thing of the past. At least they realized that the length or width of the prolabium was no factor whatsoever as it will increase in size in all dimensions. In their opinion its eventual hair ruled it undesirable for the columella. They presented possible designs, one of which was a Tennison-type approach adapted to bilateral clefts with radical interdigitations.
As this adhered less to their campaign slogan with more violation of the prolabium, in the end it found less favor with them than their other more conservative design.

**AN IMPROVEMENT ONLY**

In 1972 Broadbent and Woolf with Mormon honesty evaluated their application of the Tennison design to both sides of bilateral clefts. They reported:

It preserved a more normal vermilion ridge; gave consistently better length to the lip, and saved bilateral triangles of tissue medial to the peaks of the cupid's bow—including the vermilion ridge on the central prolabium. The latter avoided much of the horizontal tightness and resulting flatness of the lip. . . . Still existing were an adherent prolabium, a flat nose with flaring nostrils, some inequality in lip length and persistent irregularities in the vermilion ridge and mucosa. The Christmas tree lip scar now looked as though it had a two-legged stand under it, carefully encircling a small diamond of prolabium mucosa in the area of the central tubercle. A whistling deformity and a flat central lip often resulted.

Here is a similar example of the same method performed in a great eastern seaboard center bearing the trademark that was described by Broadbent and Woolf.
And another, except that this Christmas tree scar had its top chopped off by the transverse nasal base incision used in the Carter-Cronin columella-lengthening procedure. The narrowing of the alar bases during the partial columella lengthening presents pig's-ears in the lip below the alar bases. These mounds plus the lateral muscle bulges and the lateral flap interdigitations into the sides of the prolabium accentuate the absence of muscle in the prolabium.

It was easy to see that Cronin's final evaluation of the inferior triangular flap in bilateral clefts came painfully to him:

Adaptation of the Tennison type incisions to the bilateral lip has produced some very nice results for me. It tends to give a nice protrusion to the central vermilion. The scars, however, seem to be more noticeable than when the procedure is applied to the single cleft lip. If revision is necessary, it may be a little more difficult than a straight line repair.

There are other modifications of the interdigitations into the sides of the prolabium as that of Orticochea which not only make no effort to imitate philtrum columns but present a maze of irreversible scars.

THE Z IS OUT

The original advantage of preserving a portion of the cupid's bow with a Tennison Z is not valid in bilateral lip clefts. The natural
lines of the philtrum do not zigzag transversely back and forth across Langer’s lines. Lengthening the sides of the probulum offers no true advantage except to break the contracture of the so-called straight-line scar. Yet the advancement of mucosa and muscle past the skin closure posteriorly and the mucosa inferiorly, as in the method I propose, achieves a Z-plasty of layers in hidden planes leaving only the skin apposition as a curving line. On its own, the skin will show minimal threat of contracture, if any. Thus, it is far better to resist the temptation to “scramble the egg” by interdigitating skin flaps into the central sides of the probulum just for the thrill of executing a familiar Z technique. Rather, let the sides of the probulum come together with those of the lateral lip elements naturally in the general line of philtrum columns. Revisions and columella construction will be much easier.
11. Joining Portions of the Lateral Elements Behind the Prolabium

There has been a school of sporadic surgeons who, although they agreed that the prolabium should form the entire vertical skin length of the central portion of the upper lip, called upon some portion of the lateral lip elements to back the prolabium. A German named H. Meyer was first. In 1929 he freed the prolabium from the premaxilla, turned vermilion flaps back from the cleft edges of the lateral lip elements and advanced and sutured them together posterior to the prolabium.

Joining the Muscles

Louis W. Schultz, Professor of Plastic Surgery, Children’s Memorial Hospital, Chicago, was a pioneer in bilateral cleft lips. Although the general plan had been described almost 20 years before by Meyer, Schultz added the retention sutures to approximate the muscle across the cleft. As he stated in 1946:

Not being satisfied with the results obtained in most bilateral cleft lip operations performed by various operators including myself, the author searched diligently for a method which would produce a more nearly perfect effect.

As he explained, an important prerequisite to success is the understanding that

all the normal parts are there. All you have to do is unite them.
In a patient one month old, Schultz retroplaced the premaxilla by V section of the septum and, after denuding the opposing cleft edges of the maxillary and premaxillary segments, approximated them with 4-0 nylon sutures to get what he referred to as "bony union." One month later he achieved a one-stage closure of the lip by elevating the prolabium from the premaxilla and turning flaps of skin and mucosa from the lateral lip elements to be sutured together behind the prolabium in the midline. He placed retention-type sutures across from muscle to muscle and then set the prolabium into the defect so that it formed the skin and vermilion of the central external portion of the upper lip.

This approach emphasized an important principle and subsequently was responsible for influencing the surgical treatment of bilateral clefts. In the cases presented by Schultz, however, there were two glaring discrepancies: the unnatural look of the prolabium vermilion and the persistent shortness of the columella.

The Australian pediatric surgeon Denis Browne of the Hospital for Sick Children, Great Ormond Street, London, in 1949 redescribed his method of bilateral cleft lip closure. This eccentric surgeon chose a 2 mm. ophthalmic trephine and a half-inch chisel to punch and carve the infant’s lip against a slip of soft wood more the way a leather cutter would than a plastic surgeon. His design discarded much tissue but shaped the prolabium to a point and used it to construct the entire central vertical skin segment of the lip, adding only the lateral mucosal flaps to the inferior border of the prolabium.
To this orthopedic-oriented surgeon the most important part of the operation was the muscle closure, which he described:

The joining of the muscles is done by deep vertical mattress sutures of 000 chromic catgut, inserted so as to bring together the whole thickness of the lateral portions with the exception of the already sutured skin. The first of these is put in opposite the trephine holes, and two others usually are enough to join the entire undersurface of the lip. The effect of these sutures is triple: to join the muscles, to join the mucosa, and to make the lip pout. There is no need to dissect the muscles free and suture them as a separate layer. One knows exactly where they are, and the less they are injured the better.

Donald M. Glover, general, pediatric and plastic surgeon at Case Western Reserve University, Cleveland, gained his early interest and training in clefts under William Ladd at Boston Children’s Hospital. With the same tenacity that won him the U.S. Army’s Legion of Merit, Pacific Theater, in World War II, Glover has clung to the principle of joining the lateral lip musculature across the clefts in front of the floating premaxilla. In 1961, with M. R. Newcomb, he first published his stand. From his Adirondack hideaway island in Seventh Lake he wrote his unchanged 1974 views on bilateral lip clefts:

Close the lip in front of the premaxilla. This is almost always possible in one stage; only about one in ten requires secondary closure. The functioning lip, with orbicularis united behind the prolabium and in front of the premaxilla, provides the best restraint upon the premaxilla. To force it backward or reposition it by sectioning the vomer affects the growth of the premaxilla by interfering with its blood supply. The lateral maxillary processes should be allowed to grow forward and meet the premaxilla. There may never be complete union and early appearance may not be ideal but later orthodontia will make up the deficit.
The technique of the lip closure is not too critical, but the simple methods we have described removes the mucosa from the prolabium, preserving the vermilion border, and uniting the orbicularis and the mucosa from the two sides in front of the premaxilla. If the orbicularis repair does not hold (about one in ten) it should be re-united after several weeks. . . . These conclusions are based upon follow-up from five to fifty years.

This use of the entire prolabium in the central vertical length of the lip does not provide for the inevitable columella lengthening. Maintaining a triangle of prolabium vermilion with color and texture not identical to the lateral vermilion tends to set it apart rather than blend it into the lip red. In spite of these details it must be recognized that pioneers in uniting muscles across “no-muscle-land” were responsible for a major step in the progress of bilateral cleft surgery. Even today there are surgeons who do not appreciate or incorporate this fundamental principle.

For instance, Fara of Prague, who has made such a precise histological stand for getting the orbicularis oris muscle fibers in unilateral clefts lined up and joined end-on in a horizontal direction, strangely takes a rather loose position in bilateral clefts.

In 1967 he and Smahel reported sections taken from the prolabium and lateral lip segments through a posterior horizontal excision after surgery and summarized:

In the first weeks or months after the suture of the lip, there is marked regeneration and proliferation of the muscular fibers into the tissue of the original prolabium. Later on, the major part of these fibers is gradually replaced by connective tissue. But some muscular fibers always remain in the tissue of the central segment, which, together with the collagenous fibers newly formed chiefly along the longitudinal axis of the lip, make a suitable connecting link between the two ends of the musculus orbicularis oris.

Thus, they are saying that after simple, direct suture of the lateral lip segments to the central prolabium there is a heroic fight of the lateral muscular fibers, frustrated embryologically by the clefts, to accomplish a delayed invasion of the prolabium. Then after establishing a substantial “beachhead,” the muscle fibers tire and retreat, leaving only a few stragglers to hold the line:
This reconstitution of the circle of the sphincter oris which is functionally suitable plays a valuable part in the linking of the prolabium to the reconstructed lip.

It seems ridiculous to me not to help the struggling lateral muscle fibers across the "no-muscle-land" of prolabium so that they join each other. It is easy, has been done by many surgeons and means advancing each side only a few millimeters farther.

MORE MUCOSA AND LESS MUSCLE

The Indianapolis team of Trusler, Bauer and Tondra has closed a lot of bilateral clefts. In 1955 they described a two-stage procedure in which one lateral cleft edge was turned as a flap of skin and mucosa to be introduced behind half of the prolabium after it had been freed from the premaxilla.

The opposite side was done in the second stage in similar fashion, creating a labial sulcus.

The bombastic Harold M. Trusler, senior surgeon and motor force of this Indiana unit for years, had been using Barrett Brown's premaxillary retroplacement followed by the Brown-McDowell bilateral triangular flap lip closure in one stage. He began to find the late results disappointing since in Indianapolis,
at least, the vertical length of the lip became too long and the horizontal length too short. Many lips had to be shortened at the time of columella lift and an Abbe flap inserted for relief in the side-to-side tightness. Insufficient thickness of vermilion in the center was producing what he referred to as the “whistle deformity.”

True to his motto “Progress is our most important product,” Trusler was willing to reevaluate bilateral cleft surgery. The first change that he, Bauer and Tondra made was in avoiding premaxillary retroplacement, which resulted in improved face development but because of extra tension ended up with wound disruption or, at best, poor scars. Finally, in 1959 Bauer, Trusler and Tondra adapted their 1955 bilateral design, which was a modification of a design they had described for unilateral cLEFTs in 1953. The first side was closed at two weeks of age with a small triangular flap from the lateral side of the cleft fashioned to fit into a notch incised into the prolabium. Half of the prolabium was freed from the premaxilla, and the mucous membrane flap from the lateral side carrying a small amount of muscle fibers was brought beneath the prolabium.

Two months later, the second side was done, creating a moderate upper labial sulcus and part of a muscle sling.

In 1965 in Bratislava, Professor Stefan Demjen of Comenius University invited John Tondra to demonstrate the Indiana procedure for bilateral clefts. We witnessed his precise execution of a one-sided closure of a bilateral cleft demonstrating the introduction of the lateral flap behind half of the prolabium.

Finally, in 1971, in *Cleft Lip and Palate*, edited by Grabb, Rosenstein and Bzoch, the team of Bauer, Trusler and Tondra discussed their results as “encouraging,” with more normal face growth, normal upper lip length with eversion, good balance, a good labial sulcus and no need “for an Abbe lip-switch procedure.” They noted several problems including a common notching of the central vermillion requiring secondary muscle plication and the tendency to dryness of the prolabium vermillion. Then there was the lack of nasal tip development:

However, in most cases this development is not sufficient to obviate the necessity for some type of columellar-lengthening procedure.

In the Division of Pediatric Stomatology of the Moscow Medical-Stomatological Institute, A. A. Kolesov has developed a method which combines several principles. In 1970 he described this two-stage closure with the skin incisions similar to those of Tennison, Limberg and Obukhova and the vestibular sulcus created in the manner of Bauer, Trusler and Tondra. Kolesov described dissecting the prolabium from the premaxilla with particular attention to freeing the columella to the tip of the nose. The Tennison-type incision along the side of the prolabium freed a lateral mucosal flap, which was either excised or folded to cover the raw premaxilla. The lateral lip element was incised into flaps in the style of Limberg, Obukhova and Tennison with a portion for the nostril floor and a turnover flap of mucosa and skin as used by Bauer, Trusler and Tondra to line the backside of the undermined prolabium.
Kolesov operates on the first side very early and the second side two months later.

LATERAL MUCOSAL FLAPS BEHIND THE PROLABIUM

Clayton R. DeHaan of St. Luke’s Hospital, New York City, prefers to close bilateral clefts in one stage and demonstrates ingenuity in creating an upper labial sulcus. He described with illustrations the details in his section of Stark’s 1968 book:
The two-stage operation is less satisfactory, in our opinion, for several reasons. . . . When one side only is corrected, the premaxilla rotates toward it, widening the cleft on the other side and twisting the probium; thus the second side is technically more difficult to correct. . . . We prefer a straight linear repair of both sides of the lip in a single stage. . . . Probium vermilion surfaces the premaxillary side of a deepened alveolabial sulcus, while vermilion from the lateral lip elements is advanced to the midline beneath the probium.

DeHaan notes that the definite landmarks present in unilateral clefts are lacking and warns:

All points on which the repair is based depend upon the surgeon's judgment and experience. A small probium makes the correction relatively more difficult but it may still form the entire central lip since under tension the growth potential of this tissue is phenomenal.

He is, alas, willing to reenter the lip for columella lengthening:

The probial segment is often too wide following repair and lacks the desired normal appearing philtral ridge with dimple. No attempt should be made to narrow it at this time, as this segment will later furnish ample tissue for lengthening the columella.

A VARIATION IN TWO STAGES

The indefatigable Charles Horton, with Adamson, Mladick, and Taddeo of Norfolk, in 1970 advocated preservation of vermilion parings for covering the raw surface of the premaxilla. Then in 1974 Richard Mladick, with Horton, Adamson and Carraway, reproposed this principle along with introduction of lateral mucosal flaps behind half of the probium in a two-stage primary procedure. This achieves lining for both sides of the labial sulcus and frees the probium from the premaxilla.
The droll and wiry William M. Manchester of Middlemore Hospital, Auckland, New Zealand, has developed his own modification of a "down-under" approach to bilateral clefts. He refers to himself as "a rather 'square' sort of a person," but this description is not upheld by the facts. He has been active in postgraduate surgical education, has achieved renown from his stories about the exploits of the New Zealand All Blacks Football Team and is building a country house in a natural New Zealand forest filled with native plants and birds. As he recalled sympathetically,

I remember Sir Harold Gillies once telling me that what he yearned for most in England was the smell of wet New Zealand bush.

His analysis of his own philosophy gives the truest picture of Bill:

I am not a rebel but I am a great believer in people getting on with their job without unreasonable complaint, conscientiously and without too much thought of "what's in it for me." In other words the job being an end in itself.

In 1970 and again at the Melbourne Congress in 1971 Manchester described his approach to bilateral clefts, an approach which limits the amount of lateral lip elements introduced behind the prolabium as the prolabium is not freed from the premaxilla and the lateral muscles are not joined together. After lateral manipulation of the maxillary segments by his orthodontist, he accomplishes closure of both lip clefts and hard palate in one operation. He trims the lateral vermilion of the prolabium as a pair of flaps based inferiorly on the mid-vermilion, which swing out like wings A and B "à la Axhausen."
Then he unrolls the inferior vermilion of the prolabium trapdoor fashion so that the entire prolabial component unfurls. The wing portions, which come from the lateral sides of the prolabium, are denuded of epithelium and fold onto each other under the central vermilion to give more body to the mid-tuber­cle area. Manchester leaves the prolabium attached to the pre­maxilla but advances the turnover mucosal flaps X and Y from the lateral elements “down-under” his central unrolled vermilion flap.

The lateral lip elements are joined in a straight line to the sides of the prolabium with the scar of union ending bilaterally in the nasal floor.

These actions provide extra mucosa to the central tubercle but do not free the prolabium, line it or bring the lateral orbicularis oris muscle fibers together behind the prolabium. This approach produces a good lip but results in a wide prolabial component with an ample but stuck-on looking central vermilion segment. The nose shows some alar flaring and a short columella with the usual depression of the nasal tip.
Manchester discounted any concern for the short columella, wide prolabium and broad cupid's bow, advising correction of the one with the other by a forked flap when the patient reached 16 years of age. Apparently he had no hesitancy in reentering his lovely lip to cut out a forked flap.

Evaluation of these shortcomings, stimulation by modifications of his method in the literature and weariness with wrestling with the secondary surgery probably led Manchester to change his plan slightly. In August 1973 he cited this case 11 months
postoperatively as representing the procedure at its present state of development.

He pointed out:

You will note that the prolabial part of the lip is narrower in her case as I am no longer preserving material for use in elongating the columella later. I no longer believe that this is the right way to lengthen the columella and we are developing other methods at present.

When challenged further he wrote back in September 1973:

I have fairly strong views about the nasal tip, for example, the timing of the repair and the method of doing so. . . . I happen to believe that the junction between the columella and the upper lip is about the only normal part of the nose and that this part of it should remain inviolate. Even in the best of hands, this part looks unattractive and to me is a real disfigurement . . . and I am concerned that infancy is not the best time to do it for a whole variety of reasons.

This is an interesting shift of focus, but there is no great problem to getting a fine final nose in adult bilateral clefts. It is the years of suffering with the flat nose during childhood that cannot continue to be ignored.

Then in November 1973 Manchester sent another nice lip but
still with wide alae, short columella, wider than normal philtrum, straight-line scars but full tubercle.

![Image](image_url)

**IMPROVING THE SCAR LINE**

T. Ray Broadbent of Salt Lake City is a giant among plastic surgeons not only in height, offices held and contributions but also in his philosophy:

We are common children of a Father in Heaven who looks at the worth of an individual soul as being of more value than anything else.

When not engrossed in his first hobby—work—he enjoys going up in the mountains and doing a little farming and working with horses, including breaking in colts to ride. Fascinated with the challenge of bilateral clefts, concerned about the lack of an upper sulcus and the tendency for a whistling deformity, and disenchanted with the Christmas tree effect of the bilateral Z, he turned to the method of Manchester. It was not long before he was modifying Manchester’s wide prolabium and straight scars with what he loosely called “a Millard scar pattern” along the rotation-advancement line with circumalar extensions and reduction of the prolabium. Broadbent and Woolf reported their results in 1972 with this modified Manchester approach, claiming a lip with satisfactory length, a cupid’s bow, a full central tubercle, an acceptable scar pattern, a free prolabium and an adequate superior labial sulcus.

Indeed they presented lovely photographic results of the lip at least at rest, and there was no question that when they used the
rotation-advancement scar line the effect was more natural. This is particularly well exemplified in one of the cases published in *Plastic and Reconstructive Surgery* in July 1972 which had a rare dimple in the prolabium and a longer than usual columella in the original deformity.

Late in 1973, upon request, Broadbent forwarded, besides the above case, some examples of his bilateral clefts, stating:

You may use any or all of these as you see fit. They will demonstrate two or three points that I would like to make:

1) The best scar . . . is the first one . . .

2) The prolabium should always be narrowed to be no longer than
6 mm. from peak to peak or three from the center to each peak of the bow. Otherwise the bow is too wide and the lip does not look normal.

3) ... The sketch that is enclosed, though the lines do not match in length, show in dotted line a wide prolabium saving everything and in the solid lines the narrowed prolabium as we would do it. Further I think the line should be curved and tucked closely to the base of the columella to keep the incision and scar out of the floor of the nose. The scar on the floor always looks like a dirty, runny nose.

A MEXICAN MANCHESTER

Another variation of the Manchester theme was described in Plastic and Reconstructive Surgery in 1973 by Micheline Viale-Gonzalez, Felipe Barreto and Fernando Ortiz-Monasterio of the Graduate Division of the School of Medicine of the Universidad Nacional Autonoma de México.

The senior author of this modification is a Franco-Italian lady with joie de vivre who began her study of medicine when her daughter started school. Thus she is prompted to say:

I am a middle aged doctor with all the anguish and ambitions of a very young one. . . . I don’t "enjoy" bilateral clefts, I only react to the challenge. They are difficult, so, I like them.

In their design these authors first unroll a V of posterior-inferior prolabium mucosa (C) in the spirit of Manchester. Cutting the lateral mucosa free from the sides of the prolabium but leaving it attached to the premaxilla forms two flaps, A’ B’ C, which are sutured to each other over the front raw area of the premaxilla and then are folded back on themselves to form lining to the prolabium and a partial labial sulcus.

The sides of these flaps are sutured to the mucosa of the lateral lip elements. The only muscle approximated is that in the lateral
vermilion flaps, which are sutured together below the prolabium just behind the inferior central V of prolabium vermilion to form an exaggerated tubercle.

This action provoked the authors' claim that "the whistling deformity belongs to the past." Yet here again a lot of fancy maneuvering has taken place without provisions for lengthening the persistently short columella. Violation of the original lip scars is justified with:

Although we agree with Millard and Broadbent that the best scar is the first one, we feel that secondary elongation of the columella is imperative in most of these patients—and a good secondary scar can be obtained with careful technique. . . . Preservation of all the prolabium skin makes elongation of the columella relatively easy by the forked flap technique, several months after closure of the lip.

**BOLSTERING THE CENTRAL VERMILION**

A variation in the principle of introducing the lateral segments behind the prolabium was devised in 1963 by Brazilian Victor Spina, a strong man of São Paulo. He seems less concerned with muscle continuity across the clefts than with bolstering the prolabium vermilion to avoid a whistling deformity. In 1966 he readvocated his approach in three stages. The first two operations, two to three months apart and completed by one year, merely transformed bilateral complete into bilateral incomplete clefts.
Then, at five to seven years of age, the closure is reopened but with maximum preservation of the lateral vermillion, which is de-epithelialized. As a matador might tuck two swords under his cape before the kill, Spina slides denuded lateral vermillion flaps side by side under the prolabium vermillion. The lateral lip elements are reattached to the sides of the prolabium.

Staging the procedure means that more operations are required and more tissue is discarded. And, in spite of all this effort, there is still the problem of the short columella and depressed nasal tip—and less tissue available now to deal with it.

In 1970 José Guerrero-Santos and Marcos Ramirez described a procedure denuding the lateral paring flap and introducing it across the cleft to bolster the prolabium tubercle. At this time they interrupted the vertical closure with a type of Tennison interdigitation and treated one side at a time.
In 1973 Guerrero-Santos wrote from Guadalajara that several years earlier he had changed to the rotation-advancement method and combined his denuded lateral flaps buried behind the prolabium vermilion.

BACK ACROSS THE BORDER

A type of bolstering of the central vermilion by lateral elements was conceived early by Thomas A. Cresswell while in Texas. Cronin, in his 1957 double cleft paper in Plastic and Reconstructive Surgery, included a diagram of Cresswell's modification which denuded the vermilion of flaps X and Z for introduction beneath the "lift up" triangle of prolabium vermilion Y. Cresswell recalls,

When I was with Tom Cronin back in 1956, Tom was interested in reviewing his cases of bilateral cleft lip repair. As his preceptee, it became a part of my assignment to assist with this review. It did not take much of a discerning eye to note that all of these bilateral cleft repairs, despite Tom's admitted technical skill, had one thing in common, namely, that the central portion of the free margin of the lip was notched, due to a lack of substance in this central portion of the vermilion. . . . At that time I suggested the procedure Tom credited me with.

A LITTLE OF BOTH

Remembering that Cresswell had shown this ability to fly on his own in bilateral clefts, I was inquisitive as to where his flights
had carried him in the 16 years since he flew from the Cronin-Brauer nest.

He was trailed to Saginaw, Michigan, and the "game" proved worth the tracking. He wrote me his unpublished thoughts in August 1973:

My subsequent reading about the lack of any form of musculature in the prolabium itself, as evidenced by electromyographic studies, coupled with the reading of information concerning the deployment of the muscle fibers in the lateral lip masses, started me thinking. As I recall, these fibers come transversely across the lip margin and extend upward to the area of the alar bases on either side, curling somewhat in this area. After seeing this particular illustration in a text which I have now long since forgotten, it occurred to me that a logical procedure would be to actually go up and cut into this lateral mass at the root and take down a rather long segment of heavy muscle fibre on each side and bring this across the mid-line under the elevated portion of the prolabium vermilion and attach it to its opposite member, overlapping them slightly to provide not only continuous musculature across the upper lip margin, but to add some fullness to this central part of the lip. . . . I have followed this procedure now for quite a number of years and have a series of cases.

A GOOD LIP

The general plan of uniting the mucosa from the lateral lip segments behind the prolabium offers several advantages. When
the tension of the closure is taken in the hidden posterior scars, the skin scars are usually superior in quality. The prolabium backed by mucosa also has a natural sulcus. This leaves an inanimate, somewhat flattened prolabium. When the muscles of the lateral elements also are joined to each other behind the prolabium, all the previous advantages are enjoyed, possibly to even a greater degree. In addition, the upper lip becomes an animated, functioning unit that can mold the premaxillary-maxillary arch effectively and will not let the central prolabium stretch out flat like saltwater taffy. Full-length vertical joining of both mucosa and muscle, it would seem, offers a sounder lip construction than is obtainable with strips of muscle or flaps of the subcutaneous tissue. There is, however, one side-effect that is a disadvantage in reverse. The columella is still short, but with the lip so soundly constructed its refusal to stretch reduces the amount of tissue available for a secondary forked flap. If a forked flap has not been banked, it must be taken out of the lip, and the resultant scars will usually be of inferior quality when compared to those following the original lip closure.

**COLUMELLA FROM NASAL FLOORS**

When the lip has been well formed, with muscle continuity from side to side and without flat unnatural spreading of the prolabium, one will have difficulty taking a flap or pair of flaps out of it. It is then that tissue from elsewhere may be of value. The medial and upward rotation of skin from the nasal floors in continuity with the alar bases can shift a limited amount of tissue into the columella. This principle was first described by Carter but perfected and popularized by Cronin. It has the advantage of not reentering the lip for nasal revision, but its effect in the severely depressed nasal tip is less than dramatic.
A severe bilateral cleft of the lip and palate in a newborn with a protruding premaxilla and a small blob of prolabium sitting out in front of the opened-out nose is indeed a horrifying sight. It transforms a baby into a monster. The shock, anguish and fear suffered by the parents are enough to inspire surgeons to transcend their greatest effort. Yet so many factors are involved and so complicated is the problem that as a student I considered it a triumph just to get the cleft closed. This was the standard approach at Boston’s Children’s Hospital in the 40’s and later with Beverly Douglas at Vanderbilt University Hospital, Nashville. By the time I began to study with Sir Harold Gillies, I had seen enough bilateral postoperative results with the nasal tip dragged into the lip to begin to take sides with the nose. The very spirit of Gillies’ clinics stimulated controversy, and, except for fundamental principles, no accepted standard was considered sacred. When Bill Holdsworth let me come on to his cleft lip and palate service, for several months in 1949, I was allowed to do whichever clefts were admitted during that time.

Among other cases, I was guided through a straight-line closure in two stages of a bilateral cleft lip with a protruding premaxilla. The resultant flat nose haunted me even more than the others because I had been directly responsible for it.
When another bilateral lip was admitted, I asked Holdsworth’s permission to approach the closure differently. Bill was a good teacher with an easy way about him and he listened to my plan and gave his blessing. I trimmed the vermilion mucosa off the prolabium, shifted it up toward the columella so that there was no pull on the nasal tip and brought the lateral lip elements together beneath it. I remember at the time being surprised at the ease of lip closure but had contemplated the possibility of a small midline Abbe flap for a philtrum later. In 1951 Holdsworth showed the case in his book with a short-term follow-up and this comment:

If the lateral elements of lip be joined in the midline, and the prolabium is set into the columella, depression of the nasal tip can be avoided, but there is a tendency for the lip to be tight and high.

I had occasion to see the little girl five years after my primary operation, and at that point a Gillies cupid’s bow procedure was used in an attempt to improve the lip. Actually, all she needed was a small Abbe flap to release the lip and create a central philtrum. Her proud nasal tip had impressed me more than was justified. As I realized later, this incomplete cleft already had some columella, which gave her a better prognosis for a near normal nose even with the prolabium incorporated into the lip.

**OFF TO KOREA**

My next couple of experiences with primary bilateral clefts represent the two extremes and occurred immediately after my arrival in Korea to join the First U.S. Marine Division early in 1954. One was with a two-month-old baby who had a severely
projecting premaxilla, was unable to suck and was dying of malnutrition. As shown in Plastic and Reconstructive Surgery, November 1955, resection of a portion of the vomer allowed incorporation of the prolabium into the lip with bilateral straight-line closure but with depression of the nasal tip. Ten days later the baby was on the breast and gaining weight!

My second severe bilateral cleft in Korea was a 10-year-old native boy with a wide cleft and a small prolabium which inspired me to use an Abbe flap.

Thus my two Korean bilateral cleft cases were at the opposite poles of surgery: premaxillary setback with straight-line lip closure and prolabium into the columella with an Abbe flap. It occurred to me even then that there must be a better way and the answer probably lay somewhere between these extremes. Nevertheless, the potential of a primary Abbe flap deserves and will get a little chapter all its own (Chapter 14).

SUBSEQUENT EVOLUTION

Back in Miami, Florida, U.S.A., starting in 1956, a two-stage rotation-advancement approach was developed in bilateral incomplete clefts, and when the original columella was of adequate length the results were quite good. After refinements such as muscle approximation, this general approach is advocated today in incomplete clefts with an adequate columella and will be described in detail in Chapter 15.

In asymmetrical bilateral clefts in which one side was complete
and the other incomplete, the rotation-advancement principle was developed also, but here again the columella was short, at least on the complete side, and so produced unsatisfactory results requiring later surgery.

In complete bilateral clefts the columella is invariably short. I began, therefore, to incorporate the secondary forked flap into the primary lip plan. First it was used as a delayed procedure several months after a one-stage straight-line closure of both clefts. When the importance of introducing lateral lip muscle and mucosa behind the prolabium was fully realized, this principle was incorporated. The addition constructed good lips which were not anxious to give up a forked flap. Thus the columella lengthening had to be postponed, and the children reappeared in the clinic year after year with shortchanged noses until I began to see these snubbed noses regularly in my sleep. Finally they pressured me into a primary forked flap, but after a modest series the subsequent observations over months and years revealed a better potential nose but a long lip in vertical dimension. When the hazards of this radical approach were matched against the advantages, the method was discontinued. It was then that a different type of delay of the forked flap was incorporated which banked it during the primary bilateral lip closure so that it could be used several months later. Again, the despised syndrome of long vertical lip length was eventually revealed, especially in the complete clefts. Thus the final plan which is used today was evolved and will be described in minute detail in Chapters 26, 27, 28, 30 and 31 for incomplete, combined incomplete and complete and complete bilateral clefts of the lip with short columella.

Before becoming involved in the detail of more standard approaches it is well to study the two extremes of primary handling of complete bilateral clefts, the adhesion and the Abbe flap.
13. The Adhesion Principle in Bilateral Clefts

The so-called lip adhesion procedure in one or two stages is a modified lip closure that will serve to pull back at least to some degree on the projecting premaxilla. According to Leo Clodius of Zurich, Simon in 1864 attached two lateral lip flaps to the prolabium to pull the premaxilla back prior to a definitive lip closure. He made the point that a "vital indication" is not to disturb the premaxilla and its future function even at the disadvantage of a less attractive early lip repair.

In fact, this seems to be the first true adhesion procedure. It was radical, to be sure, but it achieved bilateral attachment, which, after its restraining action had served its purpose, was revised to what Simon probably considered an artistic lip reconstruction.

This adhesion operation by Simon has become the basis of a fascinating controversy. While with Gillies at Rooksdon I worked with Holdsworth who referred to the residual congenital skin bridges with or without muscle that occasionally span the upper part of a lip cleft as "Simonart's" or "Simonartz" bands. Since then I have been guilty of using this term loosely. In 1976 intellectual Tom Gibson, intrigued by these terms, started an intensive search for their origin and found that Gustav Simon in his 1868 book had presented the above operation for bilateral clefts. Gibson then deduced that someone subsequently must have written about repositioning of the premaxilla by creating the transverse bands of "Simon Arzt in Rostock" which is an operative band and not a congenital one. This no doubt solves
the name origin of the fictitious Simonart’s band which I propose could now be designated *Gibson’s bridge*, not by priority but by forced default.

Bengt Johanson of Göteborg, Sweden, a modern Viking with the sagacity and canny confidence to explore unknown waters, in 1958 first used a mucosal flap adhesion to create a bed for his early primary bone grafting. By 1961 he began to realize that primary bone grafting was contraindicated but that the adhesion was possibly having a beneficial molding effect on the maxillary segments.

He and Ohlsson wrote in 1961:

> The line of incision along the lip cleft lies inside the skin and mucosal margin, in bilateral cases leaving the prolabium almost intact towards the premaxilla. This avoids troublesome scars and loss of tissue prior to a later more thorough lip closure, but secures the desired muscular influence on the upper jaw.

By 1968 he had developed his surgical plan, which at one month of age closed the hard palate by a turnover vomerine flap and created a mucosal lip adhesion and at six months closed the soft palate, leaving the definitive lip surgery until a year and a half. This is his routine today, and he feels that the early adhesion restrains the premaxilla to aid in its eventual maxillary alignment.

In 1958 I used an early, simple attachment of lateral vermilion flaps to overlap the prolabium vermilion at one month of age to bring blood supply to the prolabium. This action was in preparation for an early columella lengthening at three months. An incidental dividend of the approach was the partial retropositioning of the projecting premaxilla. In 1963 I created my first preliminary adhesion for the sole purpose of stalling closure of a wide cleft and giving time for maxillary molding. This was a high mucosal flap adhesion, described in 1964 and used selectively ever since.

In 1965 the precise and diligent Peter Randall of the University of Pennsylvania also proposed the lip adhesion as a preliminary procedure. Then in 1971, once with Hamilton and again with Graham, he presented asymmetrical bilateral clefts in which
only the completely cleft side was subjected to adhesion. This maneuver has the same sound logic as closing the worst side first for it takes a step toward symmetrizing the sides prior to the definitive closure. Finally, in 1972 Randall reported his follow-up feelings in *Plastic and Reconstructive Surgery*:

I am continuing this operation with enthusiasm. . . . It has been particularly useful in handling the protruding premaxilla in cases of complete bilateral clefts, and has made it unnecessary to use external elastic pressure or internal dental appliances in these cases.

He admits in typical honesty:

The operation does add another surgical step. Even though the procedure is carried out in tissue which is ordinarily discarded in the lip repair, some of these patients have presented appreciable scar at the time of the definitive lip repair.

This point I feel is important because actually nothing, and I mean nothing, should be discarded in such clefts, and to add scarring in order to avoid elastic traction is questionable.

Randall has begun to select his cases, which seems a wiser course:

For several years a lip adhesion was performed in this clinic as a preliminary operation on all children with complete unilateral and bilateral clefts. This does not seem to be necessary and is not being done at the present time. If the lip segments can be approximated with little difficulty, a lip adhesion is not carried out; the definitive closure is done as the primary operation. . . . In bilateral clefts only one side is done at a time.

But this makes two stages out of a simple adhesion procedure!

In 1970 Takahashi of Tokyo incorporated what he referred to as the Randall adhesion for a preliminary procedure in preparation for a forked flap bilateral cleft closure.

Meanwhile Walker, Collito and Meijer continued their C-W (Collito-Walker or close and wait) technique of simple approximation of cleft lip edges with absolutely no undermining. This type of adhesion they claimed always produced a favorable arch form which did not deteriorate. Here is an example that Meijer forwarded in 1974.
In 1971 Cronin and Penoff succinctly placed the adhesion procedure in its rightful place:

Rather than compromise a definitive lip repair by attempting to close it over a markedly protruding premaxilla, lip adhesions may be performed if adequate progress is not being made with head cap and elastic, or particularly if the infant lives at a distance, it may be done as the initial procedure.

A LOW ADHESION

K. Hollmann of the University of Vienna, in an abstract at the 1973 Copenhagen Congress, reported his use of the lip adhesion in 27 bilateral cleft cases. Anxious for early minimal soft tissue approximation because of its growth stimulation and premaxillary molding, he advocated attachment of mucosal flaps from the lateral lip elements to the inferior vermilion of the prolabium at one week of age.

His action and timing are very similar to what I used in my first 1958 adhesion in a bilateral cleft. The only difference is that he tucks the lateral flaps under the prolabium vermilion instead of overlapping them. This is a step I have long since abandoned but it still may have value in the very small prolabium.
A HIGH ADHESION

Another type of preliminary adhesion that originated in northern Yugoslavia does not actually involve the lip but accomplishes some of the same goals possibly in a better way. Professor Franc Celesnik, trained by Costecka in Prague and Trauner in Gras, became Director of the Maxillo-Facial Clinic of the Medical Faculty of the University of Ljubljana, Yugoslavia, and organized a cleft palate center there. In 1962 Celesnik described a two-stage procedure for bilateral clefts with the first stage serving as a type of adhesion procedure. In the first operation the bilateral total cleft lip was transformed into a bilateral partial cleft lip by closing the floor of the nose on both sides.

In the second operation three months later, the definitive lip closure was accomplished on both sides by the straight-line Veau technique.

In September 1973, the very month of Professor Celesnik's untimely death, Zvone Zajdela of the Medical Faculty of Ljubljana published "Celesnik Procedure in the Surgical Treatment of Bilateral Complete Clefts" on 55 cases from 1957 to 1972. At four months of age the alveolar clefts were closed bilaterally, the floor of the nostril was formed and the upper fourth of the lip was closed.

The nostrils are fixed on both sides with a muscle flap, taken from the soft tissues of the cheek and fastened through the nasal septum as suggested by
Trauner . . . and Celesnik . . . for the unilateral cleft. The reconstructed floor of the nostril is then covered from the lower side with a flap from the buccal mucosa as described by Burian . . . . The advantages of this method are the following: pressure on the base of the premaxilla is created, repositioning the premaxilla dorsally, the development of the prolabium is better and symmetry on both sides is achieved with greater ease with an orthodontic appliance, shifting of the premaxilla downward is prevented and secondly, the expansion of the lateral segments of the upper jaw is ensured.

Under this regimen, the remaining lip cleft receives a Veau closure at least six months after the first stage, the soft palate is approximated at one year, the columella is lengthened at three to five years and the hard palate is closed at six to seven years.

A CELESNIK DISCIPLE

Another Celesnik contribution to clefts was the training of Yugoslavian Milivoj Perko, who claims to be his oldest student and is now chairman of the team for Congenital Jaw and Face Deformities in Infancy at the Oral Surgery Institute of the University of Zurich. At the International Cleft Palate Congress in Copenhagen in 1973, Perko and Margaret Hotz presented their conclusions after six years of combined management of bilateral clefts. Hotz is a remarkable combination of pediatrician, orthodontist, prosthodontist and speech pathologist. She swings into action first with preoperative orthodontic plates (with or without expansion screws), relying on natural growth to get approximation and alignment of the three segments. As Hotz explains:

Extraoral traction is not used to retrude the premaxilla in the first place, but to prevent it from developing any further. Widening of the lateral segments is necessary because of rapid growth of the lower jaw during the first six months. Our aim is to keep the upper arch wide enough to encompass the mandible. Postoperative retention and control are necessary in order to maintain normal jaw relationship.

Then at about six months of age Perko executes a Celesnik I closure of the anterior nasal floors bilaterally. He claims these advantages:

1. Tilting of the premaxilla does not occur, as it will be pushed backward bodily.
2. Growth of the prolabium occurs more rapidly after repair of the nasal floor.
3. The premaxilla will be fixed in a midline position which facilitates symmetric closure of the lip.

Yet during the Copenhagen Congress Perko admitted to me informally that he was beginning to doubt the true value of the early nasal floor adhesion of Celesnik. He expressed some concern over possible effects on growth even with this limited surgery and suggested it might be unnecessary when orthodontic manipulation by his team of Hotz and Wanda Gnoinski was proving to be so effective.

Two to three months after the nasal floor adhesion, Perko carries out what he refers to as Celesnik II stage but which is the definitive lip closure. In Perko’s hands it is actually a Veau or Manchester procedure postponing release of the nasal tip. As he says,

I prefer to perform the columella plasty later on, using your forked flap.

It is my “gut” feeling that the adhesion principle in bilateral clefts is a procrastination which is justified only if the surgeon is inexperienced, timid or without orthodontic assistance or when the premaxilla protrudes persistently and in spite of preliminary traction beyond a reasonable point for definitive closure. It seems wiser to manipulate the premaxilla element with prosthodontic and external pressures than to add further operations in preparation for a final lip closure. The adhesion will not put the kind of restraint on the premaxilla that a muscle-to-muscle closure from the lateral elements under the prolabium over the premaxilla can exert. Therefore, if it is relatively easy to get muscle-to-muscle closure, it will be more effective anyway. Bypassing this mincing step saves some tissue and avoids scarring.

A TINY EXCEPTION

When the prolabium is truly diminutive, early adhesive attachment of its sides to the lateral lip elements with mucosal flaps may be indicated. They will stretch it into a more than respectable philtrum, thus creating forked flap material and at the same time restraining the premaxilla.
AN ADHESION POLL

Resident John Osborn of Toledo in June 1974 completed a survey of 80 residency training programs in the U.S.A. and Canada. The response to the use of lip adhesions for either unilateral or bilateral clefts was affirmative in 27 (34 percent). The affirmative response is likely to increase over the next few years.
At the very end of the nineteenth century Robert Abbe switched a full-thickness flap from the lower to the upper lip in a secondary bilateral cleft and became immortal among plastic surgeons. He did not propose that his flap be used as a primary procedure and probably would shudder at the thought. Nevertheless, on rare occasions this action may be justified.

My first primary Abbe flap was carried out on Kim Moo Uy, a 10-year-old Korean boy with a severe bilateral cleft of the lip and palate. Early treatment by a marine dental lieutenant had inadvertently lost the premaxilla. As the palate gap was so large, this aspect was treated first. Then, in the fall of 1954, the diminutive prolabium was shifted into the columella position and a small shield-shaped primary Abbe flap was switched to create a natural philtrum for his upper lip. This was probably one of the first primary Abbe flaps ever used in bilateral lip clefts.

Gillies had previously discussed with me the possibilities of a primary Abbe flap, but up to 1953 no primary flaps had been done as far as I know.
A DELAYED PRIMARY LIP-SWITCH FLAP

A delayed primary Abbe flap had been used by Rainsford Mowlem of London in an infant from Egypt with a severe bilateral cleft and a diminutive prolabium. In his typical no-nonsense approach, he had left the inadequate prolabium dangling from the tip of the nose and closed the lip elements beneath it. This procedure avoided dragging the nose into the lip in “this little Naomi from the rushes of the Nile,” and at 10 months the lip was released and the defect filled with an Abbe flap as a delayed primary action. The case was published in The Principles and Art of Plastic Surgery, 1957, by Gillies and Millard.

Pioneer work like this points to the loss suffered by cleft surgery when Mowlem, in his prime, turned over his flaps to Dawson, packed up and exiled himself to Spain. Here, it is reported, he sits in the shade of his villa overlooking his estate while an attendant named Jesus rides an ass up and down his groves collecting baskets of oranges and lemons.

INSERTED INTO THE PROLABIUM

Patrick Clarkson trained with Gillies at Rooksdown House during the war and served as plastic surgeon to the fractured faces and limbs of the British forces in the Italian campaign. He returned to Guy’s Hospital in London but contributed a day a week at Rooksdown House. His mumbled humor, his suave
manner and the ever present carnation in his lapel were a success at Harley Street. He was bold without caution on the road, at a party or in the operating theater.

In 1955 Clarkson stated:

Sir Harold Gillies tells me that primary Abbe flaps have been done in his service on occasions before. This note is simply to report the start of another investigation into the value of this flap. I have done two of these primary Abbe flaps at Guy's Hospital towards the end of the first month of the child's life. I repeat the view that it is undesirable to delay unduly the primary lip repair whether it be a simple or double cleft. . . . To my mind the crux of the deformity seen in severe double clefts of the lip and palate is that there is a deficiency of both soft and hard tissues. Current methods of repair from adjacent tissues give a high percentage of very unsatisfactory results—with flat, tight upper lips and collapsed upper alveolar arches.

Interestingly, Clarkson did not even mention the short columella and depressed nasal tip. It is possible that, although his own nose had been flattened in boxing, his successful early days as a dashing gentleman among the ladies caused him to have little concern over any flat nose. He switched the lower lip Abbe flap into a split in the prolabium without using this prolabial tissue to help the columella. Evidently he was more concerned about breathing during the time of flap attachment:

I have done this operation under local analgesia supported by an ounce of port wine. Because of the potential difficulty to breathing which attachment of the flap to both sides of the cleft at one stage might cause, I have attached one side at a time—doing the second side about a week or ten days after the first. The base of the flap I have cut at about three weeks.
It would seem to me that Clarkson stopped short of his potential. At least he did have the possibility of lengthening the columella with a forked flap of the entire prolabium at a later stage, as he already had lengthened his Abbe "philtrum" in the lip. In fact, this might be the treatment of choice now for the surgeon attending these two cases. The patients would be about 19 years old today and probably still have flat nasal tips if no further surgery has been done.

**FULL CENTER OF LIP**

Ten years later, in 1966, Bombay's Noshia Antia, one of Gillies' favorite students and a leprosy expert, reported 10 cases of primary Abbe flaps in bilateral clefts in the *British Journal of Plastic Surgery* and showed one beautiful result. In his high, cultured voice he postulated:

A stage must invariably come when the tissue available in the prolabium, columella, and the lateral elements is just not enough to produce an adequate lip or a columella and often both. No amount of tissue juggling can produce an adequate result. . . . It is evident that the prolabial element is not truly a part of the upper lip but is the displaced upper half of the columella which is tethered to the premaxilla. The lower half of the columella and the central half of the upper lip are totally missing. Even the most economic use of local tissue cannot adequately repair this upper lip and an Abbe flap represents an excellent solution to this problem.

Antia commented on what others have feared:

The only justifiable argument against a primary Abbe flap . . . is scarring of the lower lip and possible danger of such an operation to the life of the patient when it is carried out at an early age. Although the majority of the patients operated in this series have been over one year of age, in my experience this operation should not carry any greater risk . . . provided that adequate pre-operative and post-operative precautions are taken. The services of a skilled anesthetist who is aware of endotracheal intubation, fixation of the tube, and adequate airway in the immediate post-operative phase are absolutely essential for the success of this operation.

Antia closed the anterior palate and then took a central Abbe flap a little over half the width of the upper lip defect and long enough to assist the columella if necessary. He noted that during the flap attachment,
contrary to what one might think, feeding is not a problem.

**Dutch Abbe**

In 1967 at the Rome International Congress, Cornelius A. Honig, of the University Hospital, Utrecht, The Netherlands, presented some interesting primary Abbe flaps in bilateral cleft cases. The blond Honig, who recalls,

In good winters one could skate on ice from one town to another,

fits my image of *Hans Brinker and the Silver Skates*. This was his logic in relation to primary Abbe flaps in bilateral clefts:

In clefts of the primary and secondary palate, the primary deficiency will be clearly visible in the result, principally in the volume of the upper lip in proportion to the rest of the face and in the length of the columella. The extreme shortness of the columella produces the typical nasal deformity with the tip of the nose pulled downwards to the upper lip. . . . In the past five years we have modified our technique in these cases and we use the skin from the prolabium to lengthen the columella, and we close the defect in the upper lip with an Abbe transposition flap.

In 1973 Honig, living on a small farm with a delightful two-acre pond full of fish, wrote me his latest thoughts:

My present view on facial clefts is that treatment should depend on the extent of the tissue defect in each case. Unfortunately there is no method by which one can measure the extent of the defect, so one can only give an inadequate estimation. In some cases we still do a primary Abbe flap for bilateral cleft lips.

**South of the Border Abbe**

Reasoning that an untreated prolabium and columella in an adult maintain the same proportions with the facial features as exist at birth, or "once short, always short," pressured Micheline Vialle-Gonzalez and Fernando Ortiz-Monasterio of Mexico City into Abbe action in 1970. When the columella and prolabium are both short, they shift the prolabium into the columella and use a primary Abbe flap for the lip defect. This maneuver, of course, ignores the well-known fact that attaching the lateral lip segments to the prolabium starts a stretching exercise that soon presents plenty of prolabium for both lip and nose.
KEY TO CODE ON CASES

CL  = cleft lip
CP  = cleft palate
B.D. = birth date
F.H. = family history
F.T. = first trimester
O.C.A. = other congenital anomalies
R-A = rotation-advancement
H.P. = hard palate
S.P. = soft palate
F.F. = forked flap

A cleft is indicated by stippling, a submucous cleft or submucous distortion by horizontal lines.

MY SPECIFIC BILATERAL CL STATISTICS

Out of 52 personal primary bilateral clefts of the lip chosen (about 98 percent consecutively) for presentation in the various chapters of this book, there are 11 incomplete on both sides, 9 asymmetrical with one side complete, and 32 complete on both sides.

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<th>Incomplete (11)</th>
<th>Asymmetrical (9)</th>
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Of the 52 total, 71 percent are male and 29 percent female; 9.6 percent have O.C.A. and 86.5 percent have associated CP. Of the 52, a family history was obtained in 40, and of these, 25 percent have F.H. of clefts and 17.5 percent have an incident in the F.T.

Bilateral incomplete CL cases have 72 percent associated CP while asymmetrical CL cases have 88.2 percent associated CP, and complete CL cases have 90.6 percent associated CP.
15. Adaptation of the Rotation-Advancement Principle in Bilateral Incomplete Clefts

When the rotation-advancement principle was being developed in unilateral clefts in Korea, it did not occur to me that the same principle might be of value in bilateral clefts because there was no vestige of a cupid's bow. Once the method caught on in unilateral clefts, surgeons began to ask about its application in the bilateral problem and I turned my attention to the possibility. This is its evolution.

My original adaptation of rotation-advancement in bilateral incomplete clefts included a design lengthening the short prolabium. In 1960 in Surgery, Gynecology and Obstetrics I wrote:

In bilateral incomplete clefts the columella is usually of adequate length and the nasal tip is in normal position. The discrepancy in vertical frontonasal length lies in the shortness of the prolabium. . . . A logical approach would seem to be division of the short prolabium from the normal nose component so that it can be moved down into the natural philtrum position in the lip. Maintenance of this correction can be achieved by advancement of lateral lip flaps into the gap between columella and prolabium.

In Four Stages

The first incomplete bilateral cleft case in which the rotation-advancement principle was used was published in the Transactions of the 2nd International Congress of Plastic Surgery. It was not ideal

| B.D. | 11-11-56 |
| F.H. | No clefts |
| F.T. | Uneventful |
| O.C.A. | None |
as the columella was moderately short. Being experimental, the surgery was staged conservatively in multiple steps.

On November 27, 1956, the lateral vermilion flaps were used to overlap the turndown flap of inferior prolabium vermilion. This procedure created the effect of a cupid's bow and ensured a tubercle but, as I wrote in my operative note at the time, it was most important to give a blood supply to the prolabium for later work.

Evidently I had some concern about the vascularity of the prolabium if it were cut completely off from the nose by bilateral rotation-advancement incisions.

Two months later a right-sided rotation-advancement procedure was carried out, and five and a half months later the left side was treated identically.

As could be predicted, the nasal tip continued to be flat and the alae wide so that on March 12, 1959, a modified forked flap lengthened the columella moderately and reduced the alar flare.
REDUCED TO TWO STAGES

In a case published in Surgery, Gynecology and Obstetrics, November 1960, the columella was closer to normal length so the patient was a more nearly ideal candidate for bilateral rotation-advancement. Since the separate primary stage of overlap of lateral vermilion flaps over the inferior prolabium vermilion was no longer considered necessary, at least in incomplete clefts, this aspect was incorporated in each rotation-advancement maneuver. The closing of one side at a time reduced the bilateral closure to two stages.

At three months of age a right lateral vermilion flap was used to overlap the turndown flap of the right half of the prolabium vermilion. A triangular wedge was excised from the nasal floor
Several minor revisions were subsequently carried out including deep tissue excision from the center of the prolabium and insertion of a dimple stitch which was more impressive early in the postoperative period than after a few years. As was predicted, the columella is almost long enough.

Two months later the left side was rotated and advanced in the same manner except that excision of the traumatic scar area made it necessary for the left advancement flap to cross the midline, introducing more tissue than was ideal above the prolabium. This discrepancy was reflected in the later development of this lip.
At the International Congress in London in 1959 I suggested that the rotation-advancement principle was applicable in bilateral clefts of the lip:

Yet placement of normal tissue in normal position does not pertain to the cupid’s bow in as much as bilateral clefts have no residual bow. The normal element rather is the prolabium which belongs in the center of the lip as a philtrum and can be kept there by the same rotation type incisions. . . . The key factor in the approach to the bilateral cleft lip closure is the original length of the columella. In bilateral incomplete clefts, the columella is usually of adequate length while the prolabium is diminutive.

Thus:

Lateral triangular lip flaps can be advanced across the cleft, one side at a time, until they touch tip to tip above the prolabium and in fact completely separate the columella from the prolabium.

The turndown of each lateral lip vermilion to overlap one-half of the turndown flap of prolabium vermilion was suggested to preserve but hide the questionable prolabial vermilion and at the same time create some semblance of a cupid’s bow.

This adaptation of the rotation-advancement principle offered certain advantages. The prolabium was maintained and shaped as a natural philtrum, advancement of the lateral elements reduced the alar flare and the scars of union were placed along philtrum column positions. However, complete division of the prolabium from the columella and introduction of lateral lip tissue between them added unwanted vertical length to the prolabium. Vigorous muscle tugging on the prolabial “bobbin,” which had been cut free from its mooring, eventually was responsible for excessive vertical upper lip length. Even in incomplete bilateral cases the columella, although not so drastically short, invariably will be found to have some inherent shortness. The transverse division of prolabium from columella theoretically burned any bridges to a secondary forked flap. Actually it was found that a forked flap with the aid of a surgical delay can be taken across scar lines as well as along them. Here is a case to prove it.
FIRST CASE OF ASYMMETRICAL CLEFT CLOSED IN THREE STAGES

An asymmetrical and difficult case came to me in 1958, and the early results were published in the Transactions of the 2nd International Congress of Plastic Surgery. Even though the columella was short on one side, the rotation-advancement design was planned. Closure of the complete and worse cleft side first was logical.

1. It maintains blood supply from the incomplete bridge.
2. Cleft closure gives molding to the wayward premaxilla on the complete cleft side.
3. When there is a deviation of the premaxilla, it usually leans away from the widest cleft, and by closure of this one first, the premaxilla is pulled toward the midline, correcting the deviation and bringing some symmetry to the maxillary arch components.

When the columella in the original deformity is short, it will eventually require lengthening. In this case a forked flap was fashioned finally.

Here was an asymmetrical cleft with one side complete so the precaution was taken to attach lateral vermilion blood supply to the inferior probrium. Later this safety measure was found unnecessary. At three months of age a first-stage procedure was done in which vermilion flaps from the cleft edge of the lateral lip elements were used to overlap the turndown of probrium vermilion.
10-23-58
Lateral vermilion flaps overlapped prolabium vermilion.

One and a half months later the more severe cleft was rotated and advanced and flap c was used in the nostril sill.

Two weeks later the right incomplete cleft side was rotated and advanced with a wedge resection of the nostril floor.

At two and one-half years of age a forked flap was used to lengthen the short columella.
One week later the little patient was thrown to the floor of the car while his parents were driving home to North Carolina and the forked flap was disrupted. The baby was brought back to Miami, and the flaps were resutured. Then in 1963 at St. Joseph’s Hospital, Asheville, North Carolina, the forked flap was modified to improve the columella and shorten the lip. A photo was sent from North Carolina dated January 10, 1964, at age five years.

Then in 1975, another follow-up photo revealed the excellent development of this young man at 17 years. He was recalled in 1976 and had both secondary nasal and labial corrections. The skin scars were excised and lateral muscles joined across the midline under the prolabium. Corrective rhinoplasty included hump removal, septal shortening, alar cartilage reduction with lift on the cleft side, submucous resection, and septal cartilage strut grafts into the columella for tip and alar support.

**ANOTHER ASYMMETRICAL CLEFT CLOSED IN TWO STAGES**

A baby born in the Bahama Islands had bilateral clefts, incomplete left, complete right, shorter columella on the right with
moderate protrusion and outward rotation of the premaxilla also on the right.

At two and one-half months of age, the right complete cleft was rotated and advanced and the lateral vermilion flaps were used to overlap the right half of the inferior prolabium vermilion. Closing the complete cleft side first made it possible to preserve the bridge blood supply from the incomplete cleft, and once it was closed, there could be molding of the rotated premaxilla.

One and a half months later the left incomplete side was rotated and advanced and vermilion was overlapped to complete the closure.

Comment. Short fork will be necessary eventually.
This example reveals the method’s ability to fashion the prolabium to philtrum shape but also proves that any shortness in the columella persists and eventually will require surgical correction.

AND ANOTHER

Rotation-advancement closure of the incomplete cleft was done on the left, and minor revision of the vermilion notch and mucocutaneous discrepancy was made on the right.

Lip revision and closure of the palate cleft were carried out with pushback and island flap.

Last seen by Frederick Remark, at four and a half years of age this little girl required vermilion revision and hearing evaluation.
In 1974 Miroslav Fara of Charles University, Prague, visited Miami. During our many enlightening discussions he mentioned that he had used the rotation-advancement principle in bilateral clefts but had interdigitated the tips of the advancement flaps one on top of the other across the midline in an attempt to get some muscle across the cleft. As would be expected, he soon found the vertical length of his lips after this was far too long!

A CONCLUSION

As experience increased, it was realized that at least a narrow bridge of original connection between prolabium and columella base should be maintained at least during the early years and the lateral flaps not advanced quite tip to tip. In other words, most prolabiums are long enough or will be, even though they may appear short at first. If at five years the columella must be lengthened, then it is probably safe to go ahead with the forked flap.

BILATERAL R-A REDUCED TO ONE STAGE

A symmetrical bilateral incomplete cleft with columella of only slight shortness presents the best type of case for rotation-advancement. At this time the lateral lip mucosa and muscles were not being joined routinely behind the freed prolabium. Thus it was possible to complete the bilateral rotation-advancement by not dividing completely through the prolabium join with the columella base, and one of the important improvements in this approach was realized. Maintaining some original attachment between columella and prolabium prevented the unnatural early vertical stretching of this upper lip. As would be expected, this lip has developed well during the years of growth.
Because of the incompleteness of the cleft there was little lateral vermilion available for overlapping the prolabium. Thus, the lateral vermilion flaps were extended up posteriorly and vertically along the lateral side of the cleft to pick up extra length and, as seen, adequate vermilion was obtained.
Beware the Hybrid

Here is an example of an incomplete bilateral cleft lip treated by what might be loosely called a rotation-advancement approach. The shortcomings of this result are not the fault of the method but are due to the failure of correct execution. The lateral advancement flaps join above the prolabium over too great a distance, giving a stuck-on appearance and preventing the prolabium from imitating a philtrum. The prolabium vermilion has been retained in visible position, resulting in an uncraftsmanlike free border with a whistling deformity. Revision is difficult.

A Selective Gain

Meanwhile, the pure rotation-advancement method, having caught on in unilateral clefts and having been proposed for certain bilateral cases, was gradually gaining selective popularity even in the camps of the opposition.

In 1971 from Houston, Texas, Thomas Cronin with James Penoff agreed with limited use of the rotation-advancement and reported having done 7 out of 71 bilateral clefts. They wrote an honest appraisal:

The Millard rotation-advancement was used exclusively for the incomplete cleft with very small prolabium. The prolabium was rotated downward in two stages to fit the lateral segments and the prolabial vermilion was augmented with a vermilion muscle flap from the lateral lip segment. . . . Six to eight weeks should elapse between stages to allow for recovery. . . . Care should be taken to avoid advancement flaps as this tends to result in a long lip vertically.

In 1974 Cronin forwarded to me this lovely example of his bilateral incomplete cleft, which, as he said,

has been corrected by a rotation-advancement (Millard) repair.

The case was presented in Boston during the 1970 Kazanjian honorary lecture and in 1971 was published in the Cleft Palate Journal.
Ray Broadbent and Robert Woolf of Salt Lake City gave their evaluation in 1972:

A bilateral repair with Millard's design, done simultaneously, seemed far too precarious for the central prolabium. There were, however, theoretical and actual advantages to this type of repair—but for safety, we staged it one side at a time. A better scar pattern on the lip resulted, and these scars could be placed out of the mid-nasal floors. This positional change, with a flap threaded across each nasal floor, went a long way toward avoiding the grooved nostrils and their persistent "dirty nose" appearance. The flat nose was somewhat improved, but still flat. However, these changes constituted improvement—but the prolabium remained attached to the premaxilla, and it was associated with an inadequate labial sulcus and a deficient central tubercle.

They did end with:

A Millard design could be used when the operator thinks the lip should be closed one side at a time.

Of course, the rotation-advancement method was not designed originally as a one-stage procedure anyway. The present redesign makes this possible and at the same time corrects all of Broadbent's objections except the flat nose. The pure rotation-advancement method has never been and still is not advocated for patients with a short columella. Yet in too many instances the principle was being used without selection even when the columella was very short. As noted, I had been through this phase and
discontinued indiscriminate use of pure rotation-advancement about 1965. Yet the trend continued, and evidence of it has come to my attention from time to time. As Bruce Williams wrote in 1973:

If the cleft is not wide or is incomplete, a bilateral rotation advancement is done at the first operation.

Having thus painted himself into a corner, the surgeon is forced into one of three undesirable choices: be content with a columella short of normal, return to the lip for adequate tissue or advance the nasal floors and alar bases for a slight gain. Consequently too many nasal tips were remaining depressed.

A 1968 paper by Tabuya Onizuka, then of the Department of Plastic Surgery, Central Hospital of the National Railway Company, Japan, is of interest. Onizuka stated that in addition to the merits he had previously noted with Millard’s method for unilateral clefts there were the following advantages in bilateral clefts, which evidently tempted him to use it even in the presence of a short columella:

1. Upper lip is pouting.
2. The “form” of the upper lip is near normal.
3. Cupid’s bow is easily reconstituted.

He compared the results with other methods, presenting actual cases to prove his deductions.

1. *Straight-line closure* produces results in which the upper lip is tight, the lower lip protrudes and the V-shaped scar is opposite to that of the normal philtrum.

2. *Triangular method* may be able to get pout, but there is a tendency for concavity in the mid-portion of the upper lip, there is bulging under the columella and the scars are ugly and complicated.


As was predicted, and as would be expected, Onizuka noted certain difficulties he encountered, most prominent of which were in the nasal area.
1. It is difficult to get a beautiful nose without a second operation.
2. Doing two operations on the nostril floor tends to cause hypertrophic scars in this region.
3. In young children the base of the columella slides down with growth.
4. The upper lip has a tendency to appear relatively long as a result of narrowing the alar portion of the nose.

**TIMING**

Onizuka's plan of surgery closes the bilateral cleft in two stages at three and six months because the premaxilla blood supply is safer, complications are less and, after first-stage improvement, the form of the side operated on can be observed.

Onizuka finds the columella too short after this first-stage procedure. He sometimes uses what he calls Millard's intermediate skin flap (flap c or one fork) which is transferred to the columella base by the transposition of Skoog. Unfortunately, all incisions gather in the nostril floor making suture difficult and sometimes resulting in delayed healing and hypertrophic scarring.

It is possible that this modification of columella lengthening may be sufficient for the Oriental nose.

**HIRSHOWITZ**

Gentlemanly Bernard Hirshowitz of Abba Khoushi School of Medicine, Haifa, was trained by Jack Penn in Johannesburg and in 1951 joined a team led by Penn to provide plastic surgical treatment in the newly established state of Israel. In 1952 Hirshowitz set up a plastic surgery service at Rambam Government Hospital, Haifa, which treated the wounded soldiers during three Arab-Israeli wars. In between hostilities he established the S.E.D. cleft palate center at this hospital. Pleased with the adaptation of the rotation-advancement principle in bilateral clefts, he developed his rendition in two stages. In the 1973 Copenhagen Congress abstracts he described two modifications that employ
the cleft edge mucosa. The vermilion of the lateral edge of the prolabium is cut as a flap based on the premaxilla, which is folded medially under the elevated prolabium over the raw front surface of the premaxilla to form half a sulcus. He claimed:

The under surface of the prolabium is initially unlined but re-epithelialization rapidly restores its mucous membrane surface. Almost no ensuing untoward effects by scarring follow this method.

The vermilion of the cleft edge of the lateral lip element is cut as an inverted V flap which is inserted into the deficient inferior prolabium vermilion leaving the intact vermilion skin border of the prolabium undisturbed. Hirshowitz summarized:

The curved medial skin incisions correspond to the philtrum lines, the rolled vermilion border is intact, the vermilion itself is full, and the nostril bases are rotated inwards. A short upper lip is ensured by not joining the two rotation-advancement incisions across the midline at the columella base.

Yet he must return into the lip later for, as he wrote,

Ample tissue enables columella advancement to be subsequently performed.

M E R V I L L E

Maxillofacial surgeon L. C. Merville of Foch Hospital, Paris, comprehends the importance of the columella in planning rotation-advancement. He wrote in 1971:

Millard technique—the operation is done differently according to the degree of the cleft: incomplete or complete, according to the degree of hypoplasia of the columella.

A D E Y I N S Y D N E Y

Another surgeon who understands this columella aspect is David Dey of the Royal North Shore Hospital, Sydney. He trained primarily as a pediatric surgeon at Great Ormond Street, London, but exposure to Mowlem, Matthews and even Denis Browne caused him to become infatuated with plastic surgery. One cleft is born a day in Australia, and Dey gets one-quarter of the total. Evidently a percentage of his 90 clefts a year have a prolabium
with vertical shortness which is slightly more than one-third of the height of the lateral elements. Thus in a paper for the *Australian-New Zealand Journal of Surgery* in 1973, entitled “An Important Contribution of the Millard Flap to Cleft Lip Surgery,” he argued:

It has been stated on numerous occasions that the central “prolabia” element grows in a remarkable fashion following closure of lip clefts, particularly if it is freed posteriorly from the “premaxilla” and a gingivolabial sulcus established. . . . However, I have yet to see this expectation realized to an acceptable degree in these incomplete clefts following a simple-type closure, and the children all tend to be left with an upper lip in which the lateral elements sweep upwards and inwards in an unnatural fashion.

In 1968 Dey turned to the rotation-advancement principle to lengthen the short prolabium and, being a perfectionist, ran the gamut that I stumbled through, including the primary forked flap (without the forks) isolating the prolabium solely on the premaxillary blood supply. He suffered as, he said:

The isolated segment of prolabial tissue was alarmingly blue for two or three days, but eventually recovered completely without tissue loss and the final outcome proved satisfactory.

This scare caused Dey to turn to two stages, which in turn enabled him to slide lateral vermilion behind the prolabium for half a sulcus at each stage. He explained the details of his technique:

The medial curved Millard incision is then inked in, conserving skin by a wide sweep and reaching the midpoint of the columella where the latter joins the lip. It does not transgress the midline at this point, and is carried downwards directly for a short distance to allow the lip to lengthen to the proper degree. . . . A wedge of skin is removed from the nasal floor. . . . The red edge of the prolabium is retained and turned forward, reinforced by the red skin from the lateral lip.

In November 1973, when forwarding requested bilateral incomplete cleft cases to me, Dey added:

This procedure does seem to deal adequately with the uncommon bilateral incomplete cleft with a short prolabium. I personally find a lip with the two
lateral lip lines running upwards very ugly—and this was all too common before I read your article!

His results appear quite good, and except for his keeping prolabium vermilion visible the method checks out. This retention of the Manchester vermilion roll-out principle can perhaps be attributed to a loyalty to his friend and neighbor "down under."

In 1974 Raymond Brauer admitted almost painfully:

To fit the longer vertical length of the lateral segments into the short prolabium, it is sometimes necessary to use the downwards rotational principle as recommended by Millard.

Over the years I have become less concerned with the need to lengthen a short prolabium. Most prolabiums are of sufficient length particularly when it is realized that the normal lip at rest should expose the lower one-fourth of the upper incisors. Often it is better to shorten the lateral segments and there are ways of using this extra tissue that will be described later.

In 1964 Cronin acknowledged his preference:

If the lateral lip segment is too long, a wedge consisting of the full thickness of the lip is removed.

Then too, early division of the prolabium from the nose tends to produce a lip that is abnormally long in the vertical axis, and this
can be worrying. There is, however, a rare prolabium that deserves help. This fact is emphasized by two cases at the end of Chapter 26 where a short prolabium was rendered normal vertical length merely by introducing lateral mucosa and muscles behind it and lateral vermilion-mucocutaneous ridge flaps over its inferior vermilion.

**A MEXICAN MODIFICATION**

A variation in the design has been developed by José Guerrero-Santos, who wrote from Guadalajara in 1973:

The Tennison procedure was abandoned by us several years ago, and as a rule in most of the cases, both my associates and my residents as well as myself are using the rotation-advancement technique.

When the lip is very wide, close one side; usually, if it is asymmetrical, the less-wide cleft, trying to change the lip into a unilateral cleft; and for the second stage we close it with the rotation-advancement method, combining it with the denuded and buried flaps.

I elongate the columella after the first year, and I do the incomplete clefts like the complete ones, using rotation-advancement combined with a denuded flap.

**MODIFYING THE ADVANCEMENT**

In 1958 in the *American Journal of Surgery* while discussing primary rotation-advancement in bilateral clefts I noted a possible modification in the advancement flap for severe clefts.
In extremely wide bilateral clefts the lateral triangular flaps are sometimes better transposed from a vertical position along the cleft to a horizontal position between columella and prolabium.

Actually this variation was never used because as experience progressed the smooth flow of pure rotation and advancement offered more natural action and scars than an abrupt transposition.

W Y N N

In 1960 Sidney Wynn of Milwaukee presented his vertical flap taken from the lateral lip element and transposed across the cleft high in the medial lip near the columella base. He also adapted this principle to bilateral clefts, accomplishing primary closure in two stages.

Of course, there are the advantages of high medial release and lateral advancement, but the kink of a 90-degree transposition not only leaves a pig’s-ear in its wake but results in a square philtrum and fails to achieve the natural curved effect of the true rotation-advancement action and scar placement. Like the rotation-advancement, transposition, by introducing tissue well below the columella, tends to lengthen the prolabium rather than the columella.

T H E  S T A N D A R D  T W O - S T A G E

In 1968, for Grabb and Smith, I described what in my opinion is the best two-stage method of closing an incomplete bilateral cleft, but only if the columella is definitely of normal length. Two important changes in the original design were added: (1) Muscle and mucosa were introduced behind the prolabium a la Meyer-
Schultz, but in stages, in the manner of Bauer, Trusler and Tondra. (2) Prolabium-to-columella continuity was not divided completely, for the lateral flaps do not meet each other across the lip, maintaining the original vertical length in the midline.

ONE STAGE IS PREFERABLE

If, during bilateral cleft lip closure, tension can be controlled and adequate blood supply preserved, one stage is better than two because of the merits—economy of time, facilitation of surgery and maintenance of symmetry. Much effort is warranted to develop a one-stage procedure, but it must be fundamentally sound.

A one-stage rotation-advancement for a bilateral incomplete cleft was presented in my Chapter 20 in Cleft Lip and Palate, edited by Grabb, Rosenstein and Bzoch. Here a procedure was diagramed which in general has possibilities, but the specific rendition suffered a touch of surrealism. The skilled artist Fred Harwin was given the unenviable task of improving drawings submitted to him. My failure to police this work resulted in
sketches that revealed artistic excellence but plastic fantasy. It was my responsibility to spot faults prior to publication but only when writing the present chapter did I actually focus on these discrepancies, and I now hasten to warn the inexperienced.

The first mistake, which is also made by many surgeons, was to use a rotation-advancement approach when the columella is short. The second was to treat the lateral prolabium as excess to be discarded when the columella is so short. This is throwing away a "forked flap," but then surgeons are guilty of the same mistake. The third had to do with vascularity. In a procedure that introduces lateral lip muscle and mucosa behind the prolabium across the premaxillary vascularity, it is hazardous to advance the lateral skin flaps almost across the remaining prolabium blood supply at the base of the columella. To have these flaps come within 2 to 3 mm. of tip to tip in one stage produces a vascular "cliff-hanger." Harwin did recover by drawing the stitched stage with an adequate base at the columella. Finally, his last stitched sketch places the circumalar scars too far down in the lip and portrays a convex prolabium turned into a philtrum dimple without the stitch to do it.

The general rotation-advancement principle is applicable in all bilateral clefts but its application in pure form should be limited to incomplete clefts with adequate columella. This is an exceedingly rare occurrence. Certain bilateral incomplete clefts, however, do have a columella that is only slightly short. These can be closed by the pure rotation-advancement with the bilateral refinements in one stage and subsequently have the columella elongated slightly by the Carter-Cronin principle if necessary.

Here is the modern design for this special group of cases after an evolution influenced by my experience and the experience and suggestions of others.
Bilateral One-Stage Rotation-Advancement

Columella near normal.

Bilateral upper rotation-advancement incisions do not meet across the midline.

Lateral paring flaps (1 and 2) of the prolabium used to cover raw anterior premaxilla.

Cupid’s bow incision on inferior prolabium placed above its convex vague mucocutaneous junction and turned down with vermilion lining flap.

Prolabium freed from premaxilla.

Lateral fullbodied vermilion paring flaps retain mucocutaneous junction ridge to accentuate the new cupid’s bow.
Mucosa and Muscle Joined Behind the Prolabium

Mucosa of lateral lip elements sutured to each other in the midline.

Midvertical incision in prolabium to dermis made from behind.

Then muscles sutured together firmly!

Dimple stitch placed.

If columella of normal length resect wedges from wide nostril floors.

Lateral vermilion paring flaps carrying "white roll" used to overlap turndown of inferior prolabium vermilion.

Then suture closure after tying dimple stitch.

or

If columella slightly short keep wide floors for later advancement.
16. Nasal Demands

A grating refrain constantly being chanted during final evaluation of every bilateral method that does not take the prolabium primarily and place it bodily into the columella is:

OK, a satisfactory upper lip!
But what about the short columella
And the flat nasal tip!

Several surgeons in the nineteenth century willingly placed the total prolabium into the columella position, and a few are still doing it in the twentieth century. Yet, for the majority, it was all they could do to get the lip together even with the prolabium as a central assistant. Several orthopedic-oriented surgeons, like Denis Browne and LeMesurier, while making important contributions to the lip surgery, admitted quite frankly that the nose was out of their realm and either accepted the nasal discrepancy or abdicated to the plastic surgeon. Thus when the columella needs are ignored from the moment of the first surgery, the nasal tip goes down in defeat in its struggle with the lip for the prolabium. Obviously, the answer is compromise.

SOLOMON'S SUGGESTION

As it says in the Old Testament, I Kings 3:16, two harlots came and stood before the king. Each had had a child. One had inadvertently smothered hers during sleep but, upon discovering her dead child, exchanged it for the live one in the night. The next morning at breast feeding, the other woman realized that
her child had been replaced by the dead one. Each woman insisted the living child was hers. Finally their argument was brought before King Solomon.

24 And the king said, Bring me a sword. And they brought a sword before the king.
25 And the king said, Divide the living child in two, and give half to the one, and half to the other.
26 Then spake the woman whose the living child was unto the king, for her bowels yearned upon her son, and she said, O my lord, give her the living child, and in no wise slay it. But the other said, Let it be neither mine nor thine, but divide it.
27 Then the king answered and said, Give her the living child, and in no wise slay it: she is the mother thereof.
28 And all Israel heard of the judgment which the king had judged; and they feared the king: for they saw that the wisdom of God was in him, to do judgment.

The prolabium dangles like the cherished living babe, claimed vigorously by the nose and just as vehemently coveted by the lip. As we have seen, through the centuries, some surgeons with compassion have cut it free with their scalpels to go into the nose while others with equal compassion have pared it to go into the lip. I believe, cruelly calculating as it may seem, that King Solomon’s original suggestion to divide “the child” is actually the wisest! Compassion has no place here for in actual fact, if wisely divided, the prolabium can serve the nose and serve the lip with benefit to both and without sacrifice to either.

PROLABIAL SHARING

Surgeons have designed various ways for sharing the prolabium between the lip and the nose. Some are better than others. The most common is primary insertion of the prolabium into the lip and then, as a delayed primary procedure, taking part of it for the columella in order to release the depressed nasal tip.

STEALING FROM THE CENTER

In 1833 Gensoul used a vertical V-Y advancement out of the upper lip into the columella to increase the columella length.
From present-day experience we know that this could give only a moderate but inadequate release of a truly depressed nasal tip, but it was a vital, if short, step in the right direction.

This type of procedure tended to tighten the lip from side to side but, in addition, caused vertical lengthening which was particularly unattractive. Exploiting the same principle by adding transverse lateral wings to the vertical flap, Blair, with his trefoil plan, lengthened the columella but shortened the vertical length of the lip at the same time.

Then, in 1941, more than a hundred years after Gensoul proposed this principle, Brown and McDowell embellished it by reducing the trefoil to a fleur-de-lis. Six years later, Brown, McDowell and Byar’s comments were of interest:

These children who are born with a total double cleft and almost no columella will frequently require secondary elongation of the latter so that this may be considered standard in this type of patient. Elongation is achieved for the columella by advancing a flap from the upper lip into it. The small cut in the septum out near the tip is usually necessary to get the tip forward and is filled in with small darts on the sides of the flap which come from the nostril floors. The defect in the lip is closed without suturing it to the new columella.

Of even greater interest was the comment:

Further elevation of the nose may be obtained when desirable, by an "L-shaped" cartilage transplant.

A schedule was suggested, by a case shown, of lip closure during the first days of life, columella elongation at about three and a half years of age and preserved L-shaped cartilage transplant inserted at age six. This confirms what the fleur-de-lis design intimates: Often there is not enough tissue supplied to lengthen the columella sufficiently to raise the nasal tip to normal. Then too, as with most columella lengthening procedures, additional support with a cartilage graft is often indicated.

The greatest disadvantage of all these columella lengthening procedures from the center of the lip was that a third vertical scar was added to the two scars already present.
17. The Forked Flap

In 1956-1957 I designed a secondary forked flap for columella lengthening which was shaped like an inverted V and split like a serpent’s fangs. The flaps incorporated the bilateral lip scars and any prolabium not needed and were taken deep enough to give body to the columella construction. These flaps which were continuous with the nasal tip, were cut out of the lip. Then with the aid of a membranous septal incision carried up over the tip, the forks were folded together and slid up along the septum. They were sutured to each other and then to their new and exalted position on the septum. The midline seam in the columella was unnoticeable. Actually, the two flaps mold into a columella with greater facility than does one larger flap, which tends to resist being forced into a hemi-column. The distal extremities of the forked flap are splayed laterally as columella base flowing into the nasal floor as nostril sill. Closure of the donor area with the aid of alar base incisions is similar to a rotation-advancement action. The forked flap cured a few ills. It afforded:

1. Release of depressed nasal tip.
2. Lengthening of the short columella.
3. Reduction of an unattractively wide prolabium to more natural proportions.
4. Revision of bilateral lip scars.
5. Reduction of the flaring alar bases.

Although the forked flap was carried out originally as a secondary procedure, its value as a delayed primary procedure was soon to become evident.
DELAYED PRIMARY FORKED FLAP

It seemed logical that if the forked flap was effective secondarily, it should be called into action sooner. In fact, it was predicted in 1958:

In severe bilateral clefts, when the columella is extremely short but the prolabium of reasonable size, a modified forked flap may be used primarily.

FIRST CASE

In 1959 the Second International Congress of Plastic Surgery met in London amidst great and colorful pomp and ceremony at the Royal College of Surgeons and at Guildhall. During this meeting and subsequently in the 1960 Transactions of the International Society it was my privilege to present the design diagrams and the early result of a 1958 case in which the rotation-advancement method had the forked flap added in the third stage at five months of age to give a delayed primary columella lengthening.

In the first stage, at two months, lateral vermilion flaps were used to overlap the turndown of vermilion from the prolabium to create a full-bodied cupid's bow. This procedure also brought in blood supply to the inferior edge of the prolabium in preparation for a delayed forked flap. In this case the premaxilla was inset at the same time into the alveolar arch, but as there was no palate cleft the problem was unusual. This was one of the first examples of early adhesion and, of course, served to mold the position of the premaxilla in the arch. At five months of age the delayed forked flap was elevated and advanced into the columella with release of the nasal tip.

The specific details of this initial case are interesting. The patient was born with a bilateral complete cleft of the lip and alveolus (primary palate) with projection of the premaxilla but
no cleft of the hard or soft palate and almost no columella at all.

On November 5, 1958, at about two months of age the mucoperiosteum of the area in front of the vomer swelling was split and the "overgrowth" was rongeured away. The mucoperiosteum of the cleft edges and premaxilla was dissected and approximated with sutures so that, when the premaxilla was pushed back into the notch in the alveolus and wired, union could follow. The lateral vermillion flaps were used to overlap an inferior prolabium vermillion flap to create a cupid's bow and bring in blood supply to the prolabium for subsequent surgery. This was also an early type of preliminary adhesion.

My concern for the blood supply of the forked flap caused me to diagram the delay incisions on the prolabium and cut them two months after the initial surgery. In the first few cases the forked flap was used even before the cleft edges had actually been approximated. Thus the amount of tissue available was reduced, of course, as the scars of union were not present to contribute to the bulk of the forks. Two weeks later, on February 3, 1959, the delayed forked flap was cut from the lip and with the aid of a membranous septal incision was advanced along the septum elevating the nasal tip and creating a columella. The lateral lip
elements were brought together tip to tip and then sutured in layers to the sides of the remaining prolabium.

The last sentence of my operative note is of interest and turned out to be a prophecy:

The difficulty here was focused on the five points closure where the two prongs of the fork, the two tips of the advancement flaps and the upper point of the prolabium all come together. Time alone will tell.

Four months postoperatively the scars at the five points were unsatisfactory, but as the months passed the scars improved. Nevertheless, this is a disadvantage in the original design and only years later was modified.

Sporadic minor scar revisions and lip shortening produced as reasonable a lip as can be achieved without joining the muscles across the cleft. The early design of the staged primary columella lengthening marked the ends of the forked flap pointed and thus too short for the total need. The immediate result was promising, and over the years the gain had been maintained and the growth of the nose benefited by the early tip release. Then in 1970 editor Frank McDowell requested proof of the value of early columella lengthening to justify pursuit of this principle in my Plastic and Reconstructive Surgery article "Closure of Bilateral Cleft Lip and Elongation of the Columella by Two Operations in Infancy" and a 12-year follow-up was published.
Finally, on July 5, 1972, at age 14, this outstanding young man had a slight columella lengthening with advancement of his alar bases and nostril floors in a V-Y fashion. A subcutaneous flap was carved from the center of his prolabium to create a hollow and turned down to give more fullness to his tubercle.

Another aspect of this case of particular interest to dentists and surgeons is the 14-year follow-up of the upper dental arch. At age two months the projecting premaxilla had its edges freshened, anterior “overgrowth” of the vomer resected, pushback and wiring of the premaxilla into the alveolar notch. Today the teeth are excellent and in reasonable occlusion and growth seems to be progressing normally.

Two years later, at age 16, scar revision, lip shortening, muscle approximation, nasal tip tailoring and columella bolstering finally achieved correct labial and nasal proportions. When the scars have healed and softened, the appearance and function should be within normal limits.
SIMILAR APPROACH IN BILATERAL INCOMPLETE CLEFTS

This patient was born with bilateral incomplete clefts of the lip, short columella and a cleft of the hard and soft palate posterior to the incisive foramen. On June 7, 1960, at three and a half months of age, lateral vermilion flaps were used to overlap the turndown of inferior prolabium vermilion, but the freshened edges of the lateral lip elements were sutured to the freshened sides of the prolabium in this first stage.

Six weeks later, on July 19, 1960, at five months of age, a forked flap was taken out of the lip incorporating portions of the prolabium, lateral lip and the joining scars. These flaps were advanced along the septum to form an adequate columella and simultaneously release the depressed nasal tip.
On February 22, 1962, at two years of age, scar revision was undertaken, prolabium skin undermined, subcutaneous tissue removed and a through-and-through suture tied over the bolus to create a dimple in the philtrum.

At 16 years of age minor lip scar revision and corrective rhinoplasty were carried out. Alar cartilages were reduced, bridge
straightened, septum shortened, alar bases denuded and advanced to each other, submucous resection to improve airway and septal cartilage inserted into the columella for nasal tip lift and definition. It was exciting to be completing a case which had no columella and had a forked flap release at 5 months of age!

A L A T E S T A R T

Of course, it is easier when the surgeon gets the case from the beginning. Here is an example of starting late. The patient was born with bilateral cleft lip and palate with protruding premaxilla which was closed at one month on one side and two weeks later on the other. The present surgeon first saw the patient at six months, with lateral elements attached to the sides of the prolabium, the prolabium vermilion intact, the columella absent and the premaxilla protruding. What to do now?
On August 8, 1959, the premaxilla was still prominent so Gillies’ reduction was used—anterior plate and tooth buds of the premaxilla were removed and the posterior plate was maintained. A forked flap was incised for a surgical delay and later advanced into the columella.

On August 7, 1969, important lip revisions were done. The width of the prolabium was reduced and in the process “white roll” flaps became available to be introduced between skin and vermilion along the entire lower border of the prolabium. The columella was revised.

**A L A T E A N D U N U S A L P R O B L E M**

A two-year-old bilateral cleft lip and palate patient had, from the vague history, had both lip clefts approximated and subsequently the palate closed. A secondary LeMesurier procedure had been done on the right and the patient discharged with sutures in
place. As he proved later with me, this patient was rambunctious and proceeded to strike his lip, with total wound disruption. The other surgeon was so upset that somehow I inherited the problem. On April 2, 1965, the child presented an open wound with eschar, shortness of the columella and a wobbly premaxilla ununited on the left and projecting in front of the maxilla. The patient was left to heal his wound, the process taking about three weeks, and in this interim he managed to lacerate his nose, requiring a suture for hemostasis!

During the next 18 months no surgery was done, but William Silver continued orthodontic care. Then a forked flap which had long been in his future, as marked, was advanced into the columella.
It was planned that at age 16 years a septal cartilage strut would be inserted to support the fork. When the patient was seen again at 12 years, as he expressed concern about his columella retraction and airway obstruction, a modified submucous resection of the deviated septal cartilage supplied a strut. This was fashioned to the shape of a Bowie knife as suggested by Dibbell and inserted for columella correction and tip support. A subcutaneous flap cut from the center of the prolabium and based superiorly was split, and the prongs were advanced into upper deficiencies in the lateral lip elements.

Final revisions including a corrective rhinoplasty will be postponed until the patient is 16 years of age.
THE LATERNAL FLAP MODIFICATIONS

Trauner

The principle of transposing a flap taken along the vertical axis of the cleft edge of the lateral lip element into a straight transverse releasing incision at the base of the columella was described as a secondary procedure for unilateral cleft deformities by Richard Trauner of Graz, Austria. He first presented this in Stockholm in 1955 at the same International Congress at which the rotation-advancement principle was proposed.

Then in 1967 at the International Congress in Rome, Richard Trauner with his son Martin adapted his unilateral plan to bilateral lip closure in two stages. This approach was a combination of the method of Veau in the lower portion and what the Trauners termed a Z-plasty in the upper portion. Actually they utilized two vertical flaps from the sides of the lateral elements based on the alar bases. These flaps were transposed tip to tip into a releasing incision across the base of the columella and did succeed in rotating and medially advancing the alar bases.
Wynn

In 1960 Sidney Wynn of Milwaukee Children’s Hospital adopted a procedure which is a cross between the Trauner flap and the pure rotation-advancement. Actually he modified the advancement part of the rotation-advancement principle by cutting a vertical flap off the edge of the lateral element with its base above, as Trauner did, and transposing it into a high rotation release. Wynn applied this approach to bilateral clefts.

For Converse’s 1964 book Cronin chose a case from Wynn’s original 1960 publication and accompanied it with this comment:

Example of lip repaired by Wynn. Note that the prolabium vermilion is a little thin compared with the lateral vermilion. The columella will require lengthening for optimum appearance.

In 1974 Wynn forwarded this series of photos as his example
of one of his bilateral flap technique cases. The scars, however, appear to interdigitate far too low to represent what is generally considered a Wynn-type closure.

The irregularity of the preserved prolabium vermilion confirms a point constantly being made, and the slight central whistling deformity is consistent with Cronin's observation. The columella, which seemed somewhat lengthened at five years, reveals less adequacy at 20 years with snubbing of the nasal tip. The sparse hair growth on the prolabium as compared to the lateral lip elements is of interest. This is, however, quite a good result considering the severity of the original deformity.

Wynn's method has been mentioned in this section in spite of its lack of truly effective columella lengthening because it is basically similar to other designs transposing vertical flaps horizontally somewhere beneath the columella base.

THE MEDIAL FLAP MODIFICATIONS

Marcks

In 1957 Kerwin Marcks, with Trevaskis and Payne of Pennsylvania, designed a secondary procedure taking two vertical flaps from the prolabium based superiorly on the sides of the columella. These flaps were transposed zigzag on top of each other into an incision transecting the columella from its join with the lip. Only a moderate lengthening was possible.

Skoog

In 1965 Tord Skoog of Uppsala carefully incorporated a variety of methods into a bilateral Swedish smorgasbord. He had already combined the high incision of the rotation-advancement with the "lowly" incision of Tennison in his unilateral cases. Now he added a vertical prolabial flap to be taken from a position similar to that of the early forked flap, but he transposed it into a transverse columella base incision identical to that described by
Marcks. Skoog proposed that all this be done for one side at three months.

Three months later the identical maneuvers are repeated on the opposite side.

It seems that in spite of Skoog’s masterful precision there are several disadvantages in principle to this general plan. First, the design is too complicated for the dividends gained. Second, the lengthening of the prolabium with double interdigitation is more than likely to produce an upper lip that is too long in the vertical dimension of its sides but relatively shorter in the center with even a possible whistling deformity. Third, the amount of possible columella lengthening is limited, for two reasons: because the greatest release can be only slightly more than the width of the prolabial flap, which, in itself, is limited; and because elevation of only half of the columella at a time strictly curtails the amount of total effective release. Fourth, flaps crisscrossing transversely at the base of the columella are not set in natural lines, and any lumpiness in these “trapdoors” could be quite eye-catching. Fifth, preservation of the prolabial vermilion in a visible position has additional disadvantages.
Onizuka

In recent years the Japanese surgeons, facing vast numbers of clefts, have been extremely productive in this field, appearing in the world literature more and more. One of the most energetic of these surgeons is Takuya Onizuka of Tokyo. In fact, a Japanese rendition of the simultaneous correction of the lip and nose was proposed by Onizuka in 1968. He advocated the rotation-advancement in bilateral clefts but indicated preference for the Skoog prolabium transposition. The combination is carried out one side at a time, and the amount of columella lengthening is limited again to the sum of one width and one tip of the two crisscrossing flaps. This, however, may be sufficient lengthening in the Oriental nose.

Only partial effectiveness

When the columella deficiency is definite, adequate lengthening can be achieved only if enough tissue is added directly to the columella area. The farther away from the columella the new tissue is placed, the less effect its placement accomplishes. As Gillies used to say:

When in love with the daughter, do not kiss the mother, kiss the daughter!

Thus, five modifications have been developed with only modest columella lengthening. Trauner and Wynn transpose a lateral lip flap into the columella base whereas Marcks, Skoog and Onizuka used a medial prolabium flap for the same purpose. Similar general criticisms are binding for all, in that effective columella lengthening is vague when introduced only at the base and is limited in actual amount when it can be little more than the width of one narrow flap.
PRIMARY SHIFTING OF NASAL FLOORS AND ALAE

In 1974 in Seattle, Randall, with D. J. Lynch, advocated for incomplete bilateral clefts with a short columella a membranous septal incision extending bilaterally into the intercartilaginous spaces and a modified Carter-Cronin bilateral alar base advancement utilizing rather than excising the wide nasal floors. The lip clefts were treated by the rotation-advancement method. This is part of their description:

Parallel incisions are used . . . but unlike Cronin, we feel there is no need to go beyond the insertion of the alar rim into the upper part of the lip. Rather, the external incision is extended laterally just beyond the incision for the primary lip repair to allow a satisfactory flap from the medial side to be shifted into place as in the rotation advancement technique. The incisions are carried medially up into the columella, preserving a “V”-shaped piece of skin at the base of the columella along with its underlying fibrous attachment to the nasal spine. This is extremely important if one is to preserve the mobilized lip elements from prolapsing down over the premaxilla.

I have not found this to be a great problem in incomplete clefts but it can happen. What is more likely to happen, even though the columella in incomplete clefts is usually less deficient, is inadequate columella lengthening by this approach. As stated by Randall and Lynch:

Occasionally, the amount of columella reconstruction has been insufficient to place the nasal tip at a level that would appear to be completely normal. In these patients further columellar advancement has been necessary at a later date.
The chances of a lengthened columella’s being hairy

There are some surgeons who consider the prolabium exclusive property of the lip and deny any justification for its being parceled off to the columella. One of their arguments has been fear of the threat that hair will be transported to the nose from the prolabium. After 25 years of extensive experience at Rooksdown House and Roehampton, both in England, where hair has not been reticent to grow, as exemplified by the mustaches of the Queen’s Guard and the bushes of the Beatles, Bill Holdsworth says quite simply:

Lip skin looks well in the columella and rarely is there trouble from growth of hair.

In 1950 Ferris Smith of Grand Rapids, in typical dogmatic style, stated:

Hair may grow on the elevated philtrum skin, but it is not probable, because this skin belongs to the columella. The author has had one instance in numerous cases.

When the total prolabium is used for mid-prolabium flaps, as first described by Gensoul and modified by Blair, Brown and Veau, there is, of course, a greater chance of carrying hair to the nose. Fortunately the mid-prolabium flaps have been displaced for the most part by side flaps from the prolabium, as described by Skoog and Onizuka, or the forked flap. Let’s take a moment to evaluate their hairy possibilities.
A BALD DEFENSE

In the first place, this is not a problem in female bilateral clefts. Furthermore, most male prolabiums do not yield luxuriant hair growth but produce a mere fuzz which proves to be as ineffectual on the lip as inoffensive on the columella.

As pointed out by Summerfield King, the mucocutaneous edge around three-quarters of the prolabium, including a slim portion of the adjacent skin, is hairless. Thus the lateral skin sides of the prolabium for almost the entire amount used in the prongs of a forked flap or other prolabium side flaps are more or less hairless from the beginning.

Whenever an incision is made in a hair-bearing area, the healed scar is hairless, partly because of the injury to adjacent hair follicles and partly because of the lack of hair in any healed scar. Thus when the incisions are made for the forked flap parallel to the sides of the prolabium and almost within the hairless area, these cuts increase the area of hairlessness. Of course, when the forked flap is used in secondary bilateral cleft cases, the scars already present, which are incorporated in the forks, are also hairless.

Indeed it is a brave or lucky hair follicle that survives these odds, and one that is still standing up along the front of the columella is reminiscent of the flag raised by the little group of heroic marines on Iwo Jima. What is more, it can be quite easily destroyed by electrolysis or mowed down by one upward sweep during the morning shave. In other words, the forked flap should never lose by a hair!
20. No Lip Muscle Union and Delaying the Forked Flap for a Year or Years

EXPERIENCE with early columella lengthening with the forked flap as a secondary procedure at three to six months of age had suggested several points:

1. Lengthening the columella benefited the nose.
2. Giving up the forked flap benefited the prolabium.
3. But total division of the prolabium from the columella so early, especially in complete clefts, tended to produce a long lip in vertical dimension.

It raised the question: Is all this early hurry to help the flat nose worth the effort or indeed worthwhile?

There not being an obvious answer, I relaxed a bit in my pressure to correct the nose early.

Here is a small series of cases treated mostly in the early 60’s by a conservative routine. "Straddling the fence" and the premaxilla meant that more radical action was required eventually. The general plan was as follows:

1. Closure of both sides of the lip cleft was to be done in one stage but without joining the lateral muscles to each other in the midline behind the freed prolabium. The muscleless prolabium was then at the mercy of the stretching action of the lateral lip musculature. This widened and flattened the prolabium but in some instances did not mold the premaxilla enough.
2. In some cases *vomer resection was necessary to set back the premaxilla*. This was postponed to about four to five years of age.

3. In the absence of early columella lengthening, the columella remained short, dragging the nasal tip flat. Thus a *secondary forked flap in one stage*, usually at about five to six years of age, was planned to incorporate the bilateral lip scars and some of the stretched prolabium. This made reentry into the lip necessary with loss of the lovely lip scars of infancy. The "five points" of the one-stage forked flap at this age did not make such nice scars.

**NO MUSCLE UNION AND FORKED FLAP AT ONE YEAR**

B.D. 2-20-60
F.H. No clefs
F.T. Uneventful
O.C.A. None

5-26-60. One-stage bilateral lip closure with lateral vermillion overlap of prolabium vermillion.

1-12-61. Forked flap for columella lengthening.
The patient returned nine years later revealing a philtrum and cupid's bow that was too wide, noticeable skin scars, lack of lip muscle continuity, a flared left ala and a retracted columella with a hooked, bulbous nasal tip.

Some of the surgical procedures which had to be used at age 15 years for secondary correction are now being used in the primary closure to bypass predictable problems.

1. During the bilateral scar revisions the prolabium was reduced to philtrum dimensions.
2. The lateral lip element musculature from each side was
dissected free and advanced into the prolabium to within 2 mm. of its counterpart and held with buried 4-0 Mersilene mattress sutures. This slight modification introduces muscles into the prolabium, but it was hoped that if the vertical center of the prolabium was left intact the bulges of the muscles up to this strip on each side would create the effect of philtrum columns flanking a central philtrum groove. Medial white roll flaps were transposed laterally.

3. The left alar base was cut free with a subcutaneous extension, which was advanced and sutured to the septal base. The right alar base was reduced by wedge resection.

4. The bulbous alar cartilages were reduced.

5. A submucous resection of the obstructing septal cartilage produced struts which were used to improve the contour of the retracted columella.

It is encouraging that, in spite of the late forked flap and late lateral lip muscle advancement toward the midline, by 15 years of age a fine final functional and aesthetic result is possible.
NO MUSCLE UNION AND FORKED FLAP AT SIX YEARS

Balber's device

B.D. 3–20–63
F.H. Father bilateral CLP with projecting pre-maxilla
F.T. Uneventful
O.C.A. None

5–17–63. Balber started spreading device.
6–21–63. Right side approximated to prolabium with usual inferior vermilion overlap.

Balber’s device

Right side first

7–8–63
8-12-63. Similar procedure on left.
S.P.
2-22-66
Palate closed except vomer pre-maxillary component.

7-14-67. Vomer resection 1 cm. and setback.

1-30-68. Bilateral bone grafts to the alveolus.
2-21-69. Forked flap.
Deviated premaxilla with maxillary components approximated behind the premaxilla.

At three and a half months the mucosa of the lateral lip elements was brought together and sutured behind the prolabium, which had been freed from its attachments to the premaxilla. The muscles of the lateral lip elements were brought to the sides of the prolabium with two chromic catgut sutures passing through the subcutaneous tissue of the prolabium. In other words, the lateral muscles were not sutured to each other across the cleft. Lateral vermilion flaps were used to overlap the turndown flap of prolabium vermilion.

Balber device spreading the maxillae.

11-5-62. One-stage bilateral lip closure.

B.D. 7-23-62
E.H. Brother with unilateral CLP
F.T. Uneventful
O.C.A. None

2 months postoperative 18 months postoperative
The projecting premaxilla continued to be a problem. The soft palate was closed with pushback and island flap at 14 months of age. The hard palate was closed at seven years of age, and the following year, on June 3, 1970, a fistula in the hard palate was closed.

7-14-71. Forked flap at 9 years.

The premaxilla needs further orthodontia, the columella and lip scars need revision and the lateral muscles must be brought together better.

MUCOSA BUT NO MUSCLE UNION AND FORKED FLAP AT SEVEN AND A HALF YEARS

At one month the prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae. The
lateral mucosa was sutured together under the prolabium, but the *muscles* were not joined. The lateral vermilion flaps were used to overlap the turndown of prolabium vermilion.

The forked flap was delayed because of the projecting premaxilla until seven and a half years of age. It is a shame to have to leave a child like this so long.

Reentry into the lip at this age does not get good scars and takes a long time to heal. Lip revision and reduction rhinoplasty are planned at 16 years.
At four and a half months of age, one-stage lip closure was accomplished. Because of excessive protrusion of the premaxilla a "conservative" straight-line closure was obtained on each side with no effort to join the lateral lip mucosa or muscles behind the prolabium. The lateral vermilion flaps were used to overlap the turndown of prolabium vermilion.

At four and a half and later at nine years of age the lip was not too long but the prolabium and certainly the cupid's bow were too broad, the nasal tip was flat, the alar bases were severely spread and the columella was nonexistent.
At 9 years the fork was stored in whisker position. The lateral lip mucosa and muscle elements were united behind the prolabium and dimple stitches placed. Six weeks later, the forked flap was advanced into the columella and the alar bases advanced medially. Time will smooth this result and final minor corrections will be made at 16 years.

**MUSCLE UNION AND FORKED FLAP AT SEVEN YEARS**

B.D. 3–2–68
F.H. Paternal first cousin with bilateral CLP
F.T. Uneventful
O.C.A. None
At two and a half months of age, one-stage lip closure, without undermining of the lateral lip elements from the maxillae, was used to try the C-W approach. There was a gradual partial separation on the right which after three weeks required approximation. The failure to join the lateral muscles together behind the prolabium and the persistent forward projection of the premaxilla caused a gradual stretching of the prolabium to unnatural breadth. Finally, at five years the premaxilla was set back moderately by resection of a portion of the vomer, and orthodontics was carried out by S. Berkowitz.

Already past school entry age, the patient had a flat nose and wide prolabium which forced secondary action in spite of the fact
that the premaxilla was still a projecting obstacle.

In May 1975 the prolabium was reduced by a forked flap which was banked in whisker position. The lateral muscles were joined together behind the prolabium.

Six months later, the forked flap was advanced into the columella to release the nasal tip, and the alar bases were advanced medially.

As the nasal bridge grows, this over-projection of the tip will be accommodated.

Note: It must be admitted that in this type of case, as the prolabium was small and the premaxilla severely projecting, there may be some justification for postponement of a forked flap and lip muscle union primarily. This allows stretching of the prolabium and setback of the premaxilla if such maneuvers are necessary.
As it turned out, this type of “conservative” approach did not join the lateral muscles across the cleft, did not mold the premaxilla as well, allowed the prolabium to be stretched thin and, by postponing columella lengthening with the forked flap, left the nasal tip flat for years. Then when the forked flap finally was taken out of the lip, the resultant “five points” scarring at this age was not as satisfactory and took years to soften. It is hoped that the ultimate results will be quite satisfactory, but the number of operations and the delay in time seemed too much. The exception, of course, is when the prolabium is too small and the premaxilla too projecting. There had to be a better way and the search continued.
The paucity of bilateral lip clefts in the Miami area in the latter part of the 50’s caused me to look elsewhere for cases. Jamaican Kenneth A. McNeill, F.R.C.S., had qualified in medicine at St. Bartholomew’s Hospital, London, and served with Joseph Sankey at the Facio-Maxillary and Plastic Surgery Unit, Barnsley Hall Hospital, Bromsgrove, England, during World War II. After hostilities ended, he had returned to Kingston, Jamaica, and started a voluntary plastic surgery unit. During a visit to Miami he invited me to come to work with him in his Caribbean paradise, setting the bait with a promise of plenty of bilateral cleft cases. At the mere mention of bilateral clefts I began tossing instruments and sutures into a bag and almost beat McNeill back to his island in the sun. Thus, a happy cooperation was begun in 1959 which has lasted over all these years. McNeill is now Minister of Health and is planning a plastic surgery center in Montego Bay with a special section for cleft lip and palate work.

At first I tried the delayed primary forked flap again. The diminutive prolabium of pea size was incorporated in the lip and the lateral vermilion flaps were used to overlap the inferior prolabium vermilion. Then, during my next visit to Kingston several months later, the delayed forked flap was advanced out of the lip into the columella with release of the nasal tip.
Attaching the lateral muscle elements to the sides of the pea-sized prolabium stretched the prolabium so much that in a few months it could quite easily give up a forked flap to the columella and still retain a normal-sized philtrum. Thus, the compromise had been successful as far as apportioning tissues between the lip and the nose was concerned, but the lack of muscle continuity across the cleft left unnatural lateral bulges on either side of an unanimated muscleless prolabium.

Another prolabium was stuck between the muscular lateral lip elements in preparation for a secondary forked flap. This was an example of the just described "conservative" approach—with no primary lip muscle union and a delay of the forked flap for years—that I was using in Miami at the time.
Then it was decided that, to improve the lip appearance and action, muscle continuity across the cleft was necessary. Therefore, on a number of bilateral clefts in Jamaica, I used the Meyer-Schultz-Browne-Glover mucosa and muscle closure behind the prolabium and noted definite improvement in lip function. Because of the lack of stretch in the prolabium, the forked flap had to be postponed five years or more. Under this regimen, the lips in the bilateral clefts in the Caribbean Negro were developing so well that the shortness of the columella, although detracting from the ideal result, still did not quite justify an early secondary forked flap. The lip scars following the primary operation in the infant were so good that enthusiasm for additional surgery of the lip to aid the nose was discouraged.
Furthermore, the Jamaican parents were satisfied and only under duress would they return to the clinic with the child. It was disturbing to have results accepted when they fell short of the possible nasal corrections, and in the Caucasian the discrepancy, of course, was worse.

Then a case using this same approach ended up with a nasal tip so flat that this aspect could no longer be ignored.

Here was the spark that set off the primary forked flap.
In 1965 I decided to "go for broke." It was at Princess Margaret Hospital, Nassau, and I was preparing to close a bilateral cleft lip with David Maisels of Liverpool assisting. The circumstances were similar in many ways to what had been experienced in Jamaica, and I was prompted to say to Maisels:

David, the prolabium must be getting enough blood supply from the premaxilla. You know how it bleeds profusely when we dissect it free. Let's do a primary forked flap and get the nose right at the same time we close the lip.

We did and it went well.

In 1967 the primary forked flap was published as a possible answer to the search for a bilateral cleft operation which closed the lip, reduced the prolabium and lengthened the columella all at the same time. As the prolabial edges must be freshened for lip closure anyway, there must be logic in this economy:

Rather than discard it, salvage it as a forked flap for the columella.

This approach also offered the advantage of avoiding the subsequent need to go back into the well-healed lip five years later to get tissue for the columella. Then too, it bypassed for the child all those flat-nosed years.

**Blood Supply**

Of course, the main deterrent to the primary forked flap was the question of blood supply. As I wrote in 1967:
At first thought, it seemed the surgeon would be sawing off the very limb he had been sitting on all these years. It is true that in complete bilateral clefts, the main blood supply to the prolabium philtrum comes through the columella and the septum (frontonasal component) in the form of the posterior septal artery and, to a lesser extent, the lateral nasal and terminal branches of the anterior ethmoid vessels.

According to Slaughter, Henry and Berger, cleft specimen dissections usually indicate one well-differentiated vessel on either side of the premaxilla in the region where the incisive foramen should have been. Each of these vessels passes anteriorly and inferiorly into the philtrum and continues medially in an arc to anastomose across the midline in the inferior portion of the philtrum.

No mention is made of a direct blood supply from the premaxilla running forward into the midposterior prolabium. Yet, in surgery, while freeing the prolabium from the premaxilla, one invariably noted a generous bleeding. This to-and-fro vascularity between the prolabium and the premaxilla proved to be adequate to sustain the remaining prolabium even following its complete severance from the nasal tip and septum.

INDICATIONS

The primary forked flap was not advocated in all bilateral clefts. Three pertinent factors determined its plausibility:

1. Position of the premaxilla:

   The primary forked flap operation may not be possible if the premaxilla protrudes severely.

2. Size of the prolabium:

   The width of the prolabium determines whether the flap is possible and the vertical length indicates the amount of columella lengthening available. A large prolabium offers no problem, but it is surprising how small a prolabium can be and still serve the columella and philtrum successfully. For instance, if the prolabium is slightly more than 1 cm. wide, then allowance of 0.25 cm. for the width of each fork of the flap leaves a philtrum a little more than 0.50 cm. wide, which is about normal for an infant. If the
prolabium is truly minute, then mere attachment of the lateral lip elements to the pared sides of the prolabium will soon stretch this central non-muscular component into a reasonable size, one capable of accommodating a delayed forked flap.

3. Columella length:

The actual amount of shortness of the columella is one final consideration. This discrepancy must be measured not only in the actual length in millimeters of the columella but also with an estimate of the patient’s desired final length. The natural flatness of the Negro nose demands less columella length than, for instance, the high-bridged aquiline nose filling the Royal enclosure at Ascot. Some surgeons claim that the flat nasal tip, even without columella lengthening, improves with growth. This has never been impressive to me but early release of a tethered tip, even if not to quite the ideal extent, might give subsequent growth a chance to make up the difference.

In the preparation of *A Primary Forked Flap*, a film for the 1967 International Congress in Rome, a little local color was incorporated. As introduction to the film it was suggested that all participants at future congresses bring scenes from their native lands on the premise that knowledge strengthens bonds of friendship. It was explained to the learned audience that the procedure being described had been executed first in the Bahamas and later in Miami and Jamaica, justifying the film’s opening with a skiing scene in tropic waters scored with a background of calypso music. One frame from the end of this short clip combined my Texas roping with Florida slalom skiing on Biscayne Bay. Ron Pigott, who did these drawings for the film, was acknowledged when he also appeared for a short ski run.

The Pigott sketches portrayed a forked flap with its base on the short columella marked on the lateral sides of the prolabium with preservation of enough prolabium in the center to act as a philtrum. With the aid of a membranous septal incision carried over the septal tip and into the vestibule a short distance bilaterally, the forked flap was elevated and its forks were sutured together. It was gently tubed onto itself in its upper portion while the lower portion was left open to be sutured to the membranous septum. The lateral lip elements were dissected.
widely off of the maxilla, and the freeing was extended by carrying the incisions up into the vestibule bilaterally. Circumalar incisions to the extent specifically required divided the alar base from the lip elements. The lateral edges of the cleft were freshened by turning down full-bodied vermilion flaps. The prolabium vermilion was turned down also. The key or cliff-hanger stitch picked up the points of the lateral lip elements, the periosteum of the premaxilla at the nasal spine and the superior tip of the prolabium. This suture brought the five points together but reduced tension on the prolabium. The alar base flaps were sutured to the sides of the septal base, reducing the alar flare and constructing the nostril sill. The tips of the forked flaps were sutured lightly to the lip flaps and the alar base flaps. The lateral mucosal flaps overlapped the turndown flap of prolabium vermilion to give a full-bodied free border and a suggestion of a cupid’s bow.

THE AFTERMATH

Evidently, complete division of the prolabium from the nose turned it free to be tugged, stretched and shifted by the strong lateral lip muscle elements. In the earlier cases, the forked flap too was being dragged partially out of the columella back down into the lip. The key nylon suture, which later was used to tack the lip elements to the periosteum of the premaxilla at the nasal spine, was an attempt to prevent lip lengthening and columella drag-back. It was only partially successful.

Here is a case with adequate prolabium, short columella and extremely flaring alae. A primary forked flap reduced the wide prolabium and gave some length to the columella.
The early total division of the lip from the nose and the lack of muscle continuity across the cleft allowed the prolabium to be stretched, the lip lengthened vertically and the forked flap pulled partially back into the lip.

Secondary revisions shortened the lip, reduced the alar flare and even tried for a philtrum hollow.

NOT IDEAL FOR GENERAL USE

A small series of primary forked flaps was done. The blood supply from the premaxilla proved adequate although occasionally the prolabium would turn slightly blue for a few hours. There was a rumor that one or two surgeons had lost a prolabium; if true, this tragedy was probably due to an incorrect key stitch and the application of too much tension to the prolabium.

In complete clefts the results immediately after surgery were impressive, but within a few months, in some, there was too much vertical lip length.
Take this Jamaican case, for instance. The prolabium was short but wide enough, the columella nonexistent and the premaxilla moderately protuberant. A primary forked flap redistributed tissue in what seemed quite reasonable nasal and labial proportions.

Then in time the early division of lip and nose and the lack of muscle continuity allowed the lip to spread and stretch and the forked flap to pull wide and back into the lip.

A high transverse excision of lip and readvancement of the columella and alae achieved a shorter lip and a better columella and improved the position of the alae.
Again in time some of this gain was lost, but the tissues are now well proportioned and can be improved satisfactorily prior to school age.

A primary forked flap in this complete bilateral cleft went well during the initial surgery. There was even the creation of a philtrum dimple.

Then gradually the forked flap pulled back into the lip and the lip lengthened. This defect was corrected by readvancement of the forked flap into the nose and shortening of the lip, preserving the philtrum dimple.
In incomplete bilateral clefts there seemed to be less consistency as to what was going to happen postoperatively. This severe incomplete cleft developed a long lip, but the forked flap remained up in the columella almost too much for the child’s age and nasal development.

On the other hand, in this incomplete bilateral cleft, the lip maintained reasonable length but the forked flap tended to drift down out of the columella back into the lip. Revision is in order at school age.
STRUTTING THE FORK

It is becoming more and more apparent that with the absence of adequate septal projection and the flattening and spread of the alar cartilages in bilateral clefts, even after forked flap release of the depressed nasal tip, the cartilages are not sufficient as skeletal structures to hold up what has been lifted. Primary homologous (child) and autogenous (after 16 years) septal cartilage struts are indicated at the time the forked flap is formed to prevent it from slipping back into the lip.

A SERENDIPITOUS DIMPLE

In another incomplete bilateral cleft, the primary forked flap produced a result with another unexpected but greatly appreciated philtrum dimple and flanking eminences.
In retrospect, this specific occurrence was accounted for in my 1967 primary forked flap article by a cause-and-effect study:

The remaining philtrum-shaped piece of prolabium was smaller than usual and, of course, maintained its attachment to a premaxilla that was not unduly protuberant. The larger muscular lateral lip elements were joined to the sides of this diminutive prolabium and also were joined to each other above the upper pole of the philtrum. It was an incomplete bilateral cleft and great tension was not involved. This created a modified three-fourths circle of muscle around a tiny tethered mid-philtrum which, in cooperation or out of desperation, inverted into a dimple and persisted as such.

Such serendipity led to the conjecture that if the upper labial sulcus is late in its formation prolonged adherence of the prolabium to the premaxilla could be a factor in dimple formation. Monie was asked to review his bilateral cleft specimens to determine the time of upper labial sulcus formation and see whether the prolabium-philtrum is still totally tethered to the premaxilla while the groove and eminences are being formed. Unfortunately, Monie's specimens were cut on the transverse plane with a view of the philtrum but not of the sulcus.

OTHER SURGEONS DARE TO USE THE PRIMARY FORK

In 1967, at the International Congress in Rome, Maisels and Littlewood of Liverpool presented their experiences with the
primary forked flap. They expressed approval of the natural shield-shaped philtrum in preference to the previous square patch and commented on the simplicity of the simultaneous lip closure and columella lengthening. They warned, however:

It is not possible to repair the anterior palate at the same time as the primary forked flap. In one case when an overambitious attempt was made at anterior palatal repair, the premaxilla was circumferentially denuded of soft tissue. It is of interest to note that the vomerine intra-osseous blood supply was sufficient to ensure survival of all the premaxilla apart from incomplete loss of the skin of the prolabium.

In 1972 the results and feelings of several surgeons on the primary forked flap were brought to my attention. Gracious Shojiro Takahashi of the Tokyo Dental School wrote:

I reported my experience in bilateral cleft lip repair by using of Millard’s forked flap method at the general meeting of the Japanese Society of Oral Surgeons on October 1st 1971 in Tokyo. I successfully repaired a bilateral complete cleft lip (14 year old girl) by a primary forked flap in Indonesia in January 1970.

He included photos of the case.

Takahashi prefers to use an adhesion prior to the forked flap but did this primary fork as it was a "one chance" case in a foreign land.

When at home and at leisure Takahashi first creates what he refers to as a preliminary Randall adhesion. Its sole purpose seems
to be to restrain the premaxilla much as the rubber band does. Then at a second stage he does a forked flap which is identical to and just as radical as my primary forked flap procedure. He forwarded me photographs of one of his cases which showed the original bilateral cleft condition, the situation one month after the adhesion, the marking of the forked flap and the immediate postoperative result.

Also included were the result at 10 days
and finally at 1 year.

In countries where there are many clefts and relatively few surgeons, a one-stage procedure offers appreciable dividends. Whereas in the African or even the Oriental the short columella is of less importance, in certain East Indians with high nasal profiles the proud columella is more demanding.

S. S. Sethi of Maulana Azad Medical College, New Delhi, India, in 1970 and in 1973 approved the one-stage primary forked flap at six months of age when the premaxilla is not protruding and the prolabium is not very small. His only modification from my original description was preservation of slightly more vermilion with the mucocutaneous junction line of the prolabium. Another interesting aspect is Sethi's use of this principle in the adult. As he wrote for the Copenhagen Congress:

In the grown up unoperated cases, the circumalar skin excisions help the moving in of the lateral lip triangular flaps. These triangular flaps meet together proximal to the tip of the prolabium island. The prolabium sinks down in line with the vermilion of the lateral lip elements, to form a nice cupid's bow and does away with any notching in the midline. This procedure forms a broad and protruding lip, a columella, a philtrum and narrow nostrils. . . . The only snag in this procedure is the delayed healing at the base of the columella where the tips of the too many flaps meet.
A suggestion for Sethi would be to turn the toes of the fork outward to join the alar bases lateral to the “five points” for improved healing.

Also in 1972 Don Kapetansky of Southfield, Michigan, forwarded to me early results of his execution of a primary forked flap.

In the same year, from the Permanente Medical Group in Oakland, California, George Scrimshaw wrote:

In bilateral clefts, I prefer the one-stage forked flap advancement in spite of some drawbacks.

James Hendrix, Jr. of the University of Tennessee, Memphis, at the Cleft Palate Symposium at Duke in 1973, presented a complete bilateral cleft lip and palate which had an early premaxillary setback by vomer resection. This was followed in 10 weeks by a primary forked flap for columella lengthening at the time of lip closure. The result shown at one year was promising.

**PRIMARY FORK PLUS ADHESION**

Peter Randall, influenced by Pennsylvania youngsters’ constant first request, “Please fix my flat nose,” has been experimenting with early forked flaps in complete bilateral lips. In 1971 Randall was “lengthening” the columella at the time of the definitive lip surgery but with minimal effectiveness as judged by the photographs. By 1972 he indicated his change by shifting the forked flap into the columella during the primary adhesion procedure. He wrote:

In bilateral clefts only one side is done at a time. At the time of the initial adhesion, a forked flap lengthening of the columella has worked well in a number of cases.

By the 1973 Copenhagen Congress, Randall, with Arthur Brown, elaborated:
In severe bilateral complete clefts of the lip the steps in repair have been first a forked flap reconstruction of the columella and a unilateral lip adhesion at the same operation. Secondly, a lip adhesion on the opposite side sometimes in association with closure of the soft palate. These two operations are usually carried out at three and six months of age. . . . The early reconstruction of the columella has led to marked improvement in the position and growth of the nasal tip. It uses tissue which is otherwise likely to be scarred in many of the procedures currently used for bilateral lip repair. The lip adhesion has been a considerable help as a gentle dynamic force for repositioning the protruding premaxilla.

In 1974 in Seattle, Randall, with Dennis Lynch, expressed his approval of placing nasal tissues into more normal position to facilitate growth rather than worrying about whether early scars might discourage normal growth. Peter Randall and I had a chance to discuss personally and at length what he has been doing. In his first case in 1965, he shifted one fork at a time and brought about what he referred to as "an unnecessary amount of distortion." It could be added, "and a limited amount of columella lengthening." Since then he has carried out 20 more so-called primary forked flaps and has varied his approach using a different timing of procedures in each group of two or three cases. In one he did the standard primary forked flap which I described. His other combinations included a one-sided primary forked flap with definitive lip closure which ended in a crooked result, as might be expected. In still others he did a lip adhesion, then a primary forked flap and finally, in the third stage, a definitive lip closure. In some he did a primary forked flap and a lip adhesion on both sides. The combination he seems to favor is a primary forked flap accompanied by a lip adhesion on only one side. He emphasized maintaining the ligamentous attachments of the probalbium by extending the V-shaped incision at the base of the columella farther up into the nasal tip to preserve for the probalbium the columella-lip angle with "its underlying fibrous attachment to the nasal spine." When the premaxilla is protruding, Randall closes the raw donor area of the forked flap on one side with sutures. On the other side he creates a unilateral adhesion by turning the undisturbed vermilion from the side of
the prolabium under a mucosal flap lifted from the cleft edge of the lateral lip element.

Sometimes a buried fixation suture at this point can help.

I predict from experience that this will not prevent down-drag of the lip with vertical lengthening, and even Randall already admits both lip lengthening and obliteration of the columella-labium angle in certain cases. In fact, in three he has found both loss of the columella-lip angle and lip elongation and in another two just lip lengthening, for a total of five. In my series of primary forked flaps, of course, not all lips were pulled long and a buried fixation suture was used. When it did happen, however, this sequela daunted my compulsion for early release of the lip from the nose.

Randall candidly enumerated the other secondary deformities occurring, but with so many varieties it is impossible to tell which caused what. Besides the 10 wide prolabiums and the five long lips already discussed, three had to have secondary columella
lengthening and another four deserve it. Two columnellas were atrophic, two were bulky, five were retracted and one was hanging. Only two, in fact, had none of the defects noted, but remember, the nasal tip was more or less up and this is a nasal advance.

A TWO-STAGE PRIMARY FORKED FLAP

Australian Harold McComb of West Perth in 1975 presented his modification of the primary forked flap. His first step is presurgical orthodontic correction of the "displaced segments of the maxillary arch" stabilized by a sucking plate. At 6 weeks of age, the primary forked flap is advanced into the columella and sits on top of the remaining prolabium to gain a length of 5 mm. At 3 months of age, through upper buccal sulci incisions, all the skin of the nose is elevated, particularly over the alar cartilages. Silk sutures through the intercrural angles of the alar cartilages are brought out at the nasion and tied to correct the downward rotation of the alar cartilages and elevate the nostril margins and lining. This adjunct promises an interesting lift.

The remaining prolabium is interposed between the lateral lip elements without muscle-to-muscle approximation, while retaining its old vermillion.

In fact, the nasal part of this procedure is superior to the labial part. Yet, the join of the columella to the lip shows an abrupt demarcation line, and further, this limited length of forked flap
does not provide sufficient release to the snubbed nasal tip. As noted by McComb, his results are too new for true evaluation.

**Forking the Entire Prolabium Primarily**

In 1973 Ivo Pitanguy of Rio in his own clinic publication, *Boletin de Cirurgia Plastica*, with Luiz Carlos Garcia, Guido Gendarillas Velarde and Gilson Dotto, adapted his 1967 secondary use of the total prolabium as a forked flap to create a columella in what is actually a primary forked flap without leaving any prolabium to construct the central philtrum. He slides the split prolabium partially into the columella as a forked flap and lets the tips splay, as I have suggested repeatedly, to form the nostril sills. He also discards circumalar crescent excisions, evidently to facilitate alar base rotation, and then joins the lateral lip elements to each other in the midline with one unnatural, potentially contracting, vertical scar. His justification for this rather radical action concludes:

> By an extensive observation of 164 cases operated by the senior author, we have concluded that the fact of joining the two lateral inner sides at the medial line will permit us to join the muscle fibers of one side to the ones of the opposite side. This avoids the need of suturing the muscle to the prolabium for in reality, it does not bear muscular fibers. Thus, a real functioning muscular band is achieved, which will re-establish the force antagonism, which assumes a vital importance in the face edification, regarding the premaxilla reposition.

In my opinion this modification of the forked flap is no more functional and is certainly less aesthetic, as is graphically demonstrated in the two cases Pitanguy presented in his clinic bulletin. Although the color photos are vague in focus and angle, it seems that in the more pleasing of the two he has actually preserved the central prolabium for a philtrum, as in the standard primary forked flap. In the second case he used the total prolabium for columella, and consequently the lip and philtrum have suffered for it. The following case of mine is pertinent to this argument.

Although it was encouraging that surgeons were willing to
make valiant efforts to correct the lip and the nose in one stage, the results were not perfect and the hazards and problems were real. Even with the originator’s edge I had one case that proved to be such a problem it deserves description in detail.

A DIFFICULT COMPLICATION

On December 12, 1966, at nine days of age, a primary forked flap was cut from the prolabium and advanced along the septum with elevation of the depressed nasal tip. The lateral lip elements were freed widely and sutured to the residual prolabium. The lateral vermilion flaps overlapped prolabium vermilion. The infant had a severely protruding premaxilla and a small prolabium, but closure was still obtained.

Then a mistake was made! A maxillary plate, fitted previously, was inadvertently left out during surgery, and on the first post-operative day an attempt to reinsert the plate caused the lip closure to pull away on one side and eventually to separate on both sides. Emergency resuture was of no avail. The forks on the columella were left in good condition, but the diminutive prolabium was further reduced by its forfeit of the forks. Now, with three raw sides and only the premaxillary blood supply, it gradually shrank and was scarred to oblivion.
Six months later, on June 30, 1967, a Hagerty-Mylin maxillary spreader type of screw plate was pinned in Miami by William Mylin of Charleston, South Carolina. About a year later, on July 7, 1968, resection of 1 cm. of vomer allowed setback of the premaxilla so that the lateral lip elements could be approximated to each other. On October 8, 1969, the soft palate was approximated, and on July 14, 1971, the anterior hard palate cleft was closed with a vomerine flap. Iliac cancellous bone chips packed between the alveolar bone gaps and struts were overlaid across the clefts.

Four years after lip closure, on July 5, 1972, the midline lip scar was excised. A long, 2.25 cm. Abbe flap was transposed into the lip defect and trimmed at its distal end to blend into the columella base. Seven months later a pharyngeal flap was attached to the velum. As the alar bases were still too wide, they were corrected with a general technique being used primarily in unilateral and bilateral clefts routinely now.

The alar bases were freed and divided into two flaps each: one anterior to advance to the columella base and narrow the nostrils; one posterior in nostril sill, denuded of epidermis, to join its mate from the opposite side with a Mersilene suture through a tunnel behind the columella to add bulk and to secure the alar advance.
Maytag Fellow Arnold Arem from Peacock's Tucson unit sketched the above records of the procedure.

After several years of experience with the primary forked flap, it finally occurred to me that this “all-in-one” method, although available for “one-shot” cases, was probably too hazardous for general use. There had been rumors of prolabil loss elsewhere, whatever the cause, but then I myself watched one shrivel and scar. Yet the cardinal disadvantage of the primary forked flap procedure was the impossibility of including the Meyer-Schultz-Browne-Glover principle of joining the lateral mucosa and muscle behind the prolabium to form a functioning lip with an upper labial sulcus.

**ANOTHER ONE-SHOT CLOSURE**

Jack Mustarde, a canny Scotsman with a knack for getting the better of the other fellow, spent three years as a P.O.W. and ended up writing a best-seller on his experiences. Gillies’ early influence stimulated him to venturous innovations, and one example was his 1971 one-stage rendition of the primary simultaneous lip and nose correction in bilateral clefts. He isolated the prolabium from all of its blood supply except that coming
through the premaxilla but left it its original size. He then cut quadrilateral flaps vertically from the lateral lip elements, which often cannot spare the tissue. These lateral flaps first were transposed in the manner of Trauner across between the prolabium and the released columella base and then were shoved side by side one step further as upside-down forks up into the columella to end head-on under the nasal tip. On paper this maneuver seems to be an improvement over Trauner in that it gets more columella out of the lateral flaps, but again there are some real disadvantages. It faces the hazards my primary forked flap did which finally caused it to be set aside for a better and safer approach. Moreover, the lateral lip muscles cannot be joined together behind the prolabium, no upper labial sulcus is formed and the *early complete* division of the nasal tip from the prolabium is almost certain to result in a lip too long in its vertical dimension.

**Haste Makes Waste**

I think it is fair to conclude that any one-shot procedure that by its rapid execution forces omission of any important aspect has only speed in its favor. If speed is not required, its use is unjustified.
First came full realization that lateral muscle and mucosal union behind the prolabium had too many marks in its favor to be ignored. There was the creation of an upper labial sulcus, excellent muscle function in the lip with less tendency for prolabial spreading and reduction of tension on the skin during closure, resulting in better scars. Yet a personal determination to save the lateral parings of the prolabium as a forked flap for the columella had me searching frantically for a way to set the forked flap aside temporarily. Then I learned of Duffy’s banking maneuver.

Colonel Michael M. Duffy, now chief of plastic surgery at Brooke General Hospital, Fort Sam Houston, builds Kentucky rifles in his spare time and has sailed the East Coast from Nova Scotia to Florida. A constant sailing partner was William C. Meloy, his stepfather and one of the founders of the American Board of Plastic Surgery. Meloy diverted Duffy’s interest in biology research by explaining:

Research on sea urchins is fine but if you discover anything worthwhile you need an M.D. to apply it to man.

and from there to plastic surgery was easy. Duffy joined the regular army for residency training and eventually was stationed at Walter Reed Hospital. Duffy recalls:

This meant I had to sign on for three years of plastic surgery—two at Walter Reed and one with Dr. Brown in St. Louis. The first two under Bill
Tumbusch and Bob Parsons were a relaxed blend of modified Blocker and Brown philosophies. At the end of two years the Army residency was approved to stand on its own and I desperately wanted to avoid carrying Dr. Brown’s brief case for a year.

As it turned out, he remained at Walter Reed through the bulk of the Vietnam reconstruction. An excerpt from his philosophy is enlightening:

I abhor the practice of applying a stereotyped operation to a patient whether it fits or not, and think that all surgery should be innovative and adapted to individual needs, with always the question in mind “how can I do this better?”

In 1970 Duffy described a modification of the Meyer-Schultz-Browne-Glover approach by undermining the prolabium from the premaxilla except at its inferior vermilion attachment. This created a tunnel into which he united the lateral lip elements to obtain muscle closure. In one case he cut the forked flap from the prolabium but “banked” it in the nasal floor for three years, after which he advanced it into the columella. The prolabium tunnel approach seemed unnecessarily complicated, but the principle of banking the forked flap was appealing. From his description, just how he stored the fork was rather vague. In 1971 he published illustrations.

In my first attempts, I let the fork prongs into transverse subalar base incisions “whisker fashion,” much as Duffy’s diagrams indicated; this was the first hop in their flight toward the
nasal tip. The incisions being hidden in the natural nasal creases, they are usually unnoticeable. Then I ran into an unexpected problem. The mucomuscular closure behind the prolabium had been achieved but *not with adequate medial advancement in the upper part of the lip and alar base*. This discrepancy had been passed over during the first stage probably because of preoccupation with the subalar incisions and storage of the fork.

In a month, when the time came to continue the "flight of the fork" and advance it into the columella, I found it somewhat difficult to advance the alar bases from their wide position without compensatory triangular skin excisions at the bases. These excisions facilitated the action but added to the cheek scarring.

This is the case that eventually precipitated an important change for me. An elastic band on the headcap had achieved some premaxillary retraction.

At two and a half months, a one-stage lip closure was done.

1. Prolabium freed from premaxilla and lateral lip elements freed from maxillae.
2. Forked flap pared from prolabium.
3. Mucosa and muscle joined to each other behind the prolabium.
4. Lateral vermilion flaps used to overlap prolabium vermilion.
5. Forked flap banked in subalar incision, whisker fashion.
Although the lateral mucosa and muscle had been united in the midline, the upper muscle approximation had been timid and the alar bases had not been advanced medially in an attempt to leave a subalar gap in which to store the forks. This allowed subsequent lateral pull to spread the prolabium, broaden the cupid’s bow and leave the alar bases flared. Then, when it came time to shift the forked flap, advancement of the wide alar bases required Burow-Imre-Szymanowski lip-cheek triangular skin excisions with less effective base positioning and more scarring.

6-1-70. Forked flap at 8 months of age.

2 weeks postoperative

1 year
The columella is long enough and, although it is too broad and retracted, it can be corrected easily by narrowing and inserting a septal cartilage strut at about 16 years of age. The bow is too wide and will have to be reduced by another type of forked flap based above on the nostril floors and let into a releasing incision in the membranous septum on each side to correct the columella retraction. The cheek scars have finally faded—and so did any enthusiasm for this modification.

It had become obvious that medial advancement of the lateral lip elements and the alar bases to near normal position should be accomplished in the first stage. But in that event prongs of the

Comment: Primary advancement of the alar bases with fixation was developed from experience of this case.
fork adequate in length to release the nasal tip would be quite long for a subalar incision unless it curved around the alar base as a handlebar or Hercule Poirot mustache. Another banking process was sought.

**THE "PRAYING HANDS" PYRAMIDS**

The next attempt, which was popular for a time, banked the forks by suturing them to the alar base flaps, at first end to end. Then the slack was further taken up by continuing their approximation belly to belly with the joined ends projecting like a pair of pyramids.

When it was time for columella lengthening, the prongs of the fork and the alar bases were separated except at their tips, and the resultant long strap was rotated up into the columella bilaterally. This had advantages over the previous approach and was used in a number of cases with reasonable success.

There remained three questions: how to advance the alar bases, how to bank the forks better and when to cash them in to the columella. When the alar base was merely sutured to the fork, no dramatic medial rotation of its flare was possible. Thus it was decided that definite and permanent alar base positioning deserved greater priority than its being a temporary playmate in the forked flap banking game.

**JOINING ALAR BASES TIP TO TIP**

The alar bases were freed from their lip elements as before, and some correction of the flare was achieved by muscle-to-muscle union in the midline under the prolabium. To increase this action, the tips of the alar base flaps were denuded of epithelium, advanced even more medially and sutured to each other at the nasal spine. The result was indeed impressive alar base positioning, but what to do with the damned forks?
FORKED POLYPS

In one case, they were tubed on themselves and tied together in front of the nose, finally becoming two projectile mounds available for columella construction later. They looked funny and caused questions from parents and friends.

WHISKERS

In the next case, the alar bases were again joined to each other subcutaneously in the midline and the forks partially tubed on themselves and let into the transverse incisions between the lip and alar bases, whisker fashion. This is probably the best method of all.

DECISION TO DELAY FORKS

My second concern was the optimum time for shifting the forked flap into the columella. Although early correction seems ideal, there is no question that total division of attachments between lip and nose, as achieved with a forked flap and other flaps introduced between columella and lip, has a tendency to allow lip elongation. Once the original attachments of the lip to the nasal spine have been severed, the lateral lip muscles seem to pull a vertical length in the lip and drag the tips of the forked flap back into the lip. This seems a more likely event in complete bilateral clefts and may justify a delay of several years in the second stage of the forked flap.

The next modification tried was in the method of columella lengthening. Instead of the usual membranous septal incision for the forked flap advancement, a more superficial dissection was used. In one of the cases in which the forks had been left protruding like horns, these projections were freed and opened and, in continuity with them, the skin of the anterior columella was elevated as a flap based on the nasal tip. Thus the spread medial crus of the alar cartilages was exposed, and all tissue between the cartilages was excised so that they could be sutured together with nylon to lengthen the columella and sharpen the
nasal tip. The forked flap, united two-thirds of its length, was advanced into the columella, and its distal ends were allowed to splay as columella bases to join the alar bases to form the nostril sills. The only advantage of this approach seemed to be that the main attachments of the lip to the nose at the nasal spine were left intact with a possible reduction in the chance of subsequent vertical lip lengthening and columella down-drag. The disadvantages seemed to be less columella lengthening and some danger of inadequate vascularity for the ends of the fork with such a thin columella base.

ADVANCE ALAR BASES AND STILL BANK WITH "PRAYING HANDS"

An improvement in the banking procedure makes possible the cinching of the wide nasal base simultaneously with the banking and will be described later in detail. In principle, it splits the alar base flaps into a skin flap D and a subcutaneous pedicle d. The subcutaneous flaps are sutured to each other and to the septum above the nasal spine, effectively reducing the flare of the alae and narrowing the wide nostrils. The alar base skin flap D is left free to approximate the corresponding fork to form a nasal sill pyramid. In fact, these flaps in gentle apposition are symbolic of Albrecht Dürer's 16th-century Praying Hands offering the hope that the banking will be sound, with safe preservation of the deposits immediately available upon withdrawal for columella payment.

CHOICE OF BANKS

Of the three banking maneuvers, polyps, "whiskers" and "praying hands," the polyp approach is obsolete. For a time, I favored the "praying hands" method as it cleared the forked flap from the lip completely and joins the prongs to the alar bases for a strap flap advancement. It is, however, responsible for more nasal obstruc-
tion, requires more postoperative care and cleaning and is a little more complicated as regards to maneuvering the flap eventually into the columella because it requires bilateral strap formation and partial opening of the pyramids prior to advancement up along the septum.

The forked flap can be inserted between the lip and the alar bases bilaterally in “whisker” position without difficulty, even after reduction of the alar flare, and retrieved for the columella as easily without lip scarring. It presents less nasal obstruction and requires less care during the weeks, months or years of banking. It has shown the least amount of shrinkage. For these reasons, the “whisker” position has become more popular. It is definitely the banking of choice in out-of-town cases and was used in the first stage of the bilateral cleft case which Simon Fredricks scheduled as a backup for the TV presentation of operations before the American Society of Plastic and Reconstructive Surgeons in Houston in 1974.
SHRINKAGE

Randall and Lynch reported in 1974 after an experience with two complete clefts:

We have not been pleased with these results as the "banked" tissue has tended to melt away.

Since they also reported that 10 of their cases had postoperative prolabiums which were "far too wide," the partial disappearance of the banked forks might be explained by the fact that the forks were cut so slim in the first place.

The astute Ray Broadbent of Salt Lake City's Primary Children's Hospital was another of the few who have tried banking
the fork but he too was disappointed with the apparent shrinkage of his flaps. A closer scrutiny of this phenomenon is warranted.

OSTRICH LOGIC?

Broadbent and Woolf in 1972 admitted:

The flat nose remains as an unanswered problem in the primary repairs.

They follow the same plan of reducing the width of the prolabium to philtrum dimensions as I have advocated, stating:

The cupid’s bow should not be more than 3 mm. from the bottom of its peak on either side.

They then “throw away” the excess, justifying this disregard of principle with

We have found “banking” of small flaps in the floor of the nostril to be of no value.

They do wisely place the excess in the floor of the nose, but spurning its value:

Admittedly, the latter is inadequate tissue for suitable nasal tip elevation but it does give body to the nasal floor.

Of course, this judgment depends directly on the ingenuity of their banking, the size of their flaps and the cover of their raw areas. Studying their fine results suggests that a Mormon thriftiness possibly has restricted prolabium reduction short of normal except in one case with an almost adequate columella. If the prolabium is reduced a bit further to 5 to 6 mm. by paring more generous forks and retaining their vermilion border for extra tissue and cover inside the nose, quite substantial flaps can be salvaged and safely stored for subsequent columella lengthening.

Broadbent was challenged with this solution, and his most recent reaction was:

I must admit you have larger flaps tucked in the nose than I have been putting there, but I have given this procedure up and frankly don’t have an answer to elevation of the tip of the nose at the time of primary repair.
Here is a case in point by Broadbent in which the prolabium has been reduced but the columella is short and as the lip is good there is no tissue available for the nose.

Both Broadbent and Woolf go along with my 1970 stand that the scar of infancy is superior, rendering reentry objectionable. They wrote in 1972:

It is our opinion that the best lip scar is the first one produced and the surgeon must arrange the scar pattern with intent not to disturb it.

They face the residual persistent short columella with two procrastinations:

[1] The tissues for correction of the flat nose are, in our opinion, in the dome of the flaring nostril, it remains a challenge for all of us to find the right way to place them satisfactorily into the nasal tip.

But I say it will still require extra skin for the columella lengthening, whatever is done to the tip cartilages.

[2] Timing is unimportant. Those who say that the flat nose deformity gets worse and must be corrected early may rue the day of that early surgery, when the resultant scar limits what they otherwise could accomplish by rhinoplasty.

Shifting sufficient skin into the columella can only facilitate the later rhinoplasty.
PLAY NOW, PAY LATER

To discard valuable portions of prolabium and create "invisible" scars of infancy may produce a lovely lip which can be enjoyed and boasted of temporarily. Eventually one must pay through the nose for this frivolity, for with no stored tissue available and no extra tissue remaining in the lip, the bridge has been burned and the tip of the nose stays down.

Broadbent got in the last word if not the best tip elevation in October 1973 when he wrote as a P.S.:

We're elevating the nose in bilateral clefts early in infancy with a composite graft from the ear.

Here in the margin is an example by Broadbent and Woolf.

MUSCLE UNION STILL NOT UNIVERSALLY ACCEPTED

At the Cleft Lip and Palate Symposium at Duke University in the spring of 1973, Georgiade, Brauer and Broadbent had each given a 10-minute dissertation on their ideal procedure for management of bilateral cleft lip. Not one of these three giants in the field had approximated the lateral orbicularis oris musculature across the cleft over the premaxilla. The undercurrent of feeling among them seemed to be that such action over a projecting premaxilla called for too much tension.

THE ROOKIE FROM AKRON

During the presentations at Duke, young James A. Lehman of Ohio, trained by Musgrave and having had a Maytag Fellowship in Miami, sat and listened. Later he said:

All of these techniques failed to describe muscle to muscle union and all produced an extremely wide and undesirable prolabium. I decided that I could no longer sit through the old method of correcting these deformities. Waving the muscle banner, I proceeded to tear at the old facade created by these paragons of plastic surgery.

In fact he raised his hand and challenged the panelists:

What about the importance of getting muscle union across the cleft?
There was a short silence. Who the hell was this upstart? As moderator of this panel I encouraged Jim:

That's the boy, Jim, carry on!

He held his ground with the courage of his convictions. Ray Broadbent led the counterattack:

I do not feel this is important. There is too much tension.

I reminded Ray that we both felt the prolabium should be of philtrum dimensions, which meant moving the lateral muscles at most only another 3 mm. from each side. Then, as they are not sutured to the pitiful little prolabium but to each other, the tension is absorbed between themselves leaving the unharassed prolabium free to rest quietly over the muscles in the center of the lip.

Four months later in Copenhagen I moderated another bilateral cleft lip panel. Georgiade again was the leadoff man and he was followed by other famous surgeons such as M. Perko of Switzerland, G. Pfeifer of West Germany and T. Skoog of Sweden. Not one of these panelists advocated truly joining the muscles across the cleft. Program chairman B. Johanson had requested that the moderator participate, so among other aspects the importance of muscle union was stressed.

Peter Randall, at the Duke Symposium and again in Copenhagen, continued to pound his point with a catchphrase "think muscle" merely on the basis of his little triangular muscle flap transposed from the weak to the strong side in the inferior portion of the lip on one side in unilateral and on both sides in bilateral clefts. Yet even he was not actually joining muscles in bilateral clefts, and I was provoked to suggest:

Peter, let's stop this "think muscle" and get on with "act muscle" by really joining them across the cleft.

The spirited Ian I. Jackson of Glasgow, Scotland, stood several times during this International Congress in Copenhagen to concur with the importance of joining the orbicularis oris muscle in cleft lip. This was his stand:
Conventional methods of repair emphasize skin rather than muscle reconstruction and disregard the anatomy of the cleft muscle. In the lesser segment careful dissection has shown it to be inserted into the dermis at the cleft margin, the alar base and the front of the maxilla; in the greater segment the insertion is largely into the nasal spine and the base of the columella. The most important part of the repair is detachment from this insertion and accurate reconstruction. The method of skin repair is now considered to be of much less importance than in the past since lip length and contour are controlled by the muscles. In the bilateral case a procedure based on that recently published by Millard has been successfully developed.

A discussion with Randall later in 1973 revealed that he had been incited out of "think muscle." He now follows his two-stage forked flap and bilateral adhesion with a later two-stage definitive lip closure that dissects the muscles widely. The muscle of one lateral lip element is freed from mucosa and skin, brought down and passed through a tunnel in the prolabium, somewhat in the Duffy fashion, but well across to the opposite side. In a second stage he repeats this muscle shifting on the other side with an actual crisscrossing of the muscle fibers. There are several discrepancies here, however, such as an area without muscle—and possibly contour too—in the upper triangle of the lateral lip element and an adjacent one in the upper prolabium. Then, too, even after these four operations there is still no labial sulcus!

In fact, in 1974 Randall and Lynch acknowledged:

Though the forked flap reconstruction and the overlapping of muscular flaps through the prolabium jeopardizes the blood supply to the philtrum we have had only a few minor areas of tissue loss in these patients. It should be noted that the midline vermilion is left intact with the underlying gingiva so as to provide an additional blood supply. This means that reconstruction
of the sulcus will have to be done later. It is interesting, however, that only five of our patients have "whistling" vermilion deficiencies perhaps reflecting the addition of muscle to the prolabium.

**MUSCLE UNION CAN FOLLOW AN ADHESION**

In 1974 Oneal, Greer and Nobel of the University of Michigan reported having adopted my muscle union and forked flap banking for bilateral clefts as a two-stage secondary procedure. They first tried it following a primary bilateral adhesion and found it effective. As they noted, the condition of the nose and lip after their bilateral adhesion procedure presented a short columella, redundancy of lateral vermilion with orbicularis oris bulges laterally and deficiency of the central vermilion. Banking the forked flap carrying the bilateral scars and joining the muscles across the cleft behind the prolabium, followed in two to three months with shifting of the forked flap into the columella, was successful for them as a delayed primary procedure.

In 1975 Alfred Rehrmann of the University of Düsseldorf still expressed his preference for closing the bilateral lip clefts with a two-stage modified Veau procedure, crossing two lateral muscular vermilion flaps into the prolabium vermilion.

Then, at about 5 years, he is willing to cut a forked flap out of the prolabium, join the lateral muscles, and lengthen the columella.
The result he published showed severe lip scars. My contention against not bringing the muscles together in the original closure is that it forces sacrifice of the lovely scars of infancy. To have to go back into the lip at age 5 years to get a forked flap and to get the muscles together is undesirable. This, of course, is the prime motivation for the banking procedure.
The Making of a Cupid's Bow and Tubercle

N A T U R E shortchanged the prolabium to such an extent that this blob's main asset is its skin. It has no cupid's bow or tubercle, and the vermilion encircling it is certainly inadequate. Gillies and Kilner put it this way:

The mucous membrane of the premaxilla, having failed to unite with that of the advancing lateral processes, forms a pseudovermilion border for the prolabium and this has tempted many a surgeon to utilize it in the construction of the new lip margin to the permanent detriment of the patient.

T O S E E O R N O T T O S E E

The prolabium vermilion serves better behind the scene as it is thin and attenuated, with a color and texture slightly different from those of the lateral lip segments. Often its epithelium has a tendency to scale and peel. Here are three probalibums, each with its inferior vermilion demonstrating an offensive but common scaliness.
These characteristics render it more appropriate as a liner of the central tubercle than as the mid-anterior cover. I have been advocating the former role since 1954.

As early as 1927 Federspiel of Milwaukee designed lateral vermilion flaps which he interdigitated beneath the prolabium, but most surgeons have chosen to retain the prolabium’s inferior vermilion. Victor Veau of Paris retained some or all of the inferior prolabium vermilion. Celesnik of Ljubljana and Perko of Zurich have modified Veau to retain a portion.

Other modern methods meticulously design front billing and bolstering of this miserable mucosa. Some surgeons, like Cronin and Georgiade, use only a small section of it, which often presents a pink peekaboo patch in the center of the lip red.

Bauer, Trusler and Tondra, in similar principle, retain a rather wide vermilion cuff on the prolabium and introduce lateral vermilion behind it in two stages.

They admitted in 1971:

The most noticeable disadvantages to this method of cheilorrhaphy have been concerned with the utilization of the mucous membrane of the prolabium to form the central portion of the vermilion of the lip. This does not seem to be completely normal mucous membrane. It has a tendency to dry out and occasionally to fissure. However, we have noted that as the patient matures, the quality of the mucous membrane tends to improve in
both function and appearance. In most cases there seems to be a rather dramatic improvement in the quality of the mucous membrane at about 10 years of age.

They then mentioned the common problem of notching in this same area, indicating to me that if after all this perseverance with the abnormal mucosa secondary surgery is still required for the whistling deformity, it just was not worth it after all. Quite apart from all the other disadvantages of this type of vermilion approach, there is far too much visible scarring in the mucosa. Although not quite as noticeable as in skin, white scars in the “red” vermilion are not attractive and should be limited to one midline vertical seam of union in the area of the tubercle.

Manchester and Spina, among others, unroll the entire inferior vermilion and bolster it from behind by various lateral flaps. Broadbent, happy with this aspect of the Manchester method, when challenged about its questionable scaliness during the 1973 Cleft Symposium at Duke, defended salvaging this vermilion in a visible position:

I would far rather have it there than discard it. If necessary, rub a little Vaseline on it if it’s dry.

Randall, in late 1973 in Hollywood, Florida, announced his persistent preference to retain this vermilion in a visible position.

It is encouraging to see that Cronin has gradually shifted the prolabium vermilion out of sight. In 1957 he kept a triangle in front, in 1964 he retained a cuff but by 1971 he left only the ridge and turned the rest of the vermilion behind the lateral vermilion flaps. In October 1973 he reconfirmed his decision to hide or discard this prolabium vermilion.
Here is an example of a case by Cresswell using his narrow lateral muscle flaps joined under the prolabium vermilion which achieved a full-bodied central free border. Because of Cronin's earlier influence, Cresswell had retained the prolabium vermilion in a visible position with an unfavorable effect. Its subsequent removal improved the result, but secondary excision is more difficult and tends to produce more scarring of the vermilion.

Too often traditions are passed down from generation to generation parrot fashion. José Barros Saint-Pasteur in a 1964 issue of *Revista Latino-Americana de Cirurgia Plastica* stated flatly:

The vermilion of the prolabium must never be excised.

and gave Axhausen, Veau, Schultz, Trusler, Marcks, Cronin and Spina as his defense. Of those no longer with us or retired, Trusler had second thoughts on this subject before his passing. Cronin and Spina are left, but Cronin prefers to hide this miserable piece himself now.

Since 1954 I have been using the inferior vermilion of the prolabium as a hidden backup lining for the center of the vermilion free border. Overlapping it with equal vermilion flaps from the lateral elements not only partially camouflages the bilateral cleft effect but places the scar of union in the unnoticeable midline, creates a tubercle and remedies "whistling deformity" deficiency.

It was pleasing, therefore, to see Musgrave's 1972 editorial against front billing of the prolabium vermilion in Goldwyn's *Unfavorable Result*.
While it is imperative that the central mucocutaneous ridge be saved, the vermilion of the central prolabium can be very poor building material. As the years pass, this central mucosa frequently becomes dry and parched and may develop superficial keratotic plaques, particularly in cold weather. The knowledgeable surgeon should, therefore, as much as possible, introduce lateral vermilion medially underneath the prolabium in interdigitated fashion and should bring in also adjacent lateral subcutaneous tissues. Nothing should be discarded other than a minimal paring of epithelium. The central prolabium mucosa should be turned as a hinged flap for lining. Like the unattractive chorus, it is essential to the overall production but should not be "front and center."

In 1974 Oneal, Greer and Nobel of the University of Michigan noted:

There is controversy about where to place the original prolabial vermilion. Both Manchester and Duffy use it anteriorly. We suggest that it is better to move it posteriorly, leaving the prolabial white line and bringing the redundant vermilion of the lateral segments to the midline. If even a small remnant of the original prolabium vermilion is left below the prolabium, it is always noticeable; this does not give as normal a vermilion contour, and the resulting groove (so commonly seen) is difficult to correct.

A MADE BOW IS BETTER THAN NO BOW

There are also many surgeons who feel that the mucocutaneous junction of the prolabium is sacrosanct. In 1971 Cronin included in his eight established bilateral principles:

The vermilion ridge, or white line of the inferior border of the prolabium, should be preserved.

The prolabium, however, seldom sports a snappy "white roll" ridge at the mucocutaneous junction and never the sensuous double curves of a normal cupid’s bow. Rather the mucocutaneous junction encircling three-quarters of the prolabium is vague and runs in a rounded, uninteresting, single curved line and can be discarded without emotion for a better one.

If in a certain case the mucocutaneous ridge were truly prom-
inent, it certainly could be saved with advantage since a scar above the white roll could thus be avoided. Yet it is better to bring in a true ridge from the sides if the prolabium mucocutaneous junction is not literally outstanding.

**VERMILION FLAPPING IN EVERY DIRECTION**

The vermilion encircling the border of the prolabium is inadequate and of different color and texture but it can be used to advantage. The vermilion of the cleft edge of the lateral lip element is attenuated in its upper part but soon swells into normal fullness and is ridged with a true white roll. Even the upper attenuated portion in the lateral elements can be of value. Yet to achieve the most efficient and economical use of all tissue, quite a bit of juggling of vermilion flaps is necessary.

The decision to hide the inferior prolabium vermilion is logical; to scrap its mucocutaneous junction depends on the specific ridge. A double curve cupid’s bow incision at the prolabium mucocutaneous junction allows the turndown of the inferior vermilion as a flap (e) based on the free border. As much cuff is developed as is considered necessary to back the lateral vermilion flaps to form a full-bodied free border and tubercle. Enough base for viability must also be maintained. Then the remaining posterior inferior mucosa of the prolabium, along with the posterior half of the vermilion border of its sides (m), is cut free from the prolabium as it itself is dissected free from the premaxilla. These portions are left attached to the premaxilla in the vague shape of an inverted M of mucosa which is used to cover as much raw area on the premaxilla as possible to aid in creating one side of an upper labial sulcus.

The attenuated vermilion of the upper cleft edge of the lateral elements is trimmed upward as flaps (l) to be used to fill the vestibular defect after alar base release. The lateral edge paring then continues as full-bodied vermilion flaps carrying a true ridged white roll (b) if required. These flaps are incised and transposed to overlap the prolabium vermilion turndown flap (e).
The incorporation of the white roll in the lateral vermilion flaps also offers a camouflage by interrupting the vertical lip skin scars. The lateral vermilion flaps, when topped with the white roll ridge, continue this line across the vertical bilateral skin scars under the inferior border of the prolabium. Each curves half of the cupid’s bow to meet the other in the midline, and any excess vermilion can protrude as tubercle. The chance of a whistling deformity has simply been averted.
25. Bilateral Cleft Game Plan

REGROUPING BEFORE THE CHARGE

In the bilateral cleft, as there is no normal side with which to compare, it is necessary to project the general ideal normal in the mind’s eye just above the specific case. A constant comparison between these two by a vertical nystagmus will facilitate the transformation.

Before we make a final outline of the present approach, let us review again specific bilateral goals. All of us want to produce a lip that is not too tight transversely or too long vertically—one that has an adequate upper sulcus, muscle-to-muscle union, a white mucocutaneous roll, a full vermilion, a cupid’s bow with a midline tubercle and a dimpled philtrum of natural shape. We should like to achieve these in infancy when scars tend to heal smoothly.

All of us abhor having to go back into an excellent lip, which has nearly invisible scars from surgical closure in infancy, to get adequate tissue to correct the nose. To get a good lip and avoid reopening it forces the banking of the forked flap. The ultimate manner of banking may vary, but the principle is here to stay.

All of us want a columella long enough to allow the nasal tip to stand proudly forward with alar bases that are in a normal position, forming a nostril sill with the feet of the columella base. It would be ideal if this could be achieved early—for better scars, for better nasal growth and development and to avoid the patient’s enduring the stigmas of the typical mid-stage broad lip and flattened nasal tip deformities during preschool and school years.
Long-term banking is inconvenient, but experience continues to prove that division of the nose from the prolabium in infancy, particularly in complete bilateral clefts, results in a lip that becomes too long in vertical dimensions. Thus, at least in complete clefts, the second-stage shifting of the forked flap into the columella is better postponed until preschool age of five to six years. The two-stage forked flap has the added advantage of avoiding convergence of the points of five flaps all at the same time with the threat of compromising the healing at this center of scar confusion.

A CHANGE OF EMPHASIS IN PRINCIPLES

Thomas Cronin, under whom I trained for a time, for whom I have respect and with whom I occasionally disagree, stated in 1971:

Certain principles and objectives of treatment have become fairly well established. These are:

1. The prolabium should form the full vertical length of the middle of the lip.
2. The vermilion ridge, or white line of the inferior border of the prolabium should be preserved.
3. The thin prolabial vermilion should be built up with vermilion muscle flaps from the lateral lip segments but no lateral skin flaps.
4. Correct disparity between premaxillary and maxillary segments of the alveolar arch, preferably nonsurgically.
5. Prevent or correct, if possible, collapse of maxillary segments behind the premaxilla.
7. Bone grafting to stabilize the premaxilla.
8. Lengthen the short columella.

Four other fundamental principles merit consideration and even priority.

1. Premeditated adequate columella planning will avoid the need for later lip reentry. Mere paring of the edges of the prolabium is wasteful; reduction of the prolabium to natural philtrum size and shape is desirable; the columella is too damn short, so the forked flap banking maneuver is indicated.
2. The creation of continuity of the prolabium with the lateral lip elements involves joining lateral mucosa for sulcus, muscles for function behind the prolabium and "white roll" and vermilion for scar camouflage and cupid's bow below the prolabium.

3. Early and permanent nasal alar base positioning is ensured by primary medial rotation and advancement of these bases with their denuded tips or subcutaneous pedicles attached to the septum for stability.

4. Total division of the prolabium from the nose should be postponed. Eventual picking up or unfolding of the banked forks and alar bases to make possible their medial swing across the nasal floors and up into the columella will achieve columella construction and nasal tip release. A banked homologous septal cartilage strut may be used for extra temporary support. This probably should be accomplished before school age of five to six years to avoid impeding physical and psychological growth.

TWENTY-ONE STEPS

Thus the steps in the management of bilateral clefts of the lip and palate can be increased to 21.

1. Practical but undercorrected positioning of the premaxilla in preparation for lip surgery (A, B or C).
   A. Elastic band to headcap.
   B. Orthodontics (McNeill-Burston-Hotz-Rosenstein).
   C. Mechanical squeezer (Georgiade-Latham).

Ears, palate and lip

2. At two to four weeks insertion of ear tubes if indicated.
3. At the same time closure of the soft palate (when possible).
4. At the same time definitive lip closure.

Definitive closure

5. Use of any excess prolabium mucosa to cover the premaxillary raw area.
6. Reduction of prolabium to philtrum dimensions (5 to 8 mm.) by paring forked flap from lateral sides.
7. Turndown of inferior prolabium vermilion with cupid’s bow
incision for use as invisible backing to the central tubercle.

8. Freeing the prolabium from the premaxilla.

9. Turnup of cleft edge mucosal flap from upper portion of lateral lip segments to be used to fill defect in lateral vestibule following release of the alar base from the maxilla.

10. Remaining cleft edge mucosa carrying a white roll ridge cut as a full-bodied flap from each lateral lip element. If the prolabium mucocutaneous ridge is outstanding, then this ridge should be preserved and need not be brought with the lateral flaps.

11. Lateral lip element freed from the maxilla and skin edge freed slightly from the muscle.

12. Advancement of the mucosa and muscle of the lateral lip elements to join each other in the midline in front of the premaxilla and behind the prolabium to obtain an upper sulcus and muscle continuity.

13. Replacement of the prolabium over the joined muscles and between the skin edges of the lateral elements the full vertical length of the lip with no tension on the skin scars.

14. Dimple of the philtrum created.

15. Alar bases cut free from the lateral lip elements as full-bodied flaps and each flap divided into two components, a skin flap and a subcutaneous-muscle flap.

16. The deeper subcutaneous flap advanced to its mate of the opposite side and sutured to it at the nasal spine with Vicryl; alar bases thus advanced on top of the lip advancements with permanent reduction of the alar flare and fixed positioning of the alar bases.

17. Banking the forks by suturing them in pyramid fashion to the alar base skin flaps in the floor of the nose, or better between the lip and the alar bases in whisker fashion.

*Columella lengthening* 

18. Nasal tip release by secondary advancement of the forked flap and alar bases to form nostril sills and columella. (The timing of this maneuver may vary from six months to six years.) This staged forked flap avoids the five points of the
one-stage procedure. A banked homologous septal cartilage strut can be used for early support in the child, and at 15 to 16 years during final scar revisions an autogenous septal strut can be added.

Note: Mersilene suture has been replaced by Vicryl because of occasional postoperative infection and "spitting."

**Palate**

19. Closure of the hard palate with vomerine flap at 18 months. If premaxilla is well within the arch, closure of the alveolar clefts includes any fistulae.

20. Lengthening of palate if necessary after four to five years of age with island flap or reduction of the velopharyngeal aperture with a pharyngeal flap.

21. Cancellous bone grafts into the alveolar gaps at eight years.

This is not a 21-point blueprint for all cases. The principles are there to be adapted to the specific problems. Dentist Simon Hullihen was still paring the cleft edges and approximating them with Paré-type transfixing needles and yet he realized the importance of variation for the individual case. He wrote in 1844 in the *American Journal of Dental Science*:

> But in addition to these general indications a particular plan should be adopted in each operation with the view of making a well formed lip, and this plan must be made with a strict reference to the peculiarities of the case, and be carefully and plainly marked out upon the lip before the operation is commenced.

Again it is important to reflect on those who have had any specific influence, large or small, on the final design being described, and this is their credit line in alphabetical allocation: AdamsBerkowitzBrowneBurstonCollitoCroninDesaultDuffyFaraFederspielGeorgiadeGilliesHortonKernahanLathamMiry MirMuirOnealRandallSchultzWalker.
INCOMPLETE CONDITION

NATURE has left some strings attached to its incomplete clefts which fortunately restrict the severity of the deformity. Usually the premaxilla is united to one or both sides of the maxilla and seldom protrudes. There may be some upper labial sulcus. The clefts in the lip are not complete, and the bridges may be wide enough to have passed some muscle into the prolabium. The integrity of the nasal floors, being intact, reduces the amount of alar base flare, but these floors are usually wider than normal. The nasal tip is less flattened, and the columella can be nearly normal although usually it is shorter than ideal.

WHAT TO DO

If the columella is adequate, the latest rendition of the pure rotation-advancement method is preferred. It has been described in detail at the end of Chapter 15.

If the columella is inadequate, the ultimate result should eventually be about the same but the means of accomplishing it become complicated. All the latest rotation-advancement actions adapted to bilateral clefts are involved.

At first consideration there may seem to be a lot of flaps going in helter-skelter direction like the proverbial Keystone Kops, but actually each action is logical and quite simple in itself. The
necessity in bilateral clefts of doubling each procedure may cause temporary confusion, but the demand for symmetry renders the second side merely a replay.

To facilitate the execution of the basic philosophy of taking what is available that is not needed where it is and shifting it in order to create what is wanted, the surgeon must superimpose in his mind’s eye the ultimate ideal normal result over the original deformity. This vision will not only clarify the problem but project the solution. Prior to the actual surgery, it is well to run a replay elucidating the reason for each specific action. Then, on the final forward rerun, the surgical sequence will be economical, effective, symmetrical and correct.

John Homans of Harvard, a general surgeon with insight beyond his time, said in 1940:

The difficulty with plastic surgery is that it requires imagination. . . . The expert must have an ability to visualize an end result against a most unpromising background and patiently, often in a multitude of steps, work toward the fulfillment of his vision.

No deformity makes this demand more than a bilateral cleft of the lip and palate. To understand one completely we have to do one, and it is logical to start with the incomplete type.

**MEASURING AND MARKING THE PROLABIUM**

In the usual bilateral incomplete cleft of the lip, the vertical height of the prolabium is shorter than the lateral lip elements but is usually long enough. On the other hand, the tissue in the upper portion of the longer lateral lip elements is often attenuated, lacking in muscle and contour. The prolabium is usually wider than a normal philtrum, but the columella is shorter than ideal. These four conditions suggest that the prolabium should set the vertical height of the lip, that the upper portion of the lateral elements are expendable and that the sides of the wide prolabium are available for eventual lengthening of the short columella.

If a vertical line is dropped straight from the lateral base of the columella on each side to the inferior mucocutaneous junction of
The double arch of the cupid’s bow is marked on the inferior prolabium which from peak to peak will be 4–10 mm, or 2 to 5 mm. an arch.

Vermilion below the bow is turned down for lining.
Calipers are marking normal and equal commissure to bow peak limit point on each side as well as half a bow distance on the lateral edge for flap b.

The vertical height of the prolabium is being matched along the lateral.

When the upper vermilion edge is attenuated move laterally as far as possible out to the limit point.

Then measure the future opposing edges for perfect matching.
the prolabium, the distance will average from 8 to 13 mm., which is a normal upper lip length. The width between these lines should be from 4 to 10 mm. (preferably 6 mm.), or the size of a normal philtrum. The midpoint along the inferior prolabium mucocutaneous junction marks the center of the cupid’s bow with the potential peak of each arch 2 to 5 mm. (3 mm.) lateral along this junction line. All prolabium tissue lateral to that marked off for a normal central philtrum is to be pared and preserved for a future forked flap.

The double curve of the cupid’s bow is marked along the inferior mucocutaneous junction of the prolabium, and vermilion beneath this will be turned down as a lining flap. If the mucocutaneous junction on the prolabium is well differentiated, it should be preserved. If not, it can be taken in the turndown flap of vermilion.

**MEASUREMENT MATCHING OF THE PROLABIUM TO THE LATERAL LIP ELEMENTS**

The length relationship of the prolabium to the lateral lip elements varies in each case and even on each side. In the normal lip the distance from the commissure to the peak of the bow along the mucocutaneous junction line can be 18 to 22 mm. or more. Once this normal distance is determined for a specific case, a point is made on each side to mark the limit of allowable lateral paring.

Above this point, the lateral lip edge is measured the exact length of the vertical height of the prolabium. When the lateral lip element is longer than the height of the prolabium, however, it is better to de-epithelialize the excess in the upper portion and retain it as a dermal extension on each lateral lip element to be used as a tether during the medial advancement of these segments. During the paring of the edge of the lateral element, a full-bodied vermilion flap b topped with a “white roll” ridge should be cut slightly longer than the length of one arch of the cupid’s bow as it will, in fact, be creating half of the bow.
Skin bridges marked for de-epithelialization.

Prolabium marks scored.

Bridges divided through the nostrils.

Philtrum has been pared of its side forks. Inferior vermilion being turned down.

Shaped philtrum with side wings free for first stage of fork banking and vermilion lining flap drooping but ready for backup of tubercle.
SCORING AND CUTTING
THE PROLABIUM

All three elements of the lip have been measured and marked. The muscleless bridges of the longer lateral elements have been cross-marked for de-epithelialization, which will produce two leading dermal handles. The main part of this dermal extension is left attached to the lip elements and can be used to pull and tether the lateral elements upward and inward to each other and the septum, bringing the lateral muscles into better position.

The prolabium is scored to delineate the philtrum, the forked flaps and the inferior vermilion turndown flap. The skin bridges have been divided all the way through into the wide nostrils. The philtrum is shaped by stabbing along the scoring with a No. 11 B-P blade to pare off the lateral forks. Then the inferior vermilion cuff is dissected as a turndown flap based on the distal end of the prolabium. Thus the prolabium has been “drawn and quartered” into a central philtrum, the two side wing forks and a vermilion turndown flap (e).
FREEING THE PROLABIUM AND THE LATERAL LIP ELEMENTS

Once the prolabium has been divided into its various flaps, the entire ensemble is dissected free from its attachments to the premaxilla right up to the nasal spine. The incision across the inferior attachment must leave enough pedicle for vermilion flap to remain viable on the end of the prolabium. All other mucosa in this area should be left attached to the premaxilla for covering its raw area and lining the posterior wall of the upper labial sulcus. The same economy is used for the forked flaps. A narrow cuff of vermilion is preserved along each lateral side of the fork to add body and cover during the banking, and when finally advanced into the columella this red rim will be hidden inside the nostril and sutured to the septum. Any remaining lateral vermilion running up on the sides of the front of the premaxilla again should be spread and used to cover as much raw area as possible to help in the sulcus lining. Thus the mucosa left on the anterior surface of the premaxilla is shaped somewhat like an M and is capable of creating at least a good part of the posterior side of the upper labial sulcus. The lateral lip elements are then dissected by undermining from their attachments to the maxilla to ease the lip closure.
Dividing the prolabium elements from the premaxilla.

Lateral lip element (Rt) being freed from the maxilla.

while leaving as much mucosa M as possible on the premaxilla and still keep inferior vermilion flap E viable.

edge starting upward from the lateral limit point.

Similar undermining on the left.
De-epithelialization of the attenuated bridge portion of the upper lateral lip elements shortens these long segments and provides dermal tips for lifting and tethering the lateral lip elements.

Vermilion-white roll flap b is being pared on left.

and again on the right.
PREPARING THE LATERAL LIP ELEMENTS

The lateral lip elements hang longer than the vertical length of the prolabium, but their upper portions are attenuated, lacking in muscle and contour, and their true muscle bulges are positioned more laterally and inferiorly. The crosshatch markings of the deficient upper bridges indicate the zones for de-epithelialization. These raw dermal tips will be advanced medially and upward and suspended with 4-0 Vicryl sutures to each other and to the septum at the nasal spine. This lift will take the tension off the closure and set the ideal stage for lip construction and healing.

The lateral lip elements are pared of full-bodied vermilion b flaps edged with a white roll ridge. The paring is limited, of course, by the normal distance already marked at the potential bow peak from the commissure.

PREPARING THE LATERAL SKIN EDGES

The skin of the cleft edges of the lateral lip elements is trimmed carefully to fit and approximate exactly the sides of the pared prolabium. The skin is also undermined 2 to 3 mm. from the orbicularis oris muscles along the lateral lip edges to ensure eversion in the closure.
Deep alar base and lateral lip suspension being achieved.

Total alar base flap being developed.

Alar base flap split into two flaps—
a skin flap D

The dermal tips of the lateral lip elements are being sutured to each other and the septum at the nasal spine just below the D flap union.

And a subcutaneous flap d.

The alar base subcutaneous D flaps are being sutured to each other on the septum.
PREPARING THE ALAR BASES AND
PLACING THE SUSPENSION SUTURES

The alar bases have been divided from the lateral lip elements in
the usual manner with a No. 11 B-P blade. They are also incised
within the vestibule to form full-bodied flaps. Each flap is then
dissected into two components—an alar base skin flap D and a
subcutaneous-muscle flap d. A 4-0 Vicryl suture is used to join
the two d flaps to each other and to the septum, reducing the alar
flare and narrowing the wide nostrils. After this suture, a similar
suture is placed in the two dermal tips of the lateral lip elements
to bring them together and hang them on the septum at the
nasal spine just below the fixation of the d flaps.

Probably the most logical order of suspension suturing will
first bring the dermal tips of the lateral lip elements together and
to the septum and then bring the alar subcutaneous flaps to each
other and to the septum just above the lip fixation suture.

Reversing the order.

First suture the dermal
tips of the lip elements
together and to the
septum at the nasal spine.

Then suture the alar
subcutaneous flaps
to each other and to
the septum above the
lip stitch.
SUTURING THE LATERAL LIP ELEMENTS TOGETHER

First the posterior mucosa of the lateral lip elements are sutured together with 4-0 chromic catgut (Ethicon #752G) in front of the premaxilla and behind the prolabium to form the anterior side of the upper labial sulcus. Then the orbicularis oris muscle fibers are approximated with 4-0 Vicryl (Ethicon #V-494G) mattress sutures.

Suturing the mucosa of the lateral lip elements together.

Then the muscle fibers are brought together with Vicryl mattress sutures.
DIMPLING THE PHILTRUM

A midline vertical slit is made in the subcutaneous tissue of the philtrum deep to dermis. A 4-0 Vicryl suture picks up the dermis in the inferior depth of the slit and fixes it to the under muscles of the lip. As the suture is tied, the philtrum dimple is depressed.
Suture of subcutaneous tissue of prolabium to subcutaneous layer of lateral lip element with 5-0 and 6-0 catgut emphasizes the dimple and improves the apposition of the skin edges.

Closure of mucosa and muscle of lateral elements behind the prolabium relieves all tension. 6-0 silk sutures bring the skin edges together with ease.

Overlap of the lateral vermillion flap b with its mucocutaneous ridge over the prolabium vermillion turndown flap to form half of the cupid's bow. The opposite flap b will complete the bow with a midline tubercle.
BANKING THE FORKS

The prolabium forks are banked by approximation with the alar base D flaps, tip to tip and raw area to raw area like the clasping of "praying hands" to form two pyramids, one in each nasal floor.

Another method of banking, which I prefer particularly in complete clefts although it can also be used in the incomplete clefts, is the subalar whisker position between alar base and lateral lip element. This maneuver was described in Chapter 23 and will be described again in Chapter 28, with examples shown in Chapter 30.
This is indeed an economical design with minimal discard of tissue.

Tongue stitch is placed as a safety precaution.

Logan bow assists in initial relief of tension and leaves the wound open for application of antibiotic ointment and eventual suture removal.
SECONDARY FORKED FLAP ADVANCEMENT

Secondary advancement of the forked flap into the columella for release of the nasal tip can be carried out as soon as three weeks later or preferably at the preschool age of five to six years.

If the ends of the forked flap are hanging free, with the aid of a membranous septal incision they can be advanced into the columella and sutured to each other and to the septum. The alar bases then can be advanced medially and their denuded ends sutured to each other and to the septum under the ends of the forked flap to reduce the alar flare and create nostril sills. If the forked flap has been banked in "whisker fashion," the same maneuver is available. If banked as "praying hands," then the attachments are unclasped except the tip-to-tip union of the forked flap ends to the alar bases. The elongated straps thus produced are advanced medially and rotated upward into the columella. A septal cartilage strut should be used to support the tip and fork; if in childhood, it can be banked cartilage, but after 15 years it should be autogenous septal cartilage.

PERSONAL CASES

At three and a half months one-stage lip closure was carried out.

1. The prolabium was freed from the premaxilla and the lateral lip elements were freed from the maxillae.
2. A short forked flap was pared from the prolabium. (Microscopic sections of the prolabium revealed skeletal muscle fibers, as might be expected in an incomplete cleft.)

3. Lateral mucosa and muscle were joined behind the prolabium.

4. Lateral vermilion flaps carrying the mucocutaneous junction were used to overlap the turndown of the prolabium vermilion.

5. The forks were sutured to the Simonart's bands in the nostril floor for banking.

Six months later columella lengthening was accomplished by the forked flap, and the alar bases were denuded at their tips, advanced and sutured to the septum.

Note increase in vertical length of short prolabium after joining of lateral muscles.
Here is an example of a bilateral incomplete cleft treated as just described with the second-stage columella lengthening of the banked forked flap postponed until just before school age.

At three months of age:

A. Bilateral myringotomy, suction and insertion of tubes by F. Pullen.
B. Soft palate closure.
C. One-stage closure of bilateral cleft lip.
   1. Prolabium freed from premaxilla and lateral lip elements freed from maxillae.
   2. Bilateral forked flap pared from sides of prolabium.
   3. Posterior mucosa of prolabium used to cover raw anterior premaxilla.
   4. Skin bridges with or without muscle denuded of epithelium, advanced to each other and sutured to the septum behind the columella, relieving tension of lip closure and reducing alar flare.
   5. Mucosa and muscle of lateral elements sutured to each other behind the prolabium.
   6. Prolabium dimple created with Mersilene suture.
   7. Lateral vermilion flaps carrying mucocutaneous ridge used to overlap the inferior prolabium vermilion.
   8. Forks sutured to alar base flaps in "praying hands" pyramids.
Patient returned from Virginia at age three years for hard palate closure and minor lip revision. At 4½ years she returned for "unbanking" of the forks to lengthen the columella before starting school. Here she is soon after the elevation of her tip.

A short prolabium

Here is a primary case that has been added too late to be included in the statistics. It is important because it presents the solution to
the problem of the short prolabium which has been adjusted to form an adequate philtrum without introduction of skin flaps from the lateral lip elements either above or below.

At 7 months of age:

1. Forked flap as marked was taken from the sides of the prolabium including Simonart’s bridges and a portion of the lateral lip elements with upper horizontal extensions to shorten the long lateral elements.

2. The prolabium was freed from the premaxilla, some of the vermilion being kept to cover its raw surface.

3. The mucosa and muscles of the lateral lip elements were brought together behind the freed prolabium, which was replaced in philtrum position with a dimpling stitch.

4. Lateral vermilion flaps carrying a mucocutaneous ridge were used to overlap the prolabium vermilion to form a cupid’s bow.

5. The forked flap was banked in whisker position.

Introduction of muscle and mucosa behind the prolabium, addition of vermilion-mucocutaneous ridge flaps inferior to the prolabium and matching the sides of the lateral lip elements to the sides of the prolabium succeeded in increasing the effective length of the short central element into good balance.

EARLY COLUMELLA LENGTHENING. Because of the incomplete extent of the clefting, the intact alveolus and a short prolabium, early advancement of the banked forked flap into the columella was considered justified and less likely to produce a long lip in vertical dimension. At age 11 months, or 4 months after banking of the fork, it was advanced into the columella.
Here is another late case not included in the statistics but important because it demonstrates again how to handle the short prolabium without paying the exorbitant price of introducing lateral skin flaps below or even above the prolabium and without dividing the prolabium from the nose primarily.

B.D. 11-3-74
F.H. Brother with severe unilateral CL&P
F.T. Uneventful
O.C.A. None

At the time of lip closure, the forked flap was banked in whisker position. Then as this was an incomplete cleft, the forked flap was moved out of the banked position into the columella with nasal tip release at $2\frac{1}{2}$ years. She is shown 2 weeks after surgery.
The lack of palatal cleft, absence of premaxillary protrusions and severe shortness of the prolabium (6 cm.) stimulated postponement of soft tissue closure in this case. Time did not improve the relative length of the prolabium, so primary definite surgical lip closure was designed at 13 months to correct this discrepancy also.

1. A forked flap was marked taking as much prolabium as was expendable from the philtrum. It also included the pared edges of the lateral lip elements and high transverse wedge triangles to shorten these too long elements.

2. A turndown cuff of inferior vermilion of the prolabium still allowed most of the posterior mucosa to be dissected from the backside of the prolabium. Based on the premaxilla, this mucosal flap was used to cover the denuded anterior surface of the premaxilla once the prolabium had been freed up to the base of the columella.

3. The usual lateral vermilion flaps carrying mucocutaneous ridge were cut from the sides of the lateral lip elements.

4. The mucosa and muscles of the lateral lip elements were advanced and sutured to each other across the midline. The prolabium was split on the undersurface and then replaced into philtrum position with a dimpling stitch. Small transverse incisions at the top of the prolabium allowed the skin tips of the lateral advancement flaps to fit in at the base of the columella.

5. The lateral vermilion flaps then overlapped the turndown of the prolabium vermilion to form a cupid’s bow and to add slight length to the central component.
Again a relatively short prolabium was cut to match the relatively long lateral lip elements by the design of the forked flap, which simply is banked at this stage. Introduction of mucosa and muscle behind the prolabium and overlap of lateral vermilion carrying a mucocutaneous ridge below the prolabium bring more fullness to the forlorn philtrum component. In fact, these actions negate the necessity of dividing the prolabium from the nose at this early age or of introducing lateral skin flaps below the prolabium at any age!!


early col umella lengthening. As in the previous case, the incomplete clefting, intact alveolus and short prolabium seemed to justify early shifting of the banked fork into the columella. At age 16 months, just 3 months after the fork was banked, it was used to release the nasal tip.

6. The prongs of the forked flap and lateral wing extension were folded together and then banked in the subalar incision in whisker position.
Although these incomplete clefts have more columella than do complete clefts, they are still short of tissue and if not lengthened will partially snub the nasal tip in adolescence and adulthood.

Another late case not included in the statistics but a good example of a bilateral incomplete cleft with short columella. Family history was impressive with father having a bilateral cleft lip and mother's first cousin a cleft lip and palate. At six months of age, first stage of the forked flap was banked and mucosa and muscle of the lateral lip elements were united behind the columella. Cupid’s bow was created with lateral mucocutaneous ridge and vermilion flaps transposed below the inferior border of the prolabium in front of the turndown of prolabium vermilion. The forks were banked in praying hands position in apposition with the freed alar bases and are readily available for advancement into the columella at about 4½ years of age.
27. Details of Converting Asymmetrical Clefts into Complete Bilateral Clefts and Banking the Fork

W H E N one side of a bilateral cleft is incomplete, the situation reduces the amount of discrepancy and distortion not only in the lip and nose but in the premaxillary-maxillary relationship. Any case benefited by reduction of distortion because of the incompleteness of the clefting on one side then presents the problem of asymmetry. LeMesurier, in 1962, stressed the importance of achieving symmetry in asymmetrical bilateral clefts:

If the two clefts are originally about the same, it is not difficult to maintain the symmetry, but if they are considerably different the cuts should be made so that the parts of the lip left beyond them, when fitted together, will make the two sides as nearly symmetrical as possible.

Thus it is artistic logic that with one side completely cleft the incomplete side must be rendered complete to facilitate closure for the sake of symmetry, preserving any excess tissue for special use.

BASIC RULES

1. The original vertical length of the prolabium will determine the vertical length of the lip.

2. Each lateral lip element must be cut to match the corresponding side of the prolabium.
3. The prolabium is usually wider than a normal philtrum and thus is pared its full vertical length by cutting free one prong of the fork off each side.

4. The lateral lip element is pared a similar length, but there is one limitation. The extension of the lateral paring must not exceed point x on either side, which is set on the mucocutaneous junction line of the lateral element not less than 18 mm. or much more than 23 mm. from the commissure. Of course, both sides must be pared the same.

5. When the lateral lip elements are being pared, a vermilion flap 1 is turned upward and will go into the vestibule to supply lining. A thicker vermilion flap b, carrying mucocutaneous junction ridge, is turned downward and will overlap the prolabium vermilion along the inferior border. It must be cut slightly longer than half of a cupid's bow width, and the little excess will form the midline tubercle.

**MEASURING AND MARKING**

*Width*

Most prolabiums are far wider than the normal philtrum and, if left wide, will produce a spread central portion of the lip with a broad cupid's bow—if indeed a bow is created at all. The normal cupid's bow along the mucocutaneous junction line, from the lowest skin point in the midline to the highest point of either arch, can be as narrow as 2 mm. or as wide as 5 mm. (preferably 3 mm.) with the entire bow from peak to peak measuring 4 to 10 mm. (preferably 6 mm.).

The bow peaks are marked on the inferior mucocutaneous junction line of the prolabium with methylene blue guided by calipers or preferably a trained eye.

*Shape*

Shaping the prolabium to philtrum dimensions requires paring the lateral excess of skin and mucosa. Starting at the most
The columnella is short. The prolabium wide.

There is no sulcus.

The normal width of the cupid’s bow is 4-10 mm. The two halves are measured and marked on the mucocutaneous junction of the inferior edge of the prolabium.
anterior lateral point of the base of the columella, a vertical line is marked with a gentle curve which breaks in slightly at the potential point of the cupid’s bow peak on the mucocutaneous junction line. If the mucocutaneous junction along the inferior edge of the prolabium has a definite “white roll” ridge, it can be preserved and the bow marked just inferior to it in the upper vermilion. If the ridge is vague, it can be discarded.

_Verical length or height of lip_

Matching the prolabium to the lateral lip elements is concerned primarily with the vertical length or height of the upper lip.

First precautions must be taken to ensure normal total lip width: The normal distance from commissure to height of bow peak varies from 18 to 23 mm. This is a guide as the cutoff point allowed in lateral paring of the lateral lip element. In other words, a point medial from the commissure along the mucocutaneous junction line at least 18 or 20 mm., and more if possible, must be set as the limit of lateral paring.

The normal vertical length or height of an upper lip as measured from the anterior lateral point of the base of the columella to the corresponding peak of the cupid’s bow on the mucocutaneous junction measures from 8 to 13 mm. Measurements within these limits can usually be marked on the prolabium of bilateral clefts.
The vertical skin height of the probalium is measured and this identical measurement is placed along the lateral edge at point x and extending upward. This presents a matching lateral skin edge to fit perfectly with the side of the probalium.

Commissure to potential height of cupid's bow measures 20–22 mm. in the normal. This gives the limit of lateral digression beyond which point x must not extend.

The width of one arch of the cupid's bow is measured on the lateral lip element as high as there is well-defined mucocutaneous ridge and fullbodied vermilion. The most lateral point must be at least 20 mm. from the commissure.

This creates flap b to form one side of the cupid's bow vermilion.

This presents a matching lateral skin edge to fit perfectly with the side of the probalium.
Whatever this length is on the pared side of the prolabium, an equal skin edge must be fashioned on the corresponding cleft edge of the lateral lip element. With point x as the lateral limit, a distance identical with the vertical length of the prolabium is measured upward along the mucocutaneous junction of the lateral element.

Another limiting factor depends on how high along the lateral cleft edge there is full-bodied vermilion with a discrete white roll ridge. Paring this vermilion topped with the mucocutaneous ridge creates a lateral flap b, which should be full-bodied and 1 to 2 mm. longer than the distance on the prolabium of half the cupid's bow. The attenuated vermilion above this along the upper cleft edge of the lateral element can be pared but preserved as flap 1 for vestibular lining use later.

Flap 1

The attenuated vermilion of the upper portion of the cleft edge of the lateral element, which is often discarded, has great value. It should be pared as a flap 1 based above on the alveolus. It is then available for lining the lateral vestibular defect created when the lip and alar base are released from the maxilla by undermining and extension of the incision medially along the intercartilaginous line. As the lip advances medially and the alar base moves forward and inward, a raw area in the vestibule is created. Previously it has been left to scar on its own, but flap 1 fills this void and reduces contracture. Bill Berkeley left me the gift of his endorsement of flap 1 which he incorporated in his bilateral cleft lip plan as presented by Hal Chaplin in Boston in 1976.
To freshen the cleft edge, the attenuated upper vermilion is cut as a flap based on the alveolus. It is destined to line the raw area created when the alar base is released from the maxilla along the broken line.
Flap b

The continued paring of the cleft edge of the lateral lip element cuts flap b, which is full-bodied vermilion edged with a white roll ridge. The flap is scored with a No. 15 B-P blade and stabbed out with a No. 11 B-P.

When paring the lateral lip element retain the mucocutaneous "white roll" ridge on the fullbodied vermilion flap b.

This flap b will overlap the turndown flap of prolabium vermilion to form half of a cupid's bow.

SIMILAR DESIGNING OF THE INCOMPLETE CLEFT SIDE

The normal distance from commissure to height of potential peak of bow is measured on the lateral lip elements to mark the limit of allowable lateral paring. This point is stabbed with a needle dipped in methylene blue. As previously described for the complete cleft side, the right side is being measured for vermilion flap b, which again is fashioned slightly longer than half the bow's width.
The distance from the commissure to the potential peak of the bow x should be at least 18 mm, preferably 22 mm, and of course the same on both sides.

The limit of the lateral paring is determined by this measurement and is marked by stabbing a needle with methylene blue.

Starting at x measuring upward the distance of slightly more than half a bow is marked on the lateral side.
During this paring flap b is released.

The vertical height of the prolabium is measured on the right and is marked along the mucocutaneous junction line of the cleft edge of the lateral element beginning at the limiting point. Flap b is marked, scored and cut.
The right incomplete cleft side has been marked, flap b has been pared and flap l is now being pared toward its base up on the alveolus. The lateral lip element is dissected free of the maxilla, but the incomplete cleft has not yet been converted into a complete one.

On incomplete cleft side flap l is designed to enable economic use of the attenuated vermilion.

SCORING THE FORKED FLAP

The lateral excess of prolabium skin and vermilion is pared as future forks for the columella with their bases on the side of the columella. A 3 mm. cuff of vermilion on the lateral side of the fork can be maintained for suturing to the membranous septum during the columella lengthening procedure. Its presence during the banking time gives more bulk and reduces raw area and its contracture. Any of this vermilion not beneficial to the forks should be left on the premaxilla to reduce its raw area and assist in sulcus formation.

Prolabium is being outlined to philtrum proportions by incisions.
INCISING THE PROLABIUM

Incisions along the vertical marks on the prolabium define the lateral sides of a philtrum of normal width. Then the inferior vermilion of the prolabium is turned back as flap e, leaving enough base for viability. The remaining inferior vermilion is cut free from the prolabium but left attached to the premaxilla. This mucosa, continuous with what is left from the lateral vermilion of the prolabium not required in the forks, forms an inverted mucosal m. Careful suturing of the cuffs of mucosa m will achieve cover of much of the raw area on the premaxilla and thus line the posterior wall of the upper labial sulcus.

The inferior vermilion of the prolabium is being turned down as flap (e) for lining the free border tubercle leaving enough base for its viability. The remaining excess vermilion is left attached to the premaxilla (m) for raw area cover as the prolabium is dissected from the premaxilla.
What ever mucosa that could be spared from the prolabium was left attached to the premaxilla. The mucosa m is being sutured over the raw area of the premaxilla to create lining for the posterior side of the upper labial sulcus.
Making the incomplete cleft complete.

Freesing the prolabium from the premaxilla.

Stabbing out the right fork.

Phtirrum and forks are free from the premaxilla.
CONVERSION OF INCOMPLETE TO COMPLETE CLEFT

The incomplete cleft on the right is converted into a complete cleft. Then the entire prolabium with its inferior vermilion turnback flap and its lateral forks is elevated off the premaxilla up to the nasal spine, leaving any spare vermilion on the premaxilla for raw area cover.

Upper cleft edge vermilion flap 1 is hanging ready. The right lateral lip element is released from the maxilla and the alar base incised along the intercartilaginous line of the vestibule to facilitate its correct positioning during the lip closure. Flap 1 will fit this vestibular defect.
Whatever extra vermilion m that is attached to the premaxilla is sutured over the raw area to create the posterior side of the upper sulcus.

The incomplete cleft has been transformed into a complete cleft.
Bilateral complete cleft

Measuring 2-5 mm. but preferably 3 mm. width of each arch of the bow from the midline.

Width of one arch and a little more is measured along the lateral cleft edge starting upward from point x, the normal commissure, to peak of bow distance.

Vertical height of the prolabium determines the further upward extension of this paring so that the lateral and medial pared skin edges match.
A N asymmetrical bilateral cleft of the lip with one side incomplete and the other complete has been converted into a symmetrical bilateral cleft complete on both sides. No tissue, however, has been discarded. With the asymmetrical cleft now symmetrical we can proceed as with the more common, true, complete bilateral cleft. It is better for clarity to repeat the measurements and markings.

The two arches of the cupid’s bow are measured at 3 to 4 mm. from the center of the mucocutaneous junction of the inferior border of the prolabium. Then a slightly greater distance than one arch is measured along the mucocutaneous ridge of the lateral element as soon as the vermilion becomes reasonably full-bodied. The lateral paring of flap b must not extend laterally beyond the normal range of commissure-to-cupid’s-bow-peak distance of 18 to 22 mm. set at point x.

Further upward paring of the lateral edge should extend to create a side equal in length to the vertical height of the pared prolabium measured from its mucocutaneous junction to the lateral base of the columella. This creates matching skin edges for exact approximation.

When paring the left lateral cleft edge, one marks the attenuated vermilion of the upper portion as flap l. This flap l is being
pared up to its base on the alveolus. The dotted line marks the vestibular incision for release of the alar base. The paring continues laterally, developing flap b, which is composed of full-bodied vermillion edged with the mucocutaneous ridge. Remember, the limit of the lateral extension of the paring is at point x, leaving normal commissure-to-peak-of-bow distance. The lip element and alar base are released from the maxilla with the incision extending into the vestibule. As the lip and alar base move in and forward, the vestibular defect opens and flap 1 is used to fill this raw area and reduce subsequent contracture.

Of course, the right side is handled like the left including the paring of flap 1, the freeing of the lateral lip element from the maxilla, release of the alar base by extending the lateral incision into the vestibule and finally the paring of flap b.

![Image showing the paring of flap 1 and the release of the alar base.](image)

The paring of flap 1, the release of the alar base, and the filling of the vestibular defect with flap 1.
Paring the right upper vermilion flap to a superior base on the mucoperiosteum of the alveolus.

Extending the incision for releasing the lateral lip and alar base from the maxilla along the intercartilaginous line in the vestibule.

Flap b, as on the left, is cut slightly longer than half the cupid's bow so the excess will pile up in the center join to form a tubercle.
PREPARING THE PROLABIUM

In order to shape a philtrum and to set aside future columella tissue, the prolabium must be "drawn and quartered."

The objectionable inferior vermilion of the prolabium is turned down as a cuff (e) to serve as hidden lining to the central free border of the lip. Enough base attachment to the prolabium must be maintained for flap e's viability.

A 3 mm. edge of vermilion along the sides of the prolabium should be retained as a fringe on each fork to supply better cover during the banking. It will also provide extra tissue in a hidden position for the new columella. When this posterior edge is sutured to the membranous septum during the final advancement of the forked flap, it will be out of sight. All extra mucosa m is left attached to the premaxilla to assist in the formation of the posterior side of the upper labial sulcus.

The three fingers of prolabium, the central philtrum with its vermilion cuff e and the two lateral forks with their vermilion edge are dissected from their attachments to the premaxilla up to the nasal spine.
Flap e of inferior vermillion is being dissected from the prolabium.

The dotted line marks the future division of the prolabium from the premaxilla. Enough intact mucosa must be left above this line to vascularize flap e.

The tripartite prolabium philtrum with its mucosal cuff and the two forks are being dissected from the premaxilla leaving the peripheral mucosa m for cover of as much alveolus raw area as possible.
First one flap 1 and then the other is sutured into the raw area created by release of the lateral lip elements and alar bases from the maxilla. The extension of the releasing incision in the lateral vestibule up along the intercartilaginous line crosses and relieves the web of tightness. Introduction of flap 1 into this gap to whatever extent required bypasses the need of a vestibular Z or skin graft now or later. Not only are both alar bases free to move forward and inward but in the wake of their movement lining flaps ensure that they maintain the gain.
Flap 1 (Rt) is being sutured into the alar base releasing defect.

The same is being done on the left.

Both 1 flaps now line their respective vestibular defects.
Scoring the division of the left alar base from the lateral lip element.

Trimming the left lateral skin edge.

Tidying the right skin edge of the lateral element.

Dividing the alar base from the right lateral lip element.

The skin edge of the lateral lip element is tidied to match exactly the corresponding pared edge of the prolabium. Then the alar base is severed from the lateral lip element with a circumalar incision to make possible its greater medial rotation and permanent maintenance of this position independent of the lateral lip element.
Freeing the skin along the cleft edge. Bringing the posterior mucosa of the lateral lip flaps together.

Pinning the upper lip to the septum at the nasal spine.

The muscles have also been approximated in the midline.

The skin edge of the lateral lip elements is freed 2 to 3 mm. to allow eversion in the skin closure. Then the lateral lip elements are sutured to each other across the cleft over the premaxilla and under the prolabium. First the posterior mucosa and then the muscles are approximated. The central upper portion of this join is fixed with a 4-0 chromic catgut (Ethicon #752G) to the septum at the nasal spine.
Each full-bodied alar base flap is divided into two flaps, one a skin flap D and the other a deeper, subcutaneous flap d. The subcutaneous alar d flaps are sutured with 4-0 Vicryl (Ethicon #V-494G) or 4-0 chromic catgut (Ethicon #752G) to each other and the septum just above the nasal spine. This suturing swings the alar bases into normal position and ties them there. Thus, the abnormal width of the nose and the flare of the alae are reduced primarily, leaving alar base skin flaps free to assist in forked flap banking.

Next the posterior mid-vertical slit in the prolabium, which has been cut to dermis, is caught with a 5-0 Vicryl (Ethicon #V-493G) suture that then takes a bite across the muscles. The tying of this suture dimples the philtrum.
Alar base flap being divided in two—flap D and flap d.

Skin flap D and subcutaneous flap d being demonstrated.

The dimple stitch picks up dermis in the slit and sutures it down to muscle.

4-0 Vicryl suture pinning both subcutaneous d flaps to each other and the septum pulling the alar flare out of the alar bases.
Once the posterior mucosa has been approximated, mucosal turnback flap e and its base are incorporated in the inferior closure. Often only a small amount of e is required for lining and the rest can be scrapped. Now the bed along the inferior prolabium is open for the bilateral advancement of the lateral vermilion b flaps edged with a mucocutaneous ridge to form the cupid's bow.

Incorporating the mucosa of flap e and its base for lining into the posterior inferior position of the center of the lip.

Suturing the skin of the prolabium to the lateral elements at key points with 6-0 silk (Ethicon #780G) sets up each peak of the bow. This allows each flap b to slide medially to overlap half of flap e and fill out the free border.
Key skin point of philtrum and lateral lip element are being sutured on the right at potential peak of bow.

Same on the left.

Excess of lateral vermilion flaps pile up to form a full central tubercle.

Mucocutaneous "white roll" ridge on the lateral vermilion flap b can be brought under the prolabium.

If the prolabium mucocutaneous junction is well enough defined it can be maintained and only vermilion brought below it.

The mucocutaneous "white roll" ridge can be brought in on flap b. If the mucocutaneous ridge along the inferior border of the prolabium is raised and definite, it should be preserved and the ridge on the lateral mucosal flap can be trimmed off. When the mucocutaneous ridge accompanies the lateral vermilion flap, the surgeon is free to shape the double arch of a true cupid's bow along the inferior skin border of the prolabium.

The extra length of flap b beyond the length of half the cupid's bow is designed to present an excess of vermilion tissue which piles up in the center join to form a full tubercle.
Banking the forks is achieved by suturing each alar base flap D to its respective fork and closing off all raw areas.

Now the forks are banked by suturing the alar base skin flap D to the corresponding prolabium fork, tip to tip and sides to sides. This creates two bizarre skin pyramids, better thought of as “praying hands,” which usually fold back into the nostril floor almost out of sight. If all raw areas are closed, although the flaps seem to settle and shrink, the tissue is there and our prayers answered when the time comes for its advancement during columella lengthening.
The remaining closure is achieved with fine catgut to the subcutaneous tissues and silk to the skin.

Final suturing is achieved with 5-0 chromic catgut (Ethicon #792G) and 6-0 (Ethicon #790G) in the subcutaneous tissue closure of the lateral lip and prolabium. Then 6-0 silk (Ethicon #780G) approximates the skin edges. The pyramid "bank" plugging the nasal aperture settles into the nasal floor without serious airway obstruction.
WHISKER BANKING

Although the “praying hands” position is good, I have tended to use the whisker position in many of the complete clefts. The bilateral circumalar incisions, which release the alar bases from the lateral lip elements and allow advancement of the flaring alar bases, also provide an opening in the subalar area for banking the forks. The advantages are not only the complete coverage of the fork’s raw area but also the visible position of the banked material, which is easily reelevated and shifted like any forked flap into the columella. This at present is my favorite banking method for all cases.
29. Postoperative Care

The present primary operative plan for a bilateral cleft lip involves three procedures: (1) myringotomy, (2) soft palate closure and (3) lip closure with fork banking.

If there is also an associated cleft palate, there is certain to be fluid in the middle ears. Thus, the otolaryngologist is scheduled to carry out bilateral myringotomy and insertion of tubes for open drainage. He will follow the course of his postoperative result. If the palate is cleft but the defect is not severely wide and the soft palate elements can be brought together without relaxing incisions or severe tension, then the cleft edges are split and the nasal mucosa, muscle and oral mucosa are sutured together in three layers. Finally, the bilateral clefts of the lip are closed bringing the lateral mucosa and muscle together behind the prolabium. Unless the premaxilla was extremely protrusive or did not respond to external pressure, there should not be great tension. The forked flap will have been banked either between the lip and nose in “whisker position” or sutured in a pyramid with the alar base flaps as “praying hands.” If the latter method has been used, the projections can often be coaxed to fall back into the nasal cavity or they will rise as tiny pyramids in the nasal floors. Although the appearance is odd, they do not seem to obstruct the nasal airway appreciably.

AIRWAY

At the completion of the operation the oral packing is removed and careful suction of blood from the nose, mouth and pharynx
is carried out, first by the surgeon and later through the endotracheal tube during extubation by the anesthetist. It is important to remember that the infant has been accustomed to breathing through a double cleft of the lip with the premaxilla projecting out of the way. The cleft in the palate has also presented a generous posterior airway. When suddenly the lip clefts are closed, the soft palate is closed and, to a minor degree, small tags are left in the nostril floors, there has been quite a reduction in airway.

The first postoperative precautionary measure is the placement of a 3-0 black silk suture in the tongue to give direct control during the early postoperative recovery from anesthesia and adjustment of the reduced airway. As soon as the infant is awake, coughing and breathing normally, this suture is simply cut and removed. As noted by F. X. Paletta of St. Louis University:

Babies with respiratory distress are placed in a hood for regulated vaporization with warm moisture and increased oxygenation.

The next postoperative consideration is wound protection, and this involves several aspects.

**TENSION**

At the end of the lip closure benzoin is painted on the cheeks and a Logan bow is applied with tape after the cheeks are pressed together with noticeable relaxation to the lip area. This limits some of the lateral pull against the wound from the muscles during crying and seems to be the best method of partially splinting the lip during the healing. The direct side-to-side closure of the mucosa and muscle of the lateral elements without involvement of the prolabium has taken much of the drag out of the tension. It is important, of course, that the infant not be allowed to turn over on his face as striking the Logan bow on the bed could be disastrous. When the infant is irritable and crying with straining on the wounds, then if feeding does not pacify, a suitable minimal dose of analgesic is given. Arm restraints to prevent flexion at the elbows, whether plaster of Paris, tongue
blade slatted wraparound splints or just large safety pins, are important. One jerk of a finger hooked in the Logan bow or the mouth could disrupt the wounds.

WOUND CARE

At the end of the operation, with the Logan bow in place and the wound open, an antibiotic ointment such as Cortisporin is applied to the suture lines. An order is written for this ointment to be applied three times daily after feedings. The rationale is as follows: An ointment places a protective coating over the suture holes and along the wound edges, not only preventing nasal discharge from bathing these areas but keeping local bacteria from infecting the stitch holes while the foreign body sutures are in position. The old method of scrubbing clots and debris from the suture line with hydrogen peroxide had good intention but did not prevent the crust; it merely removed it—and painfully. If a clot does form, then, of course, it should be removed. The presence of the ointment keeps the sutures soft and facilitates their removal on the third or fourth day.

FEEDING

Regular formula feeding by an Asepto syringe with a rubber tube extension is started as soon as the infant is awake and hungry. The nurse sits the patient upright with his head in her hand and slips the tube over the tongue, squeezing the amount of formula he is able to take. It is well to finish off each feeding with clear water through the tube of the Asepto to clean the palate suture line.

ANTIBIOTICS

Antibiotics are not used routinely following lip surgery. If the suture line at any time becomes even slightly inflamed, an antibiotic is given orally. If there is a temperature rise not accounted for by low fluid intake and even if the lungs are clear, an antibiotic is started.
HEMOGLOBIN

Surgery is not undertaken unless the hemoglobin level is above 10 gm. Bilateral cleft lip surgery ordinarily does not cause much blood loss, and even when combined with soft palate closure it rarely necessitates blood transfusion. Nonetheless, hemoglobin study, on the first postoperative day, is important to make certain that whatever loss was suffered has been tolerated. If the hemoglobin is severely low, a transfusion will be necessary to ensure the adequate healing; if it is moderately low, then iron in the form of Fer-In-Sol (iron drops) can be given.

DISCHARGE FROM HOSPITAL

The sutures are usually removed on the fourth postoperative day. The wounds receive their final application of antibiotic ointment to seal the suture holes. Then, as soon as the mother has been retaught to feed the baby with the Asepto syringe and feels confident to do so, she is allowed to take him home. Usually she does so on the fifth postoperative day, and the infant still sports a Logan bow and arm restraints. The infant is brought to the office after one week. If the tape is irritating the cheeks, the bow is removed. If not, the bow and arm restraints are removed the next week. The wounds are allowed to heal by themselves without interference with massage. There should be almost no tension on the skin wounds, and if all goes normally the scars will eventually be close to invisible.

The pyramids or whiskers of banked forks will settle into the nostril floor or sill. They must be kept clean and, although not a pair of cosmetic beauty marks, they will rest quietly until called upon to lift the nasal tip.
At six months of age this baby came from Italy after having used rubber band traction from a headcap on the premaxilla.
One-stage cleft lip closure was done at age six months.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. The upper mucosa of the cleft edges of the lateral lip elements was taken as flaps bilaterally and inserted into lateral releasing incisions in the vestibules behind the alar bases.
3. Forked flaps were pared from the sides of the prolabium.
4. Lateral mucosa and muscles were joined in the midline across the cleft behind the prolabium in front of the premaxilla.
5. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
6. The alar bases were freed from the lip elements and had their tips denuded of epithelium so they could be sutured to each other with 4-0 Mersilene behind the columella with reduction in the alar flare.
7. There was no place for the forks, so they were rolled into tubes and tucked into the nasal floor.

One fork was content to hide within the nostril, but the other (right) persisted in hanging out polyp-like. When the hard palate was closed, the fork polyps were opened up and joined to alar base flaps in the delayed "praying hands" position in preparation for columella lengthening before school age. This ended the polyp-type banking in the primary procedure. Forked flap advanced one week ago.
COMPLETE CLEFT, FIRST STAGE;
FORK BANKED AS PRAYING HANDS

The patient was first seen at two months of age with premaxilla firm and forward.

Elastic traction was used for one month. Then myringotomy was done with bilateral tube insertion, soft palate closure and first-stage lip closure with banking of forked flap.

1. The prolabium was pared laterally as a forked flap and freed from the premaxilla up to the nasal spine.
2. U-shaped vermilion of the prolabium was left attached to the premaxilla to cover the raw anterior area.
3. The lateral lip elements were freed from the maxilla. The alar bases were further freed by incisions in the vestibule extending up and medially along the intercartilaginous line.
4. Upper lateral edge vermilion flaps I were sutured into the vestibular defects.
5. The lateral lip elements were brought together in the midline joining both mucosa and muscles.
6. The prolabium was set between the lateral lip segments with a dimpling stitch.
7. The remaining lateral vermilion flaps carrying a mucocutaneous junction ridge were sutured over the turndown flap of vermilion along the inferior edge of the prolabium.
8. The alar bases were freed from the lateral lip elements by circumalar incisions. Then subcutaneous flaps were dissected from under the alar base flaps and sutured to each other at the septum, reducing the alar flare.

9. The alar base skin flaps were sutured to the forked flap as a banking procedure.

Advancement of the banked fork into the columella and reduction of alar flare will be done at about five to six years.

PREMAXILLA SETBACK, LIP CLOSURE, AND PRAYING HANDS BANKING

Like the first case in Chapter 17, this infant shows bilateral complete clefts of the lip and projecting premaxilla with no cleft of the hard or soft palate.
1. A longitudinal incision was made in the mucoperiosteum covering the septovomerine stalk with subperiosteal dissection and resection of a 0.5 cm. square block of bone between the premaxilla and the swelling in the vomer. The mucoperiosteum of the sides of the premaxilla and the maxillae was turned as flaps. Then the premaxilla was set back in undercorrected position with a 3-0 chromic catgut suture between premaxilla and vomer, followed by suturing of the mucoperiosteal flaps of the premaxilla and the lateral maxillae for total closure.

2. Forked flaps were pared from the sides of the prolabium.

3. The lateral lip elements were freed from their attachments to the maxillae.

4. Excess mucosa along the cleft edges was turned as 1 flaps to fill releasing incisions in the vestibule used to free the alar bases.

5. The prolabium was elevated from the premaxilla.

6. Lateral vermilion of the prolabium was used as flaps to cover the raw anterior surface of the prolabium.

7. The lateral lip elements were sutured to each other behind the prolabium.

8. The lateral muscles were sutured together.

9. The prolabium was replaced as philtrum with a dimple stitch.

10. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the turndown vermilion flap of the inferior prolabium.

11. The alar bases were cut as flaps.

12. The forked flaps were sutured to the alar base flaps in a handshake type of "praying hands" banking.

3 days old

6 days postoperative

10 months postoperative
STRETCHING THE PROLABIUM FOR SECONDARY BANKING

Here is a baby boy born with the bilateral cleft of the lip and palate too late to be included in my regular statistics. Because of the pea-sized prolabium, it was decided to attach the lateral lip elements to the sides of the prolabium in a glorified adhesion using the standard lateral vermilion flaps edged with the mucocutaneous ridge to overlap the prolabium vermilion. By not joining the muscles to each other across the midline, they were free to tug and stretch the tiny prolabium.

By 18 months of age, there was enough tissue to spare a forked flap that was banked in whisker position. The tailored prolabium was elevated, the lateral lip musculature joined in the midline and the prolabium replaced with a dimpling stitch. At age 4 to 5 years, the forked flap will be advanced into the columella.
31. Banking and Cashing the Forked Flap

Once the excess prolabilum skin has been moved out of the lip and stored for later use, the lip need not suffer reentry and the lovely scars of infancy can be retained forever. Whether the forked flap has been banked as tubed polyps hanging free or, better, in subalar whisker position, or in the floor of the nose clasped as “praying hands" pyramids with the alar base flaps, as long as all raw areas are covered the tissue may settle but will remain available.

Popping Polyps

In some cases, once the alar bases had been advanced medially and fixed, there seemed to be no place to bank the fork. Each prong of the fork, therefore, was tubed on itself and left dangling as polyps. This was an annoying temporary deformity which invariably was corrected by another surgical stage of opening the polyps and approximating them to the alar base flaps in “praying hands" pyramids.

One method of banking tubes (each fork to form a pair of polyps).

For better banking, these polyps can be opened and the alar base flaps D elevated.

Then each fork is sutured to each flap D in the "praying hands" pyramids.
Finally, a method was developed and has been described which allowed deep advancement of the alar bases but still supplied alar base flaps for banking the forked flap.

The second-stage columella lengthening calls first for freeing the forks by parallel anterior and posterior incisions. The anterior incisions run in front of the forks to join across the base of the columella in an inverted V while the posterior incisions extend behind the forks in the nasal floor to join and continue through the membranous septum, up over the septal tip and on to the bridge for about 0.5 cm. with lateral extensions in the vestibule to ensure full nasal tip release.

**SHIFTING WHISKERS**

If the forked flap is in whisker position, the prongs are cut out of the upper lip, sutured together, tubed in its upper portion, advanced along the septum and fixed with sutures. The tips of the fork are splayed as a columella base to meet the advancing alar bases.

![Forked flap banked as whiskers.](image)

![Anterior incision crosses the columella base as an inverted V.](image)

![The forked flap c and c are incised.](image)

![Right flap c freed from flap D.](image)

![Right flap c being elevated.](image)

![Both c flaps free from lip.](image)
Making the membranous septal incision.

Alar base flap D being freed.

Tip of alar base flap D being de-epithelialized for suture to its mate of the opposite side at the base of the septum.

Tubing the posterior aspect of the forked flap.

Suturing the anterior skin of the forked flap.

Resultant lengthening of columella well over 1 cm.

Placing the key suture through the denuded tips of the alar base flaps D and the base of the septum.

Tying the suture with medial advancement of the alar bases.

Subcutaneous suture of the alar bases to the lip.
OPENING HANDS

If the forked flap has been placed in apposition with the alar base flaps in the "praying hands" position, these two components are cut as two humped straps. Anterior incisions made along the front of the alar bases and forks meet in the midline at the base of the columella in an inverted V. Parallel with these anterior incisions are posterior incisions inside the alar bases, across the nasal floors, up the membranous septum and over the septal tip. Thus are created two strap flaps, each with a central pyramid which, when dissected partially open, lengthens the strap as would happen if the hands were pulled apart at the palms but allowed to retain contact at the fingertips. These elongated straps are advanced medially to each other and upward along the septum into the columella in the rotary action similar to the
Carter-Cronin motion. The join of the tips of the fork to the tips of the alar base flaps has been maintained and forms a slight swelling which, after medial advancement, imitates the medial alar cartilage feet at the columella base.

Dissection of the right alar base—forked flap strap through the anterior incision.

Same on the left.

Freesing the columna and the forked flap from the septum.

Anterior marking in preparation for partial reopening of the "praying hands" pyramids.

Method of making parallel posterior incision to develop D-c strap flap.

Transforming D-c pyramid into a longer D-c strap flap.

Parallel posterior marking and incising of membranous sepal and upper vestibular releasing incisions.
Forked flap portion of the D-c strap flap is being advanced into the columella as the nasal tip is elevated.

Deep subcutaneous suture approximating the fork at the base of the new columella is placed.

The first loop is thrown and tied.

Skin sutures have been placed.

If nasal floors are too wide, wedge excisions can be used.

Columella lengthening without lip reentry.
PERSONAL CASES

Asymmetrical incomplete clefts

At four and a half months of age, one-stage lip closure was undertaken.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Lateral mucosa and muscle were joined behind the prolabium.
4. A dimple stitch was made.
5. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
6. The forked flap was banked with the alar base flaps in "praying hands" pyramids.
Three and a half months later, at age eight months, the forked flap was advanced into the columella with nasal tip release and alar base advancement.
At three months Fred Pullen performed myringotomy with insertion of ear tubes. This was followed by soft palate closure and first-stage lip closure with banking of forked flap.

1. The alar bases were freed from the maxillae by dissection, and further release was achieved by incisions in the lateral vestibular lining. Lateral vermilion flaps 1 were used to fill the vestibular defects and allow the nose to come and stay forward.

2. A forked flap was pared from the sides of this tiny prolabium, and the prolabium was freed from the premaxilla up to the nasal spine.

3. The lateral prolabium vermilion was left attached to the premaxilla to cover its raw surface.

4. The lateral lip elements were brought together in the midline, with suturing of the posterior mucosa and the muscles.

5. The prolabium was brought back into the center of the lip, and a dimple stitch from prolabium dermis to the muscles fitted it in position.

6. Lateral vermilion flaps carrying the mucocutaneous junction ridge were brought together under the inferior border of the prolabium overlapping the turndown flap of prolabium vermilion.

7. The alar bases freed by circumalar incisions were divided into a deep subcutaneous flap and a skin flap. The subcutaneous
flaps were sutured to each other at the septum to correct the alar flare.

8. The forked flap was sutured to the alar base skin flaps in “praying hands” pyramids.

At 3½ years the patient was brought back from Japan for the banked fork to be shifted into the columella for tip release and for right-sided lip lift.
A disadvantage of the praying hands banking, besides slight shrinkage of the flaps, is that little additional tissue can be added to the fork at the time of columella lengthening.

Lip will require further lift on the right side when final scar and nasal revisions are done.

Complete clefts except for tiny right Simonart's band

At five months of age one-stage lip closure was performed.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Lateral mucosa and muscle were united behind the prolabium.
4. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion. The prolabium mucocutaneous ridge was vague.
5. The forked flap prongs were tubed slightly and then let into the incision between lip and alar base in whisker position.

Three months later, at eight months of age, the forks were advanced into the columella with the aid of a membranous septal incision. The alar bases were advanced medially.
Comment. In spite of early columella lengthening, lip did not lengthen too much in vertical dimension.

Again, an early cartilage strut would have offered a supportive advantage.

Asymmetrical incomplete and complete clefts

Elastic band traction from headcap was used to restrain the premaxilla. At two months of age one-stage lip closure was done.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium including some Simonart's band on the right.
3. Lateral mucosa and muscle elements were sutured together in the midline behind the prolabium.
4. A dimple stitch was made in the prolabium.
5. Lateral vermilion flaps carrying the mucocutaneous junc-

17 months 3 years 4 years

B.D. 9-13-70
F.H. No clefts
F.T. Uneventful
O.C.A. None

11-6-70. Lip closure
tion ridge were used to overlap the prolabium vermillion.

6. The forked flap was sutured to the alar base flaps in a "praying hands" pyramid.

At four months of age the forked flap lengthened the columella.

Columella lengthening was effective, but early action in this regard ended up with a lip too long vertically and some retraction of the columella. This result stimulated the use of transverse upper lip flaps based on the alar bases and transposed behind the columella into a membranous septal releasing incision with correction of columella retraction and lip length.
Complete clefts (except for tiny Simonart's band)

Rubber band traction from headcap was used against the projecting premaxilla. At six weeks of age one-stage bilateral cleft lip closure was carried out.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Upper mucosal flaps from the lateral cleft edges were inserted into the vestibular alar base releasing incisions.
4. Lateral mucosa and muscles were united in front of the premaxilla behind the prolabium.
5. The alar bases were freed from the lip elements, denuded of epithelium at their tips and sutured to each other on the septum behind the columella with Mersilene.
6. A dimple stitch of Mersilene was made in the prolabium.
7. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
8. The forks were rolled on themselves and set into incisions between the alar bases and the lip as a whisker-style banking.
Lip healed with good muscle continuity and forked flap remained banked as whiskers until four years.

A 1976 shift of forked flap from whiskers to columella

At four years, and at the same time as the hard palate closure, the forked flap was shifted into the nose. A semi-cine of the profile action shows the forked flap marked, elevated out of the whisker position in the lip, united in front with 6-0 silk, rolled into a column behind with 4-0 chromic, rising free with release of the snubbed tip by a membranous septal incision and advanced into the columella with its tips splayed at the base.
Subcutaneous extensions of the freed alar bases were sutured to each other on the septum at the nasal spine with 4-0 Mersilene to correct the alar flare. This action so reduced the width of the nasal base as to leave a discrepancy with its longer matching edge along the defect in the upper lip. It has been found, however, that the discrepancy can be accommodated as the lip is lifted back up to the nose and the airways can be maintained at the same time.

The use of 4-0 chromic catgut mattress sutures passing from inside the floor of the nose out to pick up the muscle of the lip and back again inside the nose can force a matching of edges which 6-0 sutures in the skin can finish neatly.
Elastic traction on headcap was used for positioning the premaxilla. At six weeks of age bilateral cleft lip closed in one stage.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Mucosa and muscles were united behind the prolabium.
4. A Mersilene dimple stitch was made.
5. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
6. The forked flap was banked in subalar whisker position.
11-21-72. Myringotomy, suction and tubes inserted, soft palate closed

*Comment:* Good lip with continuity of mucocutaneous ridge

At age 4½ years, forked flap was advanced from whisker banking position into the columella to release the nasal tip. This patient started with no columella and only a moderate sized prolabium. The early postoperative pictures and the later color page vindicate this compromise of sharing the prolabium as he now has a good philtrum and plenty of columella.

*Comment:* Note continuity of the mucocutaneous ridge.

An advantage of the whisker banking, besides preservation of the fork, is that extra tissue can be incorporated secondarily in the fork if necessary at the time of the advancement.
Elastic restraint from headcap was used against the premaxilla. At age three months, one-stage lip closure was accomplished.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Lateral mucosa and muscles were joined in the midline behind the prolabium.
4. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
5. The forked flap was sutured end to end with the alar base flaps in "praying hands" banking.

Comment. Cupid’s bow is too wide.
At 5 years of age the premaxilla was set back by subperiosteal block wedge resection of the vomer and fixation with a Kirschner wire and tray splint by Berkowitz.

Six months later the forked flap banked in praying hands position was redeveloped by parallel incisions, opened for lengthening and advanced into the columella with the aid of a membranous incision. The alar bases with subcutaneous extensions followed in the wake of the forks and were sutured to each other at the nasal spine to narrow the nose and elevate the tip.

Complete clefts

B.D. 12-2-71
E.H. Father
       unilateral
       CLP and uncle
       also had cleft
F. T. Uneventful
O. C. A. None
Rubber band traction from headcap was used against the pre-maxilla for two months. At age two months one-stage lip closure was undertaken.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.

2. A forked flap was pared from the sides of the prolabium.

3. Lateral mucosa and muscles were united across the cleft in front of the premaxilla behind the prolabium.

4. A Mersilene dimple stitch was made in the prolabium.

5. Alar base flaps were freed from the lip elements, denuded of epithelium at their tips and sutured to each other on the septum behind the columella to reduce and prevent alar flare.

6. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.

7. The forks were rolled on themselves and sutured tip to tip in front of the columella.

At one year of age the soft palate was closed, and at the same time the fork polyps were opened and sutured to the alar bases in the "praying hands" position. After one other such case, the polyp-like banking was discontinued and the "praying hands" or whiskers type preferred.

At 4½ years the banked fork was advanced into the columella.
Comment. Note good lip, continuity of mucocutaneous ridge, position of alar bases and columella length.

4½ years

Complete clefts

Elastic band traction from headcap was used against the projecting premaxilla. At two months of age one-stage lip closure was done.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Lateral mucosa and muscle were joined behind the prolabium.
4. Lateral vermilion flaps carrying the mucocutaneous junction ridge were used to overlap the prolabium vermilion.
5. The forked flap was sutured to the alar base flaps in "praying hands" pyramids.

B.D. 1-7-70
F.H. No clefts
F.T. Uneventful
O.C.A. I.Q. 53

3-4-70. Lip closure
Five months later, at age seven months, the forked flap was advanced into the columella with release of the nasal tip. At this time prolabium skin was elevated from above, and deep tissue was removed from the center of the philtrum and a dimple stitch placed.

A temporary homologous septal cartilage strut inserted behind the forked flap into the nasal tip would have maintained better support. An autogenous strut will be used at 15 to 16 years.

Complete clefts
Rubber band traction from headcap was used against the projecting premaxilla. At two months of age one-stage lip closure was carried out.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Lateral mucosa and muscle were joined behind the prolabium.
4. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
5. The forked flap was sutured to the alar base flaps in "praying hands" pyramids.
6. The soft palate was closed.

At three and a half months of age the forked flap was used to lengthen the columella.

Comment: 1. Very early columella lengthening with only slight lip lengthening.
2. Bifid nasal tip still needs corrective surgery.
Complete clefts

At three months of age one-stage lip closure was done.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the edges of the prolabium.
3. Mucosa and muscle of the lateral elements were sutured to each other behind the prolabium.
4. Lateral vermilion flaps were used to overlap the prolabium vermilion. The mucocutaneous ridge of the prolabium was retained.
5. The forked flap was banked whisker fashion between lip and alar bases.
At five months of age the forked flap was advanced into the columella.

Comment. No attempt at primary medial advancement and fixation of alar bases resulted in final flare requiring later reduction. Early forked flap without getting long lip.

An autogenous septal cartilage strut in the columella will eventually perfect this result.

Complete clefts

B.D. 11-2-70
Premature
F.H. No clefts
F.T. Uneventful
O.C.A. Mental retardation
1-26-71
At three months of age one-stage lip closure was carried out.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Mucosa and muscle of the lateral elements were united behind the prolabium.
4. A dimple stitch was placed.
5. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
6. The forked flap was banked with the alar base flaps in "praying hands" pyramids.

At six months of age the forked flap and alar bases were advanced to lengthen the columella and position the alar base.

The columella was thinned by a vertical diamond excision.
Rubber band traction from headcap was used against the projecting premaxilla. At six weeks of age one-stage bilateral cleft lip closure was accomplished.

1. The prolabium was freed from the premaxilla, and the lateral lip elements were freed from the maxillae.
2. A forked flap was pared from the sides of the prolabium.
3. Lateral mucosa and muscles were united in front of the premaxilla behind the prolabium.
4. A dimple stitch of catgut was made in the prolabium.
5. Lateral vermilion flaps carrying the mucocutaneous ridge were used to overlap the prolabium vermilion.
6. The forked flap was sutured to alar base flaps in “praying hands” pyramids.
At 5 years of age forked flap banked in praying hands position revealed right fork but the left fork had faded into the floor of the nose. Parallel incisions and development of the forked flap-alar base strap with the aid of a membranous septal incision allowed some release of the nasal tip and lengthening of the columella without lip re-entry.

Comment. Further columella lengthening will be required later.
Revising the early fork

When the forked flap was advanced into the columella during the first year of age, often (but not always) there was a tendency for it to be dragged partially back down into the lip and spread in width. At the same time and probably because of the same principle of muscle pull, as the child tugs the freed prolabium over the projecting premaxilla the lip increases in vertical length. A child successfully carrying out this action is shown. Although not the ideal situation and to be avoided if no other aspects of progress are lost, these minor deformities can be corrected quite easily when the child is older by simple revision. Here is a case in point.

A baby boy born in 1959 with bilateral CLP and protruding premaxilla had a complete cleft on one side and an incomplete cleft on the other. At three months of age a one-stage straight-line closure of both sides was obtained with lateral vermillion flaps overlapping the prolabium vermillion. Three months later, at age six months, a forked flap was advanced into the columella. Then followed the rather typical spread of the columella and partial drag of the forked flap back down into the lip along with some vertical lengthening of the lip.
On June 24, 1966, at age six and a half years, the forked flap was thinned and repositioned and the lip shortened by high transverse excision and suture including one midline wire suture of lip to septum.

Cartilage support for the forked flap

Since the skin flaps advanced into the columella in front of and above the septum for release and elevation of the nasal tip are only soft tissue, maybe it is not surprising that they have a tendency to sag. Of course, the vigorous muscle pull of the lip is no ally. A septal cartilage strut would support and maintain the raised nasal tip, but to take the septal cartilage in infancy or childhood is unwise. For this reason I had accepted the slight sag of the tip, widening and retraction of the columella and sliding of the tails of the forked flap back into the lip. With the anticipation that these little problems could be corrected without difficulty at age 16 years and then safely maintained with an autogenous septal strut at that time, I had postponed early support.
Oneal’s suggestion of temporary homologous cartilage support during the primary columella lengthening makes good sense. It would seem that banked uncarved but sliced homologous septal cartilage would serve exceptionally well as a temporary supporting strut during the primary columella lengthening and tip elevation at preschool age. This effect would last for years and possibly until autogenous septal cartilage could come to the rescue if that were ever necessary.

CONCLUSION

In an attempt to avoid the columella drag and lip lengthening following early forked flap advancement, the forked flap is now banked until school age and then shifted into the columella and sometimes supported with a banked septal cartilage strut. Long-term experience with various banking maneuvers at present has made the whisker position the favorite because of less shrinkage over the years and ultimately easier recutting and shifting of the fork under direct vision. It is too soon to tell whether the same secondary deformities will occur, but they probably will not. Should they appear, however, revision is not difficult and concern about it in no way justifies retaining a flat nasal deformity into school age.
II. Secondary Bilateral Cleft Deformities
Introduction to Part II

Unless the surgeon has been unusually unskilled, most severe secondary bilateral cleft lip deformities have resulted following complete double clefts. In the beginning, that is, the surgeon faced a premaxilla presenting varying degrees of projection and deviation flanked by lateral maxillary elements in varying degrees of relative retroposition. In front of this irregular and treacherous platform was a prolabium of varying size and shape, with little or no muscle in it, attached to a short columella of varying length. The lateral lip elements may also be of varying size both in length and in bulk.

Yet what the secondary surgeon faces, although indirectly influenced by the original deformity, has been seriously altered by what the previous surgeon did and how that affected subsequent growth.

An inseparable interrelation

Secondary bilateral deformities of the lip and nose are somewhat difficult to divide into separate chapters without repeating interrelated aspects. Choice of treatment of a nasal discrepancy often depends directly on the condition of the lip postoperatively. Thus, as it is difficult to divorce one aspect from the other, they will be dealt with together when necessary and separately when possible.

Repetition for teaching

It is planned that the reader can look up a certain subject and get a rather complete coverage. As examples must also appear in depth in the case studies, repetition is occasionally necessary and is acceptable only as it reduces the number of times the reader must interrupt his concentration to flip about in the book.
Skin Scars

When the primary surgery of bilateral cleft lip heals poorly or is planned or executed inartistically, there is double trouble, for indeed, inadvertently or on purpose, the same mistake has been made twice!

At the very best there will be two scars, and when they run straight up into the floor of the nose and contract to cause a notching depression, they create what Broadbent rather vividly refers to as the “dirty nose” look.

When triangular, square and quadrilateral side flaps have been transposed below the prolabium or Z-plasties interdigitated into its sides and the columella is plucked out of its center, the main scars become irreversible, unphiltrum-like brands reminiscent of strange alphabetical symbols and Indian signs.

If the sutures were placed too far from the skin edges, tied too tight, bathed in nasal discharge and left too long, there will be stitch marks too. They will appear not just as one ladder running up the lip but as at least two with possible cross ladders forming a truly bewildering maze of scars!

Beware Double Excisions

Secondary scar revisions in bilateral clefts can be handled much as described in unilateral cases. The double-breasted vest and other procedures are available. Here, again, it is well to revisualize the normal position and direction of bilateral philtrum columns and
try to maneuver the scars along these general lines, avoiding any abrupt interruptions that extend directly into the floor of the nose or even across the mucocutaneous junction ridge. There is one 

\textit{vital} principle to remember: Tension was probably responsible for the need for this revision, and the best chance for secondary success is to \textit{cut your tension odds in half and revise only one side at a time}. An exception to the rule is made when the muscles from each side are to be joined together behind the prolabium, taking up the skin tension on both sides and promising better bilateral healing.

\textbf{ATTEMPTS TO WIPE THE SLATE CLEAN}

When, in addition to stitch marks, transverse relaxing incisions have been placed widely across natural lines, the lip is turned into a tragedy of whiskered scars as seen in this spine-chilling example from Veau’s 1938 \textit{Bèc-de-Lièvre}.

In 1952 and 1954 Schmid, of Stuttgart, presented a unilateral cleft case with such severe scarring and whisker stitch marks that he was forced into drastic action. He inserted an Abbe flap for relaxation and then excised all skin and scar of the entire upper lip and covered the area with a full-thickness skin graft taken from the submental area, adding:

This procedure has also been satisfactory in men.

Skin excision of the entire area and total resurfacing with a full-thickness skin graft was also suggested by Broadbent of Salt Lake City in 1957 as a desperate last-ditch effort to salvage a tragedy that was avoidable in the first place.

Musgrave, for Goldwyn’s \textit{The Unfavorable Result in Plastic Surgery}, does not give this approach for cat whisker scars much praise and offers a combined alternative:

Replacement of the entire area by a skin graft is not very rewarding and gives an artificial appearance. When feasible, a centrally placed lip flap in conjunction with dermabrasion and scar revision may offer some hope.

Here is a personal case which was referred with extremely wide stitch marks, a short columella and alae too flared. A small
lip-switch flap had been merely stuck in the lower half of the lip, rather than being used to advantage to remove a good portion of the scarring. A forked flap reduced much of the lip scarring as it lengthened the columella, but in its wake followed the typical teenage scar hypertrophy.

Later, a high transverse elliptical lip excision shortened the lip and lifted the lip-switch flap into better philtrum position. Then bilateral vertical scar excisions flanking the central flap further improved the lip. Advancement and fixation to the septum of the denuded tips of alar base flaps reduced the nasal width. Time has brought improvement, but there is still too much scarring.

SCARS IN "HAIR" LIP

One problem of upper lip scars in the male is their effect on the hair-bearing area, for scars are hairless and stand out like brands even on a cleanly shaved lip. Extensive scarring actually prevents the production of a mustache or at least renders it ineffectual.

The ability to grow a mustache offers a means of camouflage. Then, too, some men just look better with a mustache. My father did. They need not have had a cleft or be scarred; to a lip that is slightly short or recessed a mustache can bring both body and distinction. There was a time when the black mustache automatically designated the villain, invoking in the audience an immediate conditioned reflex for hissing. Mafia gangsters are
often referred to as the "mustaches." Yet today, whether it is because villains have been glamorized into ridiculous half-heroes or because the mustache is the most masculine part of the male hair pattern, the mustache has become popular in every level of society. The fashion is fanned further by such stars as Larry Csonka on the gridiron, John Newcombe on the tennis court, and Burt Reynolds on the screen and centerfold. In fact, Schick had to pay Joe Namath $10,000 to shave off his Fu Manchu mustache on television!

In the bilateral cleft one evidence of a successful treatment is the construction of a lip that can produce a respectable mustache. This is not a cop-out nor is it as easy as it may seem, for in the bilateral cleft there is a double dose of scars, and the original isolated prolabium is seldom able to sprout a luxuriant growth of hair in the first place. When the prolabium is hairless, the trick again is to have it philtrum width so that any baldness lies less noticeably between lateral bushes.

Even the Abbe flap, so often called upon in secondary correction of bilateral clefts, does not solve the mustache problem completely. When the lower lip flap is transposed into the upper lip, its normal hair growth, of course, proceeds after transplantation but in upside-down direction as shown. Some patients become infuriated with this disorganization of hair, but with training by brushing and clipping, order can be brought to the chaos and an enviable soup strainer or handlebar can be cultivated. Here are two more examples of a mustache augmented by an Abbe flap.
Several of my bilateral cleft lip patients shown throughout this book, who have results good enough to enjoy clean-shaven lips, are at present sporting mustaches. They are merely capitalizing on the fashion of the day, which also provides them the ultimate in camouflage.

Here is a cleft lip patient at Rooksdown House, Hampshire, England, during my time with Gillies, in whom the lip scarring was rather severe and the maxilla retroposed. Either the patient had seen so many forehead-scalp flaps dangling about the wards that he had requested one himself or a surgeon in desperation had swung a rather cavalier, hairy scalp flap over the scarred lip to cover the problem once and for all with a truly swashbuckling mustache!

**PROPHYLACTIC BETTER THAN ANAPHYLACTIC**

If the bilateral cleft lip is handled as described in the primary section with mucosa and muscle approximated to each other in the midline behind the prolabium, taking all tension off the skin scars of union, the infant will heal these scars superbly. Then, if the prolabium has been reduced to philtrum dimensions and tissue for the columella shifted out of the lip, reentry and rescarring of the lip will never be necessary. If this course has not been followed primarily, then its use secondarily may be the best way out, leaving the teenager to heal it the best he can.

**SECONDARY SCAR REVISIONS ARE OFTEN SECONDARY**

When there are other, more severe labial deformities in addition to the scars, then as an added dividend the scars are simultaneously revised and often even repositioned during the process of sculpturing the contour or correcting the lip length, width or tightness. Examples of this action are scattered throughout this entire secondary section.
33. Correction of Secondary Muscle Discrepancies

In bilateral clefts, besides the actual clefting, there are two discrepancies in the orbicularis oris muscle of the upper lip. Depending on the completeness of the clefts, the prolabium has little or no muscle. The lateral lip elements have muscle, but the fibers run parallel to the cleft edges up toward the alar bases. When the lateral lip elements are merely attached to the sides of the prolabium in the standard bilateral cleft closure, of course, the muscleless prolabium eventually is pulled wide and flat against the projecting premaxilla by the strong lateral muscle elements bulging with hypertrophy. It is best to count your losses, consider this stage a radical adhesion and at about five to six years take it all apart and start again doing what has been described and should have been done during the primary procedure.

In 1963 Bill Holdsworth of Queen Mary’s Hospital, Roehampton, England, cognizant of the importance of muscle continuity, designed a secondary procedure in bilateral clefts. In his 1970 fourth edition of Cleft Lip and Palate he explained:

To interfere as little as possible with growth, operation is delayed until the age of eight.

He then reemphasized the values of his procedure:

1. To permit function, it is necessary, as in the palate, to join muscles. Otherwise the lip can never be an instrument of expression, and will remain a passive curtain, with unsightly lateral bulges caused by misplaced muscle. Veau (1938) pointed out that the absence of muscle from the
prolabium was the principal cause of mediocre results in double clefts.

2. Vertical scars need revision.
3. The prolabium is too wide to imitate philtrum.
4. A mucosa sulcus is wanted in front of the premaxilla.
5. The lateral elements of the lip require vertical shortening in muscle and skin.
6. A median notch on the edge is to be removed.
7. The nostril floors are too wide.

Holdsworth considered that all of these matters were dealt with by his 1963 operation based on the Veau III. He excised the scars bilaterally, elevated the prolabium as a trapdoor flap, joined the lateral muscles together across the midline, advanced the alar bases and replaced the prolabium.

The only possible criticisms are that this maneuver should have been completed during the primary operation, and even as a secondary procedure it has made no allowance for adequate lengthening of the short columella.

Thus, it is proposed that the best and most efficient approach is to join the lateral muscles to each other across the cleft during the primary surgery as has already been described in the banking procedure. If this has not been done, then it should, as a secondary procedure, be carried out the same way. The lip elements should be cut free from the alar bases, brought down and advanced to each other behind the prolabium.

Here is a case treated in New York using the earlier plan in which primary bilateral rotation-advancement had been followed by a secondary forked flap. The columella seemed almost long enough, but the lack of muscle continuity across the prolabium,
lip shortness, the visible preservation of a portion of the prolabium vermilion and a slight whistling deformity spoiled the result.

As the columella was almost adequate, the lip scars were excised and the prolabium was elevated. The lateral muscles were mobilized and sutured to each other in the midline, and a Mersilene dimpling stitch replaced the prolabium in better philtrum posture. Maintaining the inferior mucocutaneous ridge, the prolabium vermilion was turned down so that vermilion of the lateral lip elements could overlap it out of sight and create a full tubercle.

The borderline shortness of the columella and the width of the alae will probably be corrected by the advancement of the alar bases and nostril floors into the columella at about 15 to 16 years, when nasal shortening and a septal cartilage strut can be used for final tip shaping and support.
If the columella is also short, a forked flap can be banked while the muscles are approximated, and three weeks to three months later the forked flap can be advanced into the columella.

This complete bilateral cleft with a severely protruding pre-maxilla was treated with the early Georgiade-type rubber band retraction. The lip clefts were closed by simple straight-line approximation with no effort to join the muscles or bank a fork. The result was about what would be expected and nearly what would be achieved by a bilateral adhesion procedure. The stage was set for taking the entire lip apart, paring a forked flap, joining the mucosa and muscle of the lateral elements behind the prolabium, advancing the alar bases and suturing their denuded ends together in the midline to the septum, placing a dimple stitch in the prolabium and banking the forks in whisker position.

Several months later the forked flap was taken out of the lip and advanced along the septum into the columella and the lip elevated to the nostril sill.
Here is another example of secondary correction of the nose and lip which included cutting the forked flap, approximating the lateral muscles together behind the prolabium, and banking the fork in "praying hands" position. Three months later, the forked flap was advanced into the columella.

The six-year-old Central American girl on the next page had been born with a bilateral cleft lip and palate, treated in infancy in San Salvador by surgical approximation of the lateral lip elements to the prolabium. The result was typical for this method, presenting a flat nasal tip, short columella, wide prolabium with lack of muscle continuity, lateral muscle bulges and deficient central vermillion with a whistling deformity.
A forked flap incorporating the bilateral scars and portions of the wide prolabium was cut up to the base of the columella. The central portion of the prolabium was freed from the premaxilla, leaving most of its mucosa to cover the anterior raw surface of the premaxilla. The lateral lip elements were approximated to each other, first mucosa and then muscles for complete continuity. The prolabium was replaced as a philtrum with a dimpling stitch. The forked flap was banked in subalar whisker position.

Two and a half months later, the banked fork was reelevated and advanced into the columella with the aid of a membranous septal incision, which was extended bilaterally in the vestibules at the tip for adequate release. Small side flaps cut from the forked flap were interdigitated into the vestibular releases. The forks were sutured together in front, rolled into a tube with catgut sutures and stitched to the septum with the tips splayed at the columella base. The alar bases were cut as flaps with subcutaneous scar extensions, which were advanced medially and sutured to each other at the nasal spine. The join of the alar bases to the splayed tips of the forked flap created the nostril sills.
SECONDARY MUSCLE APPROXIMATION AND FORKED FLAP

This boy, with a complete bilateral cleft lip and palate, had the old standard closure in infancy in New York. At 10 years he revealed all of the typical secondary deformities including short columella, flaring alae, absence of muscle in wide prolabium, lateral muscle bulges, absence of upper labial sulcus and deficiency of prolabium vermilion with whistling deformity. The premaxilla was slightly projecting but the maxilla and palate were reasonable.

In the first stage of the secondary correction a forked flap was elevated, lateral mucosa and muscles united across the midline, dimple stitch placed in philtrum, lateral vermilion flaps advanced to overlap miserable prolabium vermilion and forked flap banked in whisker position.

Several months later forked flap was advanced into the columella and lip lifted up to the nasal sill.
Ian Jackson of Glasgow, Scotland, is one of the modern champions of joining muscles across the midline in bilateral clefts. In Copenhagen in 1973 he pointed out its value as a secondary procedure:

These methods can be applied to secondary cases where there is shortening of the lip and muscular dysfunction due to lack of reconstruction. Correction of whistling deformities in bilateral cases has been effected without difficulty since this is due to lack of muscle in the prolabium.

Several months later he added:

If one looks at the orbicularis reconstruction in secondary cases, this is where I think the answer lies. . . . It has been interesting that showing these lips prior to operation to other surgeons they have suggested in many cases that Abbe flaps will be necessary to bring in new material. It seems that when one brings the orbicularis into its true position in the midline the need for an Abbe flap diminishes because the whistling deformity is cured in an effortless fashion and the whole lip is lengthened by swinging down the muscle bundles into the midline. In fact, there have been a few lips which have ended up marginally too long after this procedure.

MUSCLES ARE JOINED IN MICHIGAN

Robert Oneal with Donald Greer and Gary Nobel of the University of Michigan reported “Secondary Correction of Bilateral Cleft Lip Deformities with Millard’s Midline Muscular Closure” in Plastic and Reconstructive Surgery, July 1974. They cited nine cases adopting this two-stage procedure in secondary deformities. The sequence of events as they described it is of interest:

We had been doing our primary closures with bilateral lip adhesions. With Dr. Millard’s encouragement, we applied his two-stage technique for lip closure in one of these patients. We were encouraged by our results with this patient. Because the lip-adhesion repairs resembled many of the patients coming to us for secondary repairs, we decided to try this technique in a series of patients for secondary repair of bilateral cleft lip deformities.

They noted certain aspects about these deformities:

In some cases during movement of the lip, the deformity is magnified. . . . With an attempt at puckering, the lack of midline orbicularis oris union becomes quite striking. In these cases the lateral vermilion is redundant and
the unconnected orbicularis segments bulge laterally beneath the skin; this causes the central muscle and vermilion deficiency to become even more apparent. In addition, many of these patients have a short columella and a tethered nasal tip; these also require correction.

Robert Oneal kindly forwarded me a series of diagrams and photographs, some of which he published in *Plastic and Reconstructive Surgery*. A few of these have been selected to show the secondary deformity, banking the fork, muscle union behind the prolabium and finally columella lengthening.
Their attitude toward banking the forked flap is sound:

If the columella needs lengthening, the extra bulk available from the "banked" flaps and the good results obtained by the Cronin columella raise justified the two-stage procedure.

In summary they noted:

Our review of nine cases in which this technique was employed demonstrates significant improvement in all the basic aspects of the deformities. We have been particularly impressed with the resultant cupid's bow and midline tubercle. The most dramatic change, however, has been in the dynamic function of the orbicularis—particularly during active puckering of the lip . . .

Once the muscle is united in the midline, the transverse vectors cancel each other out, the vertical vector is doubled and it now acts centrally to elongate the center of the lip. This is potentially helpful when the prolabium is congenitally short. These factors suggest to us that the lack of muscle continuity should be corrected as early as possible.

It was particularly encouraging when sound and knowledgeable Bill Grabb, author of the comprehensive Cleft Lip and Palate, voluntarily expressed his "joy" with the functional and relaxing effect of this joining of the lateral muscles behind the prolabium. The reduced prolabium, shorn of the forked flap, snuggles like an intervening piece of a puzzle back between the skin edges of the lateral elements in a better than perfect fit so that the scars of union have absolutely no element of tension tugging against their healing.

In 1976, James Lehman of Akron endorsed this type of secondary muscle approximation during forked flap banking followed by advancement of the forks into the columella as a second procedure.
Tord Skoog of Uppsala is another surgeon who by 1973 in Copenhagen was advocating joining the lateral muscles across the midline as a secondary procedure. He wrote me in January 1976:

In bilateral clefts I am more and more impressed by the results of the secondary lip reconstruction which is described in my book on pages 134–140.

In his 1974 *Plastic Surgery* Skoog shows several cases of bilateral cleft lip with a whistling deformity that had been closed originally by his method. He then presents beautiful color pictures of lifting the prolabium (making fresh skin scars) and joining the lateral muscles across the midline in an effective secondary procedure. This is similar to what many of us have been advocating for years *primarily*—and, of course, secondarily also when necessary.

**AutoGenous Skeletal Muscle Free Grafts**

In 1874 Zielonko, a Russian pathologist in Strasbourg, first transplanted free autograft of skeletal thigh muscle in the lymph sac of the frog and observed rapid necrosis without regeneration. Others experienced similar failures. Lyndon Peer’s 1955 suggestion that the entire length of the myofibril be used in the grafting rather than only a segment of the cell, and Hogan, Dawson and Romanuel’s 1965 demonstration of reduced metabolism following denervation of muscle suggested two adjuncts to increase the chance of free muscle graft survival. This was the basis of Noel Thompson’s Foundation of the American Society of Plastic and Reconstructive Surgeons 1971 prize-winning essay. Then in 1974, in his Kazanjian Lecture, he presented autogenous free skeletal muscle grafts applied to various areas including the bilateral cleft lip.

Research-oriented Thompson, apparently without great experience in primary cleft lip surgery, infatuated with his free muscle grafting and anxious to try it everywhere, made a vague “half case”:

Attempts made to restore muscular continuity across the prolabial region by mobilizing the lateral lip musculature (Glover and Newcomb, 1961; Duffy, 437
1971) have the disadvantage of producing a tight lip of excessive vertical height or progressive fibrous replacement in this tissue putting excessive tension upon the transposed muscle (Fara and Smahel, 1967).

He continued:

A simple and reliable method of successfully restoring the continuity of the orbicularis oris muscle fibers in the bilateral cleft lip is by exposing the area completely. This is accomplished by turning down skin of the already repaired upper lip by bilateral nasolabial incisions joined by a transverse incision below the nostril floors and root of the columella. The lateral muscle masses of the upper lip are exposed; the fibrous tissue of the prolabial region is removed, and a muscle graft (one belly of suitable size from the extensor digitorum brevis muscle [denervated 14 days prior to transplantation]) is applied to bridge the prolabium and sutured directly to the lateral muscle elements. Complete sphincteric contraction of the lips results.

He then presented an adult secondary bilateral cleft. Obviously the patient had never had the lateral muscle elements joined behind the prolabium and could not whistle. His postoperative photo revealed improvement but a rather odd-looking lip while whistling and had this label:

Electromyography. Preoperatively there was, on volition, normal electrical activity in the lateral lip elements, but no activity in the prolabium. At 3 months after muscle grafting to the upper lip, there was well marked volitional activity in the prolabium following reinnervation of the graft.

This is interesting, but his next suggestion is disturbing:

If applied at about the age of one year, it seems possible that the improved muscular activity might affect skeletal development in the premaxillary region beneficially.

Many of us will postpone free grafting of skeletal muscle until its microscopic vessel anastomosis is practical. It will probably never be needed in bilateral clefts anyway as there is already enough innervated muscle present, if handled correctly, to obtain good function and whistling without one’s having to lend a hand or even part of it to the lip.
34. Philtrum Contouring and Cupid’s Bow Construction

Many operated lips with a bilateral cleft hang like a curtain without animation, philtrum dimple or cupid’s bow. This condition is easily understood as there is no muscle in the prolabium and there is no residual of the normal cupid’s bow or dimple in the bilateral cleft deformity. If the vertical length of the lip is within normal limits, the problems of the cupid’s bow and philtrum dimple become priorities. In fact, if there is ever to be a bow and dimple—and a lip without them is unnatural—they must be handmade. If correctly designed, a cupid’s bow and dimple can be created during the primary surgery. If they were not, then secondary bow and dimple formation is necessary. There are several ways of achieving this goal.

Dimple Making

Even when the bilateral scars have been placed strategically in the philtrum column positions, the lip still looks unnatural without a philtrum hollow flanked by eminences.

Gouging a philtrum

Gerald O’Connor and Mar McGregor of St. Francis Memorial Hospital, San Francisco, noted in 1958:

Obvious anatomical differences that immediately single out the operated cleft lip from the normal are:
1) The absence, or lack of development of the normal philtrum (median groove) either pre- or postoperatively.
2) The absence, lack of development or alignment of the normal prominence that is in the upper lip skin just above the junction at the vermilion border. This has been called the “white line” or “white roll” (Gillies).

They called it the cutaneous upsweep of the upper lip and noted that Marcks and Trevaskis claimed its presence in all cases and emphasized its importance as a landmark in alignment of the cleft lip elements.

O’Connor and McGregor elaborated on the function of the philtrum:

The philtrum, besides being possibly the junction point of the two medial nasal processes, has elevated sidewalls to permit nasal secretions to run down either side of the upper lip, and the cutaneous upsweep acts like a gutter for perspiration or nasal secretions to drain away from the mouth opening . . . .

The philtrum and cutaneous upsweep are also so constructed, in our opinion, to permit the many and varied motions of the lips in all directions, giving a little extra material when play is needed in the upper lip . . . . The excess material lies in sort of a reverse folded position to act as a ready reserve for all complicated lip motions and yet spring back to the norm when at rest.

As they pointed out:

This philtrum absence is accentuated in the double cleft lip by the prominence of the prolabium and the presence of the flattened surgical junction scars on either side of the prolabium.

To imitate the philtrum groove and cutaneous upsweep, they elevated the skin of the prolabium. A mid-vertical subcutaneous flap based inferiorly was cut and split down the middle. Each prong, when threaded laterally into a tunnel along the arch of the bow just under the mucocutaneous junction line, left a central hollow and emphasized the bilateral upsweep. The prolabial skin was sutured deep into the hollow in an attempt to maintain the groove.

Recently Mar McGregor, nicknamed “Fearless” by his residents because of his willingness to take on any problem, was asked how he felt about his philtrum operation today. He reminisced that they had done four of these procedures and had been encouraged by the results over a period of about a year, after which, for one
reason or another, the patients were lost to follow-up. Thus their ingenious and original preliminary report, now 15 years without photographic records, suggests that O'Connor and McGregor combined the economy of the Scots in its conception with a bit of the blarney of the Irish thereafter. In spite of the ingenious design for shifting philtrum tissue, nature tends to smooth out man-made depressions in the upper lip, which always have been and continue to be as elusive as leprechauns.

Alps and valleys

At the Rome International Congress in 1967, Austrian Otto Neuner of Berne University Dental Institute, Switzerland, presented some impressively artistic secondary corrections of bilateral clefts. One of the methods he described was remarkably similar to that of O'Connor and McGregor. He transposed two inferiorly based subcutaneous flaps from the mid-vertical to the lateral-horizontal position to create a philtrum hollow and the elevations of a cupid's bow curve. The case he presented had photographic evidence of a dimple. To this he added bilateral V-Y vermilion advancements to accentuate the red lip eversion and the central tubercle of the bow.

The roll-over

There is also a possible application in the bilateral cleft lip of Onizuka's 1971 unilateral philtrum roll-over flap.
An even better double roll-over also follows Onizuka’s philtrum adaptation of the great general principle of taking tissue from where it is not wanted and moving it to where it is needed.

_A chondrocutaneous philtrum_

Innovative Edward Schmid of Stuttgart, Germany, stated in 1963:

So far, none of the attempts to reconstruct an absent philtrum have given a satisfactory result. . . . Lexer, in particular, practiced philtral imitation. . . . In patients with bilateral cleft formation, in whom no after-development of the philtrum can occur . . . our solution is to take suitable cutaneous-cartilaginous fragments from the ear and transplant these as composite grafts into the upper lip. . . . Permanent trough-shaped grooves are obtained, which are bordered by lateral elevations corresponding to the sides of the philtrum. . . . Owing to the support given by the cartilage it is possible to stretch lips which are slightly shortened in the center.

Schmid used composite auricular grafts with the central portion of the cartilage thinned or perforated to aid in philtrum hollow construction. When the entire skin of the philtrum was scarred, the entire philtrum was replaced by the composite graft.
A commoner and more intriguing application of this principle involved use of a philtrum-shaped auricular cartilage perforated in the center and carrying with it only the amount of skin necessary to create the tip of the philtral bow. As described by Schmid:

In the zone of the philtrum the vermilion is separated from the lip and a tunnel is made in the latter. The cartilage fragment without skin can now be introduced into the subcutaneous space, while the skin attached to the cartilage is sutured between the lip and the vermilion, which was retracted downwards.

Pieces of cartilage in the lip have never been particularly enticing to me, but Schmid faced the problem head on:

I have been asked whether such implantations of cartilage did not impair the patient's sensitivity, e.g. during kissing. I have asked my patients this and their answers have reassured me.

Other stiff upper lips

Neuner of Berne confirmed, in Rome in 1967, the value of Schmid's auricular cartilage graft in the formation of a philtrum hollow. He advocated use of the cartilage with a preformed hollow from the scaphoid fossa of the ear inserted through a mid-vertical mucosal incision.

Cupid's bow in bilateral clefts

In the original bilateral cleft, there is no vestige of a cupid's bow, and only by shaping the prolabium and even its inferior border
and possibly bringing in lateral vermilion flaps, or vermilion flaps ridged with a mucocutaneous "white roll" ridge, can a semblance of a bow be created. If this procedure has not been done primarily, there are ways and means of secondary bow construction.

**Transforming Blair-Brown into Hagedorn-LeMesurier**

When triangular flaps from the lateral lip segments have been slid toward each other below the inferior edge of the prolabium to touch tip to tip as in the Blair-Brown method, often a single mucocutaneous arc is created with the suggestion of a central vermilion whistling deformity. The advantage of the Hagedorn-LeMesurier method was that it created an artificial cupid's bow. Thus, by turning the triangular flaps with additional excisions into quadrilateral flaps, wider at their medial ends, the semblance of a cupid's bow is achieved even with a midline tubercle.

The unnatural position of the skin scars, of course, is more noticeable three weeks after surgery but will forever detract in some degree from the ultimate result.
Another secondary method of creating an artificial cupid’s bow was ingeniously designed by Sir Harold Gillies in 1932. This was, incidentally, the one of his artistic procedures that propelled me to cross the Atlantic for study with him. I went to learn of philtrums and of cupid’s bows but in the process was also taught of trouts’ tricks, “Of shoes—and ships—and sealing-wax—Of cabbages—and kings.”

It was said that Gillies was one of the top six fly-fishermen in England. One day he and I were strolling along his stretch of the river Test in the mayfly season. My mind was on the lip section of our book. I realized that when the mucocutaneous line curves without any peaks but the lip is loose with no reason to insert an Abbe flap, the Gillies cupid’s bow procedure can be useful. I tried to draw him out on this subject, but he simply countered by picking a hook out of a tobacco tin and with green floss silk tied a fly of brown cock’s hackle and flue for wings and tail, identical to the pale watery olive mayflies hovering over the quiet river that afternoon. Only after a catch was Sir Harold willing to return to the cupid’s bow, and then and there we composed a few lines for our 1957 *Principles and Art*:

First estimate by measurement from the alar base the desired lift, mark the elliptical skin areas and excise them. Then undermine the lip mucosa from its muscle except at the central point, which is to remain fixed. Nick the tight muscle bands at the centre of each “bow,” or perhaps even excise a small triangle, which will increase the side-to-side length of the lip. As the fresh vermilion edge is advanced up into its new position, the central point tilts forward.
Freeing the vermilion.

Nicking the muscles.

Suturing the cupid's bow.
This was an operation Barrett Brown attacked with vigor, saying,

Only God can make a cupid's bow!

and then elaborating,

It is thought that the resultant scars of these operations, in some instances, may be more deforming than the absence of the “bow.”

Meticulous Musgrave echoed this same feeling decades later:

Note the artificial appearance of this “manufactured” cupid’s bow.

Gerhard Pfeifer of Hamburg expressed German resistance to the operation:

I do not think we ought to use excisions at the vermilion border, after Gillies, since even the finest suture cannot improve the natural border of labial red and white.

It is quite true that when this method is executed inartistically the unnaturalness created cancels out any assets accrued. Yet there are several possible modifications to refine the design.
Preserve the mucocutaneous ridge

The original procedure can create a semblance of a bow with improvement in certain cases. As the normal white roll of the mucocutaneous junction was destroyed in Gillies' plan, the results consequently present in the lip area a false-face effect. Thus, to counteract Brown's, Musgrave's and Pfeifer's criticism, it is suggested that the white roll of the mucocutaneous junction be spared, as has been shown in secondary unilateral cleft corrections, and the excisional lift be carried out just above it, preserving the skin ridge of the mucocutaneous junction to reflect a highlight along the white roll.

INTEGRATING THE ‘‘W’’?

Albert Facundo Borges, the czar of scars, formerly of Havana University and now of Falls Church, Virginia, wrote an excellent W-to-Z atlas entitled Elective Incisions and Scar Revisions. He advocated that transverse excisions of the lip be made as W-plastic-type scars and further insisted that this principle is applicable to the skin excisions in the cupid's bow operation. Even when the excisions are carried out above the salvaged mucocutaneous "white roll" ridge, Borges claims the W-plastic maneuver will give a superior end result. In 1977 he wrote:

Your modification of Gillies' procedure in which the mucocutaneous ridge is preserved is an ingenious one and will get a great improvement. The correction of displaced anatomical landmarks supersedes in cosmetic improvement any deleterious effect created by the presence of a scar. The unfavorable, or not, result of a transverse scar on the lip should be judged, not only with the patient's lips in repose, but specially with the patient smiling or talking. Although I have not performed the following W-plastic technique to correct asymmetry of the two arcs of cupid's bow secondary to cleft lip repair, I have performed it for post-traumatic drooping as seen in Figure 8-10 of my book on scars. The schematic representation of the technique is enclosed. Note how the widest triangles correspond to that segment (medial third) where one desires the greatest excision of tissue, thus the greatest upward pull. The lowermost angles of the W-excision reaches to, but does not transect the mucocutaneous ridge. The excision should not be any higher, since this would require a greater width of the W-plastic tissue excision. Too
wide an excision could create dog ears at the ends of the excision which would require vertical fusiform excision of tissue for its correction. The end result would be an elastic concertina-like transverse scar on the lip that would not hinder the normal laugh of the patient, nor would it make the patient stop laughing. This scar would be composed of “almost” vertical TL very small scars. This scar WILL BE superior in theory and in practice than any transverse long scar running against the RSTL.

This may be true but here the scar skirts the mucocutaneous ridge and I personally prefer to keep the scar parallel to the curve of the ridge line rather than try to “W” it just above the ridge along the entire width of the lip.
A further improvement in this operation is suggested. The bilateral triangular or elliptical skin excisions should not be removed in the usual manner, and the notches should not be cut out of the free edge of the orbicularis oris muscle. Instead, the skin triangles should be de-epithelialized and then incised as dermomuscular flaps based at the center of the bow. If subcutaneous tunnels very close to the skin are dissected along the ideal philtrum column lines toward the base of the columella, the dermomuscular flaps can be tugged into these tunnels with pull-out sutures. This operation will now create a cupid’s bow with a mucocutaneous ridge, a central tubercle and philtrum columns with a central dimple.

Such an operation, as always, is available for shortening a long lip, but these refinements make it possible simultaneously to fashion a more natural cupid’s bow and to contour philtrum character. By the relative rise of the overlay principle, the philtrum columns and hollow can be achieved without the necessity of dividing by gouging the midline muscle union across the lip!

Again, if the primary cleft operation was executed correctly, there will be no need for such shenanigans. This is but a secondary procedure of last resort refined to make the most of a flat situation.
De-epithelializing the skin but preserving the mucocutaneous junction ridge.

Medially based subcutaneous-muscle pedicle being dissected.

and elevated as flaps.

Philtrum column tunnel dissected.

Flaps being pulled into tunnels to create cupid's bow, philtrum columns, and dimple.

This modification has real possibilities!
35. Deformities of the Free Border Vermilion in Bilateral Clefts

THE WHISTLING DEFORMITY

The most common defect of the free border in bilateral clefts is the whistling deformity. This unattractive central deficiency, often seen as a postoperative sequela, spoils the effect of an otherwise satisfactory closure, for one tends to see the hole and not the doughnut! Of course, its occurrence is easily avoidable if the primary lip surgery is planned correctly and the prolabium vermilion is not called upon to constitute the center of the lip alone. A myriad of methods have been used to correct this secondary deformity.

A MYRIAD OF METHODS

A fancy vertical V-Y

In 1957 George Crikelair and M. J. Hickey of Columbia-Presbyterian Medical Center noted that in bilateral clefts when the lateral segments have simply been approximated to the prolabium the central segment is often lacking in vermilion fullness, presenting a dark hole in which the upper central incisors are visible. They suggested a V-Y advancement with lateral extensions from the posterior buccolabial line of the prolabium to fill out the "whistle deformity."
Double horizontal V-Y's

Tall and gentlemanly Dave Robinson, with Lynn Ketchum and Frank Masters from the plastic stronghold in the center of the corn belt of Kansas, admitted that after conservative simple side-to-side closure of a bilateral cleft lip when the prolabial vermilion is left as the center of the red border:

For the first few years, the prolabial vermilion is too high—but it does assume a more normal position in 5 to 10 years. In spite of the claims that it will usually assume the same level and the same degree of fullness, this progression does not always happen. Thus the "whistling deformity" occurs.

For this deformity they reviewed the central advancement of posterior upper lip mucosa by a Z, a V-Y or a double rotation. They even mentioned a free composite graft from the lower lip. Then they plowed them all under and came up with a horizontal double V-Y in the free vermilion border of the lip which shifts the lateral mucosal redundancy into a central four-flap tubercle.

More recently, at the University of Kansas, the surgeons have been treating whistling deformities with flaps described by Kapetansky.

The pit and the pendulum

In 1971 enthusiastic Donald Kapetansky of Detroit noted:

When the prolabium has not been augmented with lateral vermilion flaps in the primary repair, an abundance of tissue is usually apparent in both sides of the upper lip. The problem is one of secondary transfer of this tissue. The usual flaps do not permit the necessary mobility, but island flaps are mobile and avoid the need to twist the tissues or stage the repair.

He designed two vertical pendulums composed of vermilion,
muscle and coronary vessels. The anterior plane of dissection divided the lip coronally with about one-third of the orbicularis oris muscle mass in front of it; the posterior plane was behind the labial vessels. A transverse incision uniting these two provided a space into which the pendulums could swing together, filling the whistling deformity.

![Diagram of lip dissection and muscle splitting.]

His result was impressive, but the magnitude of the muscle splitting of the "pit and the pendulum" method has the slightest suggestion of a plan by Poe.

Three years later, with a total of 24 cases, Kapetansky had made a few interesting modifications which he presented in the April 1974 Cleft Palate Journal. He now cuts his pendulums full-thickness muscle in their medial portion and split-thickness laterally. With back-cuts into his pendulum pedicles he achieves medial lengthening to form a central tubercle and notes that if the back-cut is placed low and short, the tubercle will be small, while if it is high and deep, the tubercle becomes larger.

![Diagram of pendulum modification.]

To create a pit between his pendulums, Kapetansky sutures the central prolabium dermis to the muscle pedicles. His immediate results are dramatic but seem slightly better than the later results, as in most dimpling procedures.

It is also worthy of note that Kapetansky has such faith in this secondary procedure that he is happy with simple side-to-side...
closure in his primary bilateral clefts at one week, accepting lack of muscle continuity, short columella, flared alae and whistling deformity. Then at five years he plans to swing the pendulums and, later, to lengthen the columella.

Juri, Juri and de Antueno of Buenos Aires in 1975 suggested a modification of the Kapetansky technique that used another approach to increasing central lip fullness. They advocated that the Kapetansky flaps be “fitted together downwards in the shape of an ‘L’ to make up the center of the tubercle.”

**Double transpositions**

Marvin S. Arons, of Yale University, also designed a correction of the whistling deformity. As it is intriguing to review the background of those who later contribute, here are his 1974 reminiscences:

As a general surgical resident at Duke, I first saw the cleft lips repaired in a textbook technical fashion. My first experience was with Truman Blocker of the University of Texas while he was still active in the operating room. It was what I called the “twenty minute free hand repair of a cleft lip.” I believe that he represented to me the art—as well as the science—of plastic surgery. I learned from him the importance of rolling in the ala, utilizing the skin below to restore the floor of the nose as a lateral based flap brought medial. We all called this the “Blocker flap.” I’m sure Dr. Blocker did not realize that the Collis procedure was reported in 1868.

In 1971, for the central vermilion deficiency in bilateral clefts, Arons designed a secondary Z. He hinged small bilateral inverted V flaps of mucosa and scar down on either side of the whistling deformity. The central segment was elevated and flapped forward into a roll. The lateral V flaps were then interdigitated horizontally behind the central flap.
V-Y-Z

In 1969 Shugo Soeda, of Tokyo University Hospital, added a Z-plasty to the V-Y posterior mucosal advancement. As he explained:

V-Y-Z plasty is combined V-Y plasty and Z-plasty for advancement of the wide V-shaped flap and preventing postoperative retreat of that flap. This technique is applied for secondary revision of the thin prolabial vermilion, produced as the postoperative deformity after primary repair or Abbe flap repair of the bilateral cleft.

This rather complicated action does have a double advantage of lowering the short central segment while lifting the long lateral edges, but it must be rare that the middle segment is short enough to require this many flaps.

A drop down

Humorous Hugh Johnson of Rockford, Illinois, simplified his treatment of the whistling deformity by turning the posterior lip mucosa down like the back flap in a pair of red long johns and holding it rather adroitly with a stay suture over cotton. This maneuver presupposes that there is posterior mucosa in the first place, that the inevitable overgrowth of injured mucosa is inevitable and that the rather large posterior raw area will heal without contracture. Too many ifs for most cases, but for the one he presented with a minor "whistle" there was permanent improvement.

Turning a chink in V-Y for a tubercle

In my experience, advancing the free border in the central whistling deformity with a posterior mucosal V-Y can be augmented by a combination of details. Mark and cut the V slightly
wider than the free border vermilion discrepancy. Dissect the V flap down to its base along the inferior border of the lip. Then cut one or two small vertical subcutaneous or muscle flaps from the excesses on each side and transpose them beneath the flap to form a filler under the roll. The muscles are approximated across the upper defect, but the downward advancement of the V can be minimal, producing only enough stem in the Y for one or at most two closely placed sutures.

**Redundancies**

A very common secondary deformity of the vermilion free border is an excess bulge here or there. With an eye for a symmetrical cupid’s bow curve of the free border, the surgeon must trim the redundancy by marking and sculpturing with scissors. Sidney Wynn facilitates accuracy and hemostasis in his removal of redundant vermilion of the free border with a series of Allis clamps pinching a welt of the excess. Then he cuts with scissors along the compressed teeth marks of the Allis clamps. According to Albert Borges, this transverse reduction and contouring of free border
vermilion redundancy can best be accomplished with a W-plastic type excision. The extensible zigzag scar is very good cosmetically, producing elasticity in and out of a smile.

A relative whistling deformity

When the central portion of the vermilion is adequate but there is a relative excess of the lateral vermilion segments, there may be an apparent whistling deformity. It can be corrected simply by reduction of the sides without disturbance of the center. In this case transverse free border excisions of the overhanging vermilion, more on her right than her left, produced a central tubercle and the natural vermilion curves of the cupid's bow.

From tip of tongue

Another source of pink mucosa for constructing the deficient vermilion of a cleft lip is the tip of the tongue, as described by José Guerrero-Santos of Guadalajara in 1964:

We obtained a lingual flap in one single unit and after a vermilion shave of the upper lip, we sutured the flap in place and resected the pedicle 2 weeks later.

By 1969 he had modified his tongue-tip flap. When the vermilion was scarred, he replaced it with a tongue flap.
When the vermilion was unscarred but deficient in bulk, presenting the whistling deformity, he denuded the tip of the tongue-tip flap and buried it in the lip. After three weeks, the flap was divided, keeping as much tongue mucosa as was necessary to correct the deficiency.

*From opposite lip*

Vermilion flaps from the lower lip are available and have been used for defects of the upper lip. They are all possible solutions to the whistling deformity. Lexer used a relatively wide flap from the inside of the free border of the lower lip which he turned out and attached directly to the center of the upper lip. This flap he divided after an inset of two weeks.

In 1973, Hans Tschopp of Basel, Switzerland presented an embellishment of the Lexer lower lip mucosal flap which sported lateral extensions.
His design was similar in principle to the mucosal portion of my 1964 fleur-de-lis lip flap presented at the end of this chapter and the reverse of a flap used in the following case.

Here is an eleven-year-old girl who had had a LeMesurier lip closure in Missouri with a reasonable result except for soft tissue flatness of the upper lip when compared to relative protrusion of the lower lip. The thinness of the free border vermilion of the upper lip suggested the use of a reverse Lexer type lower lip mucosal flap.

At age 14 years under local anesthesia a transverse posterior incision above the free border of the upper lip released the vermilion. Then a wide mucosa and orbicularis oris muscle flap based inferiorly was cut on the lower lip and let into the upper lip defect. Andrew Klein inquired if my fleur-de-lis flap could be used here. Realizing that such a modification of a flat flap would achieve final inset of the lateral wings and produce larger portals for breathing and feeding, I did just that, with excellent take of the entire flap.

Ten days later the pedicle was divided, the spurting coronary vessel cauterized, the donor area in the lower lip closed, and the flap inset completely in the upper lip.
Gillies, in the two world wars, used flaps from the vermilion of the lower lip for defects in the upper lip. He even tubed the pedicle of one of these mucosal flaps, but in most instances he transposed them 180 degrees without delay.

*Much ado about almost nothing*

This may seem like a whole circus parade of methods for a problem worthy of only a "peep show," but actually each one has merit and in a certain case could be the best. The important point in the entire show is that the whistling deformity should no longer occur in the first place, and if the primary surgery is well designed it damn well won't!

**A MORE CONTINUOUS VERMILION FREE BORDER DEFICIENCY**

The wide medial advancement of the upper labial tissues after extensive freeing from the maxilla and "back-cutting" the mucosa at the extremities of the incision was advocated also in bilateral clefts in 1973 by O'Connor, McGregor, Murphy and Tolleth. This radical action does give more body and eversion to the free border vermilion of the upper lip and does so without visible scars.

Since 1965 the artistic Otto Neuner, oral surgeon of the Berne University Dental Institute, has reported fascination in secondary cleft deformities. In 1969 and 1971 he published three designs for evert ing the deficient upper lip vermilion in bilateral clefts.

One approach was similar in principle but less radical in execution than that described later by O'Connor. He referred to it as a "vestibulum-flap-shifting-plasty to protrude the vermilion," and, as with the O'Connor method, it was equally applicable in unilateral and bilateral clefts.
Another Neuner method took two mid-vertical mucosal flaps and transposed them bilaterally after release by horizontal posterior incisions. This approach, of course, supposed that there is enough mucosa in the scarred vertical axis of the posterior upper lip to supply rather grand horizontal needs.

It has also been diagrammed this way:

The third method looked to the lower lip for its mucosa. When the upper lip does not have sufficient mucosa to spare, Neuner advocated transposing a horizontal bipediced mucosal strap flap from the lower lip. This strip of mucosa is let into a posterior releasing incision placed in continuity around the commissures with the upper incisions of the strap. The action not only everts the deficient free vermilion border of the upper lip but reduces redundancy of the lower lip.
Neuner feels that one of the advantages of these mucosal maneuvers is the fact that they can be done without the use of an Abbe flap. This is a commendable point. It is, however, important not to overemphasize the attitude of "use anything to avoid a lip-switch flap" because the Abbe has far more to offer than mere mucosa.

For instance, sometimes the upper lip vermilion is thin while the lower lip is voluminous, and, at the same time, there is transverse tightness or a vertical skin scar which, when excised, will produce side-to-side tightness. In this case the lip fleur-de-lis Abbe flap can be a winner.

Fleur-de-lis

The lip-switch flap can be specifically designed to fill out the free border vermilion of a tight lip which has a thin red edge. The conception of the fleur-de-lis lip flap was developed only after three consultations with a bizarre case over a period of one year beginning in 1962. Yet the dividend derived from this prolonged and tenacious campaign to fit the pattern of procedure to the specific idiosyncracy of the defect was dramatically rewarding. It was published in *Plastic and Reconstructive Surgery*, July 1964.

A 29-year-old female at first sight presented an upper lip with slight shortness in vertical length producing a notch which exposed teeth and appeared to be a postoperative unilateral cleft lip deformity. The impulse to use a routine Abbe flap was almost as conditioned for me as salivation at the sound of a bell for Pavlov's dog. But the history revealed that a hemangioma of the upper lip had been treated in infancy with radon seeds. The sclerosing process had shriveled the skin into an atrophic scar with areas of depigmentation and hyperpigmentation involving
the left philtrum column and skin 1 cm. laterally. On closer examination, the full effect of the interstitial radiation became

more apparent. The central two-thirds of the upper lip revealed a generalized lack of development with a thinness particularly of the vermillion, which contrasted unfavorably with the pouting voluminous vermillion of the lower lip.

My thoughts persistently ran a one-track rut straight for the routine Abbe flap. Yet to transpose a portion of the thick lower lip into the thin upper would have been as uncraftsmanlike as repairing a hole in a bed sheet with a patch of puffy eiderdown. As I was obviously not on the right track, rather than proceed at full speed or even jump the track, it seemed wiser to slow down until coming on to a suitable sidetrack. After a year of off-and-on meditation, the solution became clear: two sidetracks! The severe excess of lower lip vermillion demanded reduction. If the usual composite lip-switch flap were taken with lateral vermillion extensions, the lower lip would be reduced effectively in three dimensions, and these mucosal wings could be used to bolster the free border of the entire upper lip.

A vertical excision of the upper lip scar preserved the philtrum dimple and two-thirds of the cupid’s bow. The lower lip fleur-de-lis was cut to pattern retaining the usual small coronary vessel pedicle posteriorly. The mucosal extensions had to be taken anterior to the main coronary vessel. Horizontal relaxing inci-
sions in the mucosa of the upper lip just posterior and superior to
the free border let its thin vermilion flap down. The three-armed
flap was cartwheeled 180 degrees and inserted into the upper lip
defect with the lateral extensions fitting behind into relaxing slits
to maintain the improved plumpness of the upper lip. The
pedicle was divided at two weeks and the new lip relationship
was so exciting that a reduction rhinoplasty became mandatory.

Considering the possibility of a Cinderella story for this pa­
tient, I asked her if she was married. She replied that she was and
smilingly asked, “Why?” “Oh, I just thought how easy it would
be for you now,” I told her. Several years later after a follow-up
visit she said rather hesitantly, “Doctor, do you remember you
once asked if I were married? Well, it was not successful, but
now I have remarried and we are very happy!”

Of course, this lip fleur-de-lis flap variation can be of value in
certain postoperative cleft lip deformities, especially bilateral,
when the lower lip vermilion is voluptuous and the entire upper
lip shows only a thin red line.
36. Creating the Upper Labial Sulcus

ARTHUR von Deilen of Camden, New Jersey, in 1956 set criteria for bilateral cleft lip construction including a free upper lip. This involves creation and maintenance of an upper labial sulcus.

ADHESION

When the upper labial sulcus is bridged by an adhesive band, this can be simply divided—or better, split—and closed with a Z of mucosal flaps as described by many, including Raymond Gola in 1970.

TOTAL ABSENCE OF SULCUS

Techniques that introduce the lateral mucosa behind the prolabium satisfy the development of a sulcus. Methods that accept the prolabium's attachment to the premaxilla, of course, never achieve a sulcus. For such cases several surgeons have proposed methods of secondary sulcus construction.
FREE SKIN GRAFT INLAYS

An important contribution to face and jaw reconstruction during World War I was that of Johannes Frederick S. Esser, a Dutchman working in Austria. He conceived the free skin graft inlay for creating a labial sulcus. Concerned about the complications of infection, he made an incision in the skin under the jaw and dissected a blind pocket between the lip and cheek and the mandible without opening into the oral cavity. A stent, covered by a skin graft with its raw side out, was inserted into the pocket, which was closed by suturing the skin over it. Once the graft was well healed, Esser incised along the line of the future sulcus inside the mouth and removed the mold, revealing a well-lined labial sulcus.

There are stories that cloak Esser’s name in mystery and contradiction. Joseph Safian recalls observing him in Berlin trying to operate without anesthesia on the cleft lip of a convulsing infant, with the baby in his lap. When questioned about this incident, Esser is reported to have stated abruptly:

Babies have no feelings.

At the peak of Hitler’s power in the early 40’s, Esser, who was now working in Berlin, came to the United States and, traveling about in a mobile home, visited various plastic surgeons. Maliniac recalled that, during Esser’s visit,

One could not meet him without liking him.

Yet Lamont remembers that the elderly John Staige Davis had been quite upset by his visit with Esser. Certainly during his call on Safian, Esser revealed his Nazi sympathy by condoning the loss of thousands of lives in the effort to unite western Europe. Just one day after Esser’s visit with Safian, an agent of the Federal Bureau of Investigation came looking for him, but he managed to keep one jump ahead of the F.B.I. until his return to Germany.
POSTWAR ERA

At the end of the 1914–1918 war, most of those who had served as plastic surgeons in the British army returned to their previous specialty. Gillies recalled:

To venture into this rather new field of civilian plastic surgery was certainly a gamble, and as Sir Milsom Rees had kept the E.N.T. post open for me, it was a temptation to return. . . . It meant reassociation with royalty and certain financial success, but the plastic bug had bitten.

By 1922 Gillies had consulting rooms in London at Great Portland Place, Kilner had joined him and private practice was gradually increasing:

One particular group of patients that were numerous about this time were the old secondary harelips who were coming in for buccal inlays.

He simplified Esser's original 1917 skin-burying procedure, and this more direct method has served effectively in bilateral clefts that require the construction of a sulcus. The technique is quite easy. A split-skin graft is wrapped around a gutta-percha mold with its raw surface out. Then an intraoral pocket is dissected between the lip and the premaxilla, the epithelial egg is nested into the pocket and the mucosa sutured over it for several weeks. Then the sulcus "lays the gutta-percha egg," leaving behind a skin-lined cavity.

These grafts are notorious for their 99 percent take. Of course, the fate of the take depends on the raw surface's being outward. I have heard the rotund Professor Kilner relate his favorite inlay graft story. He awakened one night suddenly wondering whether
the inlay he placed the day before had been inserted the wrong side out. He tossed and turned becoming more and more suspicious that the graft was inside out. Finally he got up and went to see for certain and was relieved to find the graft correctly positioned.

This procedure is effective. Eventually some contracture is noticed, but in general the skin graft inlay creates a functional sulcus.

EXTENDING SULCUS TO FREE THE NOSE

H. D. Gillies extended his upper sulcus inlay principle to its ultimate in the contracted luetic nose. He used the same principle to free the contracted nose in the secondary bilateral cleft lip.

Later, in 1952, A. von Deilen of Camden, New Jersey, described the restoration of a 15-year-old girl with the typical secondary deformities of a bilateral cleft including contracted maxilla following a Brophy-type palate closure. He carried out a prolabium shift into the columella and replaced it with an Abbe flap. He then noted:

This girl's face still had a dished appearance, due to the retroposition of the base of the nose. . . . I decided the best way . . . was with an appliance which had a high and thick labial flange. This flange would fit into a manufactured epithelialized pocket anterior to the maxilla and push out the nose and upper lip and close all holes. So I decided to deepen the labial sulcus, free the base of her nose, bring the nose forward and cover all raw areas with a split skin graft. This was done.

The result he showed was a noticeable improvement.

FREE MUCOSAL GRAFT

In 1966, Cosman and Crikelair reported late release of the prolabium from the premaxilla and creation of an upper labial-alveolar sulcus in 12 cases out of a series of 40 bilateral clefts. As they reported:

Dissection of the prolabium from the premaxilla with a full thickness free mucosal graft to the labial surface leaving the premaxilla area bare was found to be an effective method free of major objections.
FLAPPING THE SULCUS

Alfred Falcone of Syracuse, New York, a romanticist with a love of his work, was trained by pioneer Leon Sutton, whom he considers a second father. He recalls such succinct “Suttonisms” as:

Why is a left sided cleft lip easier to repair than the right? Simply because there are more left clefts and the experience level should be greater.

or,

One can compare repair of the cleft lip, especially at the point where some of the excess vermilion is discarded, to the government fiscal policies—it seems that when you don’t have enough, you end up throwing some away.

Obviously, Falcone resented misuse of mucosa. In 1966 he designed its effective use in the construction of the upper sulcus. The mucosa of the anterior premaxilla was cut free with its base above in continuity with the upper lip mucosa. The lip was dissected from the premaxilla as a pocket up near the nasal spine, and the mucosal flap was turned under to line the lip side of the sulcus. The raw periosteum of the premaxilla was left to re-epithelialize, and it readily does so.

The productive Norfolk team of C. E. Horton, J. E. Adamson, R. A. Mladick and R. J. Taddeo in 1970 suggested preservation of the vermilion parings as flaps of mucosa to line the sulcus or cover the premaxillary raw surface in the primary surgery. This sound and economical gesture at least partially maintains a
sulcus. They also stated that, quite apart from the need for a free upper sulcus, if the prolabium remains attached to the premaxilla it can interfere with growth.

Then, in Georgiade's 1974 transactions of the Cleft Lip and Palate Symposium held at Duke University, after a slight rearrangement of the members of the team and one substitution, Richard Mladick (of Yugoslavian extraction but Duke trained), with Horton, Adamson and J. H. Carraway, presented several alternate secondary methods of flapping and mucosa-grafting (MG) the upper sulcus. Each has a possible place in sulcus surgery.
FOR BOTH FREE BORDER AND SULCUS

Gung ho Joseph O’Malley of Orlando left his practice to serve in the field with the marines in Vietnam. Once, over the mountainous terrain of Ethiopia, he tracked and shot a rare, padded knee goat, the walia ibex, now in the Smithsonian Institution. Just a few months before his tragic end, O’Malley wrote a note in the June 1973 Southeastern Plastic and Reconstructive Surgeons’ Newsletter:

Throughout my travels around the world . . . and particularly in Central America, I have found many cases of repaired bilateral cleft lips which present a totally obliterated upper lip sulcus and inadequate vermilion of the prolabium and I have found the vermilion lip roll, a variation of the Abbe flap, to be most useful.

In cases with a whistling deformity and no sulcus or posterior mucosa for the usual roll-down, O’Malley advocated Peterson’s altered Abbe. A standard V Abbe flap the width of the prolabium was cut and shorn of its skin, leaving muscle, mucosa and vermilion border. He freed the prolabium from the premaxilla and slid this skinned Abbe behind to line the lip and fill out the free border. The pedicle was divided in 10 to 14 days.

Yet again, it is important to remember that if the primary surgery is designed correctly, an upper labial sulcus will be one of the dividends and only minor revision, if any, should ever be required.
37. The Anatomy of the Secondary Bilateral Nasal Deformity

Exclusive to secondary results in bilateral cleft cases, besides the usual discrepancies in the scar, muscle, contour, landmarks, free border and sulcus, there is the especially characteristic bilateral cleft lip nose. As this nose has ordinarily been left for secondary correction, it presents a more constant picture and one not greatly unlike the original deformity. A typical bilateral cleft lip nose that has had no treatment besides closure of the clefts in the lip presents a columella of varying degree of shortness from slight to almost total absence of any central column. The tethering of this short, single, central bridge presents a depressed nasal tip, often with nothing between lip and tip and boasting little to no profile at all. It is accompanied by bilateral dislocation of the alar cartilages off the crest of the septum, attenuation of these stretched cartilages with an obtuse medial-lateral crural angle and a spatula flatness of the nasal tip with an unnatural width between
the alar arches. Therefore, with the **flare** and even **eversion** of the alar bases, the **shortness of the vestibular lining** and the **width, flatness, scarring and fistulae of the nostril floors**, reconstruction of these residual discrepancies promises no plastic picnic.

The combination of the frontonasal shortness in the original congenital deformity and the subsequent attempt at projectory growth produces a snubbed nose restrained at the tip but exploding at the sides with kinking and flaring like that of a snorting steed on a carousel.

Frankly, the distal half of this type of nose is a depressed mess, as deserving of special allocations as any other disaster area. The only positive light in the darkness of the double deformity is that the anomaly has occurred twice, and so usually has a quality of symmetry.

**Alar cartilages:**

![Diagram of alar cartilages](image)

**Once short, still short**

In all methods that incorporate the entire prolabium the full vertical length of the lip, if the columella was short originally, it continues to be short postoperatively. In methods in which the prolabium is not pulled into the full vertical length of the lip but is bolstered below by lateral flaps, there may be slightly less drag on the columella but it will still end up too short. The LeMesurier results fall into this group.

In 1971 Farkas and Lindsay studied bilateral cleft patients after the LeMesurier closure and reported:
In all bilateral cleft lip and palate patients the columella length on both sides was significantly shorter than in normals. However, the difference in length was only about one and a half millimeters. In patients with complete and incomplete bilateral cleft lip and palates . . . the columella difference in length from one side to the other did not differ significantly.

**THINK COLUMELLA!**

Whenever a surgeon faces a specific secondary correction in a bilateral cleft, his attention should be directed first to the columella. Too many bilateral clefts have been operated on again and again along a one-track lip correction throwing away valuable tissue and ending up with a good lip but with the columella still short—and, by now, no tissue left to lengthen it. This is preposterous procrastination or simple stupidity. *Design the columella lengthening when planning the lip correction.*

**SECONDARY COLUMELLA LENGTHENING**

When the columella is short, this aspect of the secondary nasal deformity deserves first priority of action. Once accomplished, it will set off a chain of happy reactions such as elevation of the tip and opening of the airways.

Columella lengthening requires the transport of new tissue into the area. It can be obtained from various sites in a number of ways, but its most common donor is the adjacent and deformed upper lip. How it is to be taken depends directly upon the condition of the lip. Because columella lengthening should have a high priority both in the primary and certainly in the secondary surgery, and although it is often excluded from the early planning, it will be discussed first.
38. Lengthening the Columella with Central Lip Tissue

PROLABIUM IN THE LIP

If the prolabium was incorporated into the full vertical length of the lip, the lip probably will have adequate width and length. In fact, in time the muscular lateral lip elements will stretch the muscleless prolabium wide and flat. Victor Veau complained about this aspect:

The principal cause of the mediocre results obtained in bilateral cleft lip repair is the absence of muscle in the prolabial segment of the lip. One can hope for contour and shape approaching the normal only if the lip contains muscle. I have long emphasized this fact: the muscular sterility of the prolabial segment.

At least there is extra lip tissue available for lengthening the short columella.

SHIFTING THE TOTAL PROLABIUM

When the upper lip is ample, it can supply a flap for lengthening the columella. This flap can be the entire prolabium, as was used by Baron Dupuytren along with excision of the premaxilla and direct side-to-side closure of the lip. The principle was later adapted to secondary corrections. Peskova and Fara gave J. S. Davis and Ferris Smith credit for attributing this approach to Gensoul. This is possibly a language misinterpretation because both Davis and Smith describe Gensoul's method correctly as a V out of the center of the prolabium and not the entire prolabium. In fact, Davis also illustrated a vertical columella excision to thin the center column simultaneously with the Gensoul lengthening.
Gillies taught me to shift the entire prolabium in certain cases, and I have used it in many types of combined secondary bilateral nasal and labial corrections. Usually it requires an Abbe flap replacement in its wake, and in the right circumstances the result can be quite dramatic, as demonstrated in the case of this young schoolteacher published in *Plastic and Reconstructive Surgery*, April 1963.
WHEN AND HOW TO SHIFT
THE TOTAL PROLABIUM

When the columella is short and the upper lip tight in relation to the lower lip, a reduction of the lower lip is necessary. The total prolabium is taken out of the upper lip as a unit. After a membranous septal incision extended by lateral vestibular releasing incisions, the columella-prolabium component hangs from the tip of the nose like a Ping-Pong paddle. To turn this into a columella takes a bit of clever tailoring.

Extension flaps at the top of the prolabium can be used to fill the lateral vestibular incisions. Then the remaining prolabium is thinned and rolled on itself with sutures. The join of the end of the true columella to the beginning of the prolabium tends to resist a smooth transition. If it does not form a graceful column in the first stage, it can be revised with a vertical diamond excision secondarily. The bottom end of the prolabium can be split to splay as a columella base to join the alar bases across the nasal floors as nostril sills. Again septal cartilage struts to shore up the tip and column can be used primarily or secondarily. Several examples of this double action will be shown later.

Others use this general principle of advancement of the entire prolabium into the columella and filling the upper lip defect with an Abbe flap. The most recent (1973) advocate of this approach was René Malek of Paris, who, when taking columella from below, elucidated the type of bilateral secondary cases in which he preferred this regimen:

One or more of the following elements exists: the medial part of the lip is too short in height; the prolabium is scarred and the muco-cutaneous ridge is disturbed; there is a transverse shortening of the lip (causing, according to Victor Veau, a holy-water basin appearance in the profile view) . . . In all these cases, it is necessary to utilize an Abbe flap. The prolabium gives added height to the columella.

GENSOUL

A more popular columella lengthening approach for over a century was the use of a flap taken out of the mid-vertical portion
of the prolabium in continuity with the base of the columella and shifted upward by V-Y advancement. This has become known as the Gensoul principle.

Joseph Gensoul of Hôtel-Dieu, Paris, was a dexterous, explosive, audacious surgeon with an imperturbable sangfroid. In 1833 he was the first to conceive a secondary lip V-Y to lengthen the columella, and many fine surgeons since have used and modified this principle. There was one major drawback—it added a third scar to the already doubly scarred lip.

**Gillies Used It**

Gillies and Kilner described treatment of the bilateral cleft lip nose in the 1932 *Lancet*:

One of the most common faults is found in cases of double hare-lip, for the so-called prolabium is often placed so far down the lip that the lobule of the nose is dragged down with it. The vertical dimensions of the prolabium vary considerably. . . . If the skin of the prolabium were truly a part of the lip then its incorporation in the lip should lead to no secondary deformities. . . . One might describe it (prolabium) as that portion of the skin joining the columella to the upper lip . . . it might be better termed the supralabium . . . From a lip plastic point of view, it is imperative in all cases of down-drawn nose tip to take the prolabial skin out of the lip and suture it so high upon the free border of the septum as will allow the tip of the nose to come forwards and upward into normal position. To ensure this, it may be necessary to divide the membranous septum with scissors, which are carried even over the anterior border of the septum. . . . There remains a V-shaped gap in the lip. The skin of the lip, the floor of the vestibule, and the base of the ala are carefully undermined . . . to loosen the false attachments . . . a buried catgut suture is inserted to gather the deep tissue
together to support the columella from below and behind. This stitch draws in the alar bases and so improves the nose still further by narrowing the nostrils. . . .

In some cases there is insufficient septal development to give prominence to the new tip, and a supporting graft of cartilage . . . is required later.

LEXER USED IT

Erich Lexer, who succeeded Sauerbruch as chief of surgery in Munich in 1928, also used the Gensoul flap. It might seem unlikely that the grandiose Lexer, who reveled in arterial aneurysms, arthoplasties, joint replacements and jejuno-dermato-oesophagoplasties, would even notice a short columella. He not only took note of it; he designed a procedure to correct it and at the same time narrow the flaring alae.

Of great physical strength, Lexer was somewhat overpowering, as testified by Hans May, who was one of his students:

Lexer never had more than two assistants helping him, and they had to keep their fingers out of the wound at all times. "I like to be alone in the wound" was an often quoted request of his. The handling of ordinary instruments was called for by sign language, and conversation at the operating table kept at a minimum.

On a weekend he invited one of his assistants to join him in his two-oar boat rowing on Lake Constance for hours, stripped to the waist in the blazing sun, and when the assistant suffered burns and exhaustion, he was treated by immersion in a tub of iced water and a bottle of champagne to replace fluid balance.

Yet Lexer had an artistic eye and never used a ruler. He had studied art before medicine and could use the painter’s brush or the sculptor’s chisel as masterfully as the surgeon’s knife. This facility probably explains his enjoyment of plastic surgery and willingness to lengthen a columella.

SO DID MCLNDOE

Sir Archibald McIndoe of 149 Harley Street, London, and Queen Victoria Hospital, East Grinstead, trained in general surgery at the Mayo Clinic, where it was reputed he could perform a
cholecystectomy as adroitly as anyone at the Clinic during the last of his seven years in Rochester. A distant relative of Gillies and also from New Zealand, he came under the tutelage of Sir Harold Gillies, was knighted for his great work on the burned airmen during the Battle of Britain, became an officer of the Royal College of Surgeons and was undoubtedly one of the top technicians and showmen of plastic surgery in the world. In 1959 McIndoe consorted with one of his favorite students, Tom Rees of New York, to describe a grand and synchronous secondary correction of cleft lip and nose deformities. Using a modification of the Gensoul principle, they elevated the prolabium or a portion of it like a trapdoor based on the nasal tip and with this open door exposure removed the hump with a chisel and sawed bilateral osteotomies. The prolabium piece was then advanced completely out of the lip into the columella and the lip closed with a Z-plasty—but, alas, without a philtrum.

Suave Tom Rees, who has attracted an elite clientele of New York similar to the one that pilgrimaged to McIndoe’s Harley Street consulting rooms in London, recently reminisced on his early days with Sir Archibald:

I particularly remember driving to the Queen Victoria Hospital on Monday mornings with Archie in his Rolls Royce, in which he would be in a completely merry mood, full of good cheer and generally feeling fit and ready to tackle a new week. Immediately upon arrival at the hospital, however, he would literally tear the place apart, which he admitted to me several years later he did on purpose, just to “get the troops in line for the coming week.”

Certainly Archie had great charisma. He was aware of this and was able to
exert his magnetism in much the same way as a famous politician or even a movie star. As you know he had enormous ham-like hands with which he could do the most intricate and delicate surgery. . . . I helped Archie do several rather radical operative approaches to the secondary deformities of cleft lip nose in which he did a complete take down of all elements of the lip, nose and reconstruction with a submucous resection, nasal plastic and restoration of the lip with or without an Abbe flap.

**TRIFOIL**

Vilray Blair of Washington University, St. Louis, who in his prime was called upon to do many secondary cleft corrections, modified the Gensoul principle with lateral extensions to fill a releasing incision in the membranous septum by what he referred to as the trifoil flap. This procedure tended to shorten the vertical length of the lip.

Blair also used the V-Y principle in the nasal tip. He called it the "batwing" procedure and often combined it with his trifoil flap as a consecutive secondary effort to increase the nasal tip refinement, an advancement on top of an advancement. He used these two maneuvers many times during the 20's, 30's and 40's. His description in 1930 is typically lucid:

In the batwing the material comes from the nose and columella by cutting through the cartilages of the columella and nasal tip and suturing the mesial portion forward. This brings the tip of the nose forward, gives a more oblique slant to the nostril, and narrows the columella.

Here are two case examples published by Blair and Letterman in *Plastic and Reconstructive Surgery*, January 1950.
In 1941 Brown and McDowell reduced Blair’s trifoil to a smaller, sleeker fleur-de-lis with lateral extensions near the floor of the nose. Here again the donor area added a third vertical scar in the upper lip, but the procedure did produce columella length with tip elevation.

In 1947 Brown, McDowell and Byars acknowledged that their fleur-de-lis columella lengthening at three and a half years of age often required cartilage support at six years:

Further elevation of the nose may be obtained, when desirable, by an L-shaped [preserved] cartilage transplant.

In 1966 Frank McDowell reviewed their late results and noted in the bilateral complete clefts:

A further problem in the double cleft is the short columella. About half of the patients will grow a columella of minimal normal length and will require no surgery for this condition. The other half will continue to have columellas so short that the tip of the nose is snubbed down. It seems well established now that these should have surgical elongation of the columella between the ages of 4 and 8 years. The method we used was published in 1941.
Study of these cases revealed that when the columella was not lengthened it was often just short enough to drag the tip and hook the nose. When the columella was lengthened by the central fleur-de-lis, it did not always lift the tip adequately and it invariably created a third midline lip scar.

Yet as late as 1974 Broadbent and Woolf were advocating:

Minor degrees of depression can be improved with a V-Y procedure on the columella and tip.

Their tiny V-Y maneuvers acted as "petit Ombredannes" and "petit Gensouls," depending on the direction of the V. They stated:

Minor and moderate degrees of depression associated with bilateral cleft lip nasal deformity can be improved by splitting the columella, extending its halves and covering the defects with free grafts or local flaps.

The cases they presented used a V-Y type of flap and seemed to produce too much scarring for the limited amount of tip release.

**LATERAL VESTIBULAR V-Y’S**

In 1954 John Potter of Stockton-on-Tees in northern England added an important corrective dimension to the Gensoul operation. First he outlined the problem:

In bilateral cleft lip cases, the nasal tip is usually depressed with a short columella, which at times seems almost non-existent. This is due to the shape of the underlying alar cartilages, which have extremely short medial (columellar) crura. The condition is similar to the flat unilateral cases, only the condition is bilateral. The arch of the alar cartilages is flattened and the lateral portions of the cartilages are frequently rotated inferiorly and so their outer surfaces are seen projecting into the nose causing a degree of nasal obstruction. The alar margins tend to be everted laterally; the appearance of the nostrils is low and wide instead of high and narrow.
Obtaining exposure by the Gensoul operation, Potter explained in detail the medial V-Y advancement of his alar cartilage flaps:

The amount of philtrum skin required is estimated in each case to give a correct length of columella. The philtrum skin required is raised and the incision on each side is continued along a line 3 mm. posterior to the columellar margin to the nasal tip and then follows the lower border of the alar cartilage [then turns back] along the upper border of the alar cartilage. . . . The cartilage with its overlying mucosa is then freed from the skin and is fully mobilized. The nasal tip skin is widely undermined. The columellar flap is retracted upwards and the alar cartilages are sutured into their correct positions to each other. . . . There is a raw area laterally. . . . This area is undermined and closed by sutures. . . . The columella skin flap is then sutured into its new position. . . . The defect in the philtrum is closed by approximation, aided by an incision in the alar sulcus and carrying it around the lateral alar attachment for a short distance.

Again the principle is sound and probably has a better chance of success in the bilateral deformity. Many surgeons continue to incorporate it, one way or another, in their nasal corrections.

A CONDEMNATION FROM BEHIND THE IRON CURTAIN

In 1960 H. Peskova and M. Fara of Charles University, Prague, commented on the wedge-shaped flap from the middle of the prolabium to lengthen the columella:

This operation is used by Brown, Ragnell, Benaim, Kirchstein, Dockhorn and others. Lengthening of the columella is only small, however, and in severe deformity is not sufficient for a satisfactory result. The vertical scar of the lip is disfiguring and in children can undergo hypertrophy.

Most surgeons have come to agree with this stand, but for many years a third vertical scar was being added routinely to the center of bilateral cleft lips, with only inadequate columella lengthening.
39. Columella Lengthening by Vertical Scar Flaps Including the Forked Flap

VERTICAL LIP TRANSPOSITION

IN 1881 Demons advocated the raising of two rectangular flaps of skin and subcutaneous tissue lateral to the philtrum with their bases above and their free ends reaching the vermillion border. They were turned up and awkwardly transposed 180 degrees so that their raw surfaces were apposed and their ends attached to the tip of the nose. The lip donor areas were closed directly.

In 1955, at the Stockholm Congress, Richard Trauner of Graz presented his vertical lip flap, transposed horizontally across the columella base for columella lengthening in the primary unilateral cleft. At a congress in Hamburg the previous week he had also demonstrated this flap as a secondary procedure in bilateral clefts. In 1967 in Rome, he and his son showed their adaptation of the method primarily in bilateral clefts, which they referred to as a double Z-plasty. In 1972, while visiting in Miami, the senior Trauner mentioned that he got better columella lengthening with secondary procedures and that he had used his flap more than once on the same patient to advantage.

MORE Z'S

Another secondary flap design to lengthen the columella was described by Marcks, Trevaskis and Payne in December of 1957. They cut two single-pedicle flaps from the outer border of the
prolabium along the old scars and transposed them at 90-degree angles crisscross fashion into a releasing incision at the base of the columella in what they called a Z-plasty.

This narrowed the width of the lip, lengthened the columella and had the extra advantage of being a one-stage procedure. It was responsible, however, for a most unnatural columella scar line and at best could lengthen the columella no more than the sum of one width and one tip of the two flaps. In certain cases when the need for columnella lengthening is limited, this approach may be of value as it does not add further scarring to the lip.

When the vertical flaps are taken from the lateral lip elements, based on the alar wings and transposed across the base of the columella, then in principle they are the Trauner Z. The same general corrections are achieved, but as the flaps only meet tip to tip at the base of the columella, the lengthening of this element is even less.

In 1966 M. V. Mukhin and A. P. Agroskina of Leningrad endorsed Marcks' design for columnella lengthening in bilateral clefts and diagramed their modification.

THE FORKED FLAP

For the same type of secondary bilateral cleft lip deformity, in which the prolabium is wide, the nasal tip is spatula flat, the columnella is extremely short and the alae are flared, the forked flap was developed originally. It was first used at St. Joseph's Hospital, Asheville, North Carolina, in the mid-1950’s on a 12-year-old Tennessee mountain girl who in infancy had been operated on by William Justice, an early student of William Ladd of Boston. Her severe bilateral lip clefts had been closed with the prolabium constituting the center of the lip except where lateral mucosal flaps joined beneath the prolabium as advocated by Federspiel. As I suggested in 1958:

From the moment of the first surgery, the nasal tip had gone down in defeat in its struggle with the lip for the prolabium. By now, the nose tip is spatula flat with no nasolabial angle and, in fact, boasting little to no profile at all. As with any nose that is bursting for projectory growth but is rudely bridled by a short columella, it must bulge in some direction and usually this is evidenced by flaring of the nostrils.
Furthermore:

Even the most radical of us must admit the prolabium has been stretched by the lip pull and valuable tissue gained even if the prolabium is unattractively wide. . . . A natural distance between philtrum columns is actually quite narrow. Thus, an unattractively wide prolabium must be reduced and should be made to "fork up" the needed columella tissue.

It was reasoned, however:

To take the columella flaps out of the heart of the prolabia in the usual [Gensoul-Brown] manner merely adds another insult to the upper lip and places it in the unnatural position of a midline scar.

Thus, for the common type of secondary deformity seen in bilateral clefts (prolabium wide, nasal tip spatula flat, alae flared and columella extremely short), an inverted V flap forked like the fangs of a serpent was proposed, the logic being:

Why not include the bilateral cleft scars and as much prolabia in each prong of the flap as will give sufficient body for a columella and still leave a natural looking philtrum?

The use of this flap in secondary cases without adding new scars merely improves the original bilateral scars, as seen in the design published in *Plastic and Reconstructive Surgery* for November 1958:
Further description of the procedure was included:

These flaps are skin, muscle, and scar and run smoothly into the true columella at its base. The original columella is then freed from the septum by a piercing incision in the membranous septum which is carried up along the nasal bridge for about an inch. At this moment, the tip of the nose comes really free and sits up smartly. From this position, the flat alar cartilages can be trimmed for a neater tip. Then comes the process of closing the fork which merely entails folding the wings together, suturing them to each other and fixing them in their new and exalted position along the septum. The midline seam in the inferior portion of the new columella will pass unnoticed.

Actually, the two flaps mold into a columella with greater facility than one larger flap, which tends to resist being forced into a hemi-column. The distal extremities of the forked flap are used but not sutured, so they splay laterally as columella bases flowing into the nasal floors as nostril sills.

Further detail included the following:

Small wedges from the flaring nostril floors and short relaxing lateral incisions under each alar base will allow the lateral lip elements to be advanced medially and joined to the reduced prolabia to make a far more pleasant and natural looking philtrum. This process will also bring about an eversion of the upper lip and in principle is similar to the advancement of the lateral lip element in the radical rotation method of unilateral cleft lip.

If the extremities of the forked flap have been made pointed and extended into the vermillion, direct advancement of the lateral lip elements will achieve good closure. If the ends of the fork are flat and stop at the mucocutaneous junction, the vermillion border will have to be advanced medially on each side along the inferior border of the prolabium to facilitate the closure. There is then the possibility that an excess of vermilion mucosa humping in the midline will be available to correct a whistling deformity or even to create a tubercle.

This approach had a better answer than the Gensoul position to the invariable question of the chance of a mustache on the columella:

Even in the adult male there is usually an area along each of the bilateral lip scars which is sparse enough of hair to serve as a respectable columella.
It is incredible how much additional columella skin is required to perk up this type of round nose and, at the same time, avoid kinks just under the tip or that unnatural flatness of the tip itself. During the original planning of the long two-pronged flap, it was considered a certainty that an excess would be discarded. Out of principle, nothing was trimmed, and by the time the flat tip had been uncoiled and the nasolabial angle first created and finally deepened to 120 degrees, there was not one millimeter of excess. It is little wonder that flaps taking only one-half or two-thirds of the vertical length of the lip or depending on the width of the flap for lengthening are in many instances found short.

It has been a source of pride that during the 1959 International Plastic Surgery Congress, held at the Royal College of Surgeons in London, the elegant and artistic John Conley of New York recalled:

There was spontaneous applause twice during the Congress. Once at a lovely ear reconstruction by Rad Tanzer and again at the result of that young girl with a forked flap.
In April 1969 this secondary forked flap case was published in *Plastic and Reconstructive Surgery*:

It emphasizes the insatiable need of the short columella, requiring a forked flap with its prongs taken from the full vertical length of the lip.

Another dividend of the forked flap, besides lengthening the columella and releasing the snubbed nasal tip, has been improvement in lip conformity and the creation of a more natural nasolabial angle. It can also be used to help narrow a wide lip.
A bilateral cleft lip and palate was closed by L. W. Schultz of Chicago with his method of joining the muscles behind the prolabium. This resulted in a well-functioning lip which, surprisingly, spread to quite a wide central segment. Of course, the columella was short, the alae were flared and the nasal tip was flat.

A forked flap, taking portions of the prolabium and the bilateral scars, achieved columella lengthening, nasal tip elevation and reduction in alar flare.
Even after adequate columella lengthening and tip release the prolabium was still wider than ideal philtrum dimensions.

Here is an eight-year-old boy with a prolabium that forms the entire central segment of the lip. Not only is it too wide, but the columella is short, the nasal tip is depressed and the alar bases are flared. This is a natural for a standard forked flap.

A forked flap including prolabium and scars was advanced along the membranous septum. The alar cartilages were sutured to each other in the tip. The forked flap, sutured and tubed on itself in the upper 1 cm., was sutured to the membranous septum but allowed to splay at the bottom as columella base joining alar base flaps to form nostril sills and reduce flare.

Free border vermilion side flaps were tucked behind a turned-down flap of prolabium vermilion to create central tubercle fullness.
Fourteen months after use of the forked flap, double-breasted vest scar revisions were made and a columella-thinning procedure was done.

From 8 to 18 years of age there is often an angriness in the healing of scars, but in time they usually settle and smooth out.

This bilateral cleft lip and palate had closure of the lip in New York by the conservative straight-line approximation of the lateral lip elements to the sides of the prolabium. By five years of age, the prolabium had spread to a wide central component, and, of course, with the short columella, the nasal tip was snubbed. Original preservation of a cuff of prolabium vermilion in front gave a segmented effect to the visible vermilion.

Excision of most of the prolabium vermilion at least smoothed out the central red area of the lip, but columella lengthening was postponed to see what growth alone would do to the nose.
At 14 years, the nose was still showing a flat nasal tip, so a forked flap was used to lengthen the columella and narrow the philtrum. Through the forked flap exposure, a modified nasal reduction lowered the bridge, shortened the septum and reduced the alar cartilages. The patient then proceeded to heal with the typical angry teenage scarring, but as time has passed, the scars have begun to settle.

Further nasal and lip revision including a sepal cartilage strut in the tip will be carried out as soon as the patient expresses the desire for further improvement.

When I described the forked flap to Sir Harold Gillies, he was pleased with the principle and said it was the reverse of his alar wing flaps.
Neither Gillies nor I associated the forked flap with the early example of the "scrambled Z," a frightening case operated on by Gillies which we included in our book section on cleft lips, warning that such radical surgery was not advised as a routine. It had called upon a double Z of the lip which moved the alar bases in and gave less than half the vertical length of the lip as advancement flaps into the columella. Initially horrified with such random chopping of the lip, I had put the case out of mind. Yet, upon reflection, one must note that the upper portion of this puzzle of cuts might be a distant ancestor of the forked flap.

While attending an International Congress in Bratislava in 1965, I learned that the grand old man of Prague, Professor Frantisek Burian, was also using a secondary columella-lengthening procedure similar to my forked flap. The language barrier blocked our discussing the method, and it was not until 1968 that his book written in English diagramed his general procedure.

His release over the tip of the septum was not enough even though he did suture the alar cartilages together. The advancement of his flaps did not go completely into the columella, for the lower one-third remained in the lip, with penalties to both the lip and the nose.
EARLIER USE

By 1958 I had adapted the forked flap for use as a delayed primary columella lengthening (four months of age) and I presented the design at the 1959 International Congress in London. My original diagrams for this new use outlined shorter pointed flaps, which, as it turned out, were too short for adequate columella lengthening in the typical bilateral complete cleft.

In 1972 Kurt Schneider of Zurich, fresh from a visit to Charles University, Prague, came to Miami for a Maytag fellowship. Informing me of the international misunderstanding about the forked flap, he obtained for my enlightenment an article written in 1960 by H. Peskova and M. Fara of Charles University. Evidently these two had hastened into the literature on behalf of their leader, Burian, who until then had said nothing about this columella lengthening. In the Prague clinic for years, as they reported in 1960:

The columella has been lengthened by using the sides of the philtrum, including the scars, and making use of excess tissue from the nasal threshold.

They diagramed a forked flap of about the same measly proportions as my 1959 design for early use in infancy but added Brown’s horizontal short spurs from the base of the nose.

It is noteworthy that in the same paper they mentioned Burian’s preference, in severe deformities, for external incisions through the alae and advancement of the dorsal skin of the nose for columella lengthening. It is also interesting that in his final 1968 book Burian’s description of the forked flap was quite unlike their rendition.
As I have never been to Prague and had no idea what they were doing behind the then more rigid Iron Curtain, and as there had been no publications on the subject, even in Czech, little remains to be said. The same thing has happened many times in history; more than one person comes upon an idea—and often almost simultaneously as though the specialty had progressed to the point where this was the next logical step. It is almost ironical that the identical "come lately" claim was made with the tube pedicle. As J. P. Webster noted in 1959 after extensive research:

In 1916 and 1917 three surgeons, independently, recognized the value of closing the parallel skin edges of open pedicle flaps by suturing them together to form tubes.

They were Filatov of Russia, Ganzer of Germany and Gillies of England. It was rumored, subsequently, that Burian of Prague had done it before any of the others but, again, without establishing the fact by publication in the world literature.

It is unfortunate, if indeed Burian favored the fork, that he did not publish his work. Yet, setting aside priorities for a moment, let me say again, the principle is a good one and its staged primary use will eventually supersede its value as a secondary procedure.

In 1963 Alexander Limberg of Leningrad, in his book *The Planning of Local Plastic Operations on the Body Surface*, gave a mathematical dissertation on the forked flap (Millard, 1958) but adding lateral triangular extensions at the columella base as described for Gensoul by Blair and Brown and for the forked flap by Peskova and Fara:

After plastic reconstruction of the lip for congenital bilateral cleft, as a result of growth the child after 8-10 years usually shows some surplus of the tissue in the central portion of the upper lip. This surplus may be well utilized in plastic operations for lengthening the columella.

From the base of the short columella, downward, there extend two diverging incisions, outlining a symmetrical triangular flap, which is kept in the central portion of the lip. The external incisions, forming lateral flaps in the upper lip, are kept if possible in the area of the scars. It is sufficient to add one more component part to the incision in the direction of the lateral surface of the columella.
In the 1966 *Modern Trends in Plastic Surgery* Limberg, with the aid of this paper model, demonstrated mathematically the effect of shifting the forked flap with its opening and closing of angles producing lying and standing cones.

All 14 components of the incision are of equal length and each is equal to half the depth of the upper lip. Two flaps of lip skin, which include the harelip scars, are raised in continuity with the short columella. The advancement of the lateral margins of these flaps is made possible by an additional three-limbed incision along the lateral surface of the columella. The five lateral components of the incision may be regarded as two sets of asymmetrical triangular flaps with unequal angles of 60 and 90 degrees and 120 and 150 degrees, one lateral limb of each being superimposed. Extensive undermining allows the flaps to be moved into their new position.

**STARK AND OTHERS CONCUR**

It was interesting that in 1964 Stark and Washio from New York's St. Luke's Hospital endorsed the forked flap. Later, Stark in his 1968 book summed up the situation and demonstrated a very nice result:

The classical postoperative defect in bilateral clefts of the lip is the overly wide protibium, the snub nasal apex with short columella, and wide nostril floors. The forked flap columellar advance operation of Millard is ideal to correct all the aspects simultaneously.

At Schuchardt's 1964 Hamburg Cleft Palate Congress, I again presented the forked flap showing a new set of diagrams. A suggestion was made for improving the results with this principle:

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It is important to avoid the depressed notching in the new columella just below the nasal tip, noticeable in profile. This is achieved by suturing the flaps of the fork together in front. They are then rolled together in the upper portion (1 cm.) and sutured gently in a loose tube. This portion must not be sutured to the septum but allowed to ride up freely while the lower portion of the lengthened columella is sutured to the septum.

At the same Hamburg Congress, Professor Gerhard Steinhardt of Erlangen-Nürnberg University expressed his dislike of the Gensoul approach and his endorsement of the forked flap, quoting logic from my 1958 paper and adding:

The procedure will also bring about an eversion of the upper lip and elevate the anterior part of the nose simultaneously. We have good results with this modification. . . . What I want to say, in short, is an old request: we should avoid secondary scars as much as possible in cleft patients.
The gentlemanly Steinhardt spoke with cicatricial authority as he himself has a "handsome" dueling scar on his left cheek, received while a student at the University of Heidelberg in the 20's. In Germany, prior to World War I, such marks were a proof of valor.

After Steinhardt finished, Gerhard Pfeifer of Hamburg University rose to give a modification:

Bilateral scar flaps are suitable for prolonging the columella as Dr. Millard and Dr. Steinhardt have just pointed out. In some cases it may be useful to leave a triangle of skin on either side that goes into the incisions at the nasal sill. This incision has to be made to bring up the tip of the nose. . . . The triangles mentioned comprise, furthermore, all extensions of Z-shaped incisions of primary operations and transform the linear scar into less noticeable smaller ones.

During that Hamburg Congress E. Schmid of Stuttgart revealed that he had been using the forked flap for some time and showed a couple of improved columellas.

Over the years, the forked flap has gained in popularity. It has been adapted to unilateral use and modified in shape, size, position of placement and methods of banking. As Mark Gorney stated in reference to his support in bilateral cleft nasal correction:

The gull wing graft can be combined with almost any procedure you may choose. If added columnar length is needed we use a forked flap or one of the other refinements.

Tessier's 1969 suggestion of selectivity for this procedure is partly correct:

The Millard procedure, or forked flap . . . consists of using, not the central part or totality of the prolabium itself, but its edges and adjacent scars. It presupposes good continuity of the orbicularis, and a wide prolabium without transverse scars. The two flaps should reach the mucocutaneous border. Lengthening is less than that obtained with the three-leafed flap; on the other hand, the scars on the lip blend in well with the philtral ridges and the philtrum takes on a pleasing triangular allure.

In 1971 even Tom Cronin, although he usually used the skin
from the floor of the nose and part of the alae for columella lengthening, admitted:

Occasionally, I have used the forked flap, especially if bad scars of the lip needed excision and revision.

I recall with pride that as early as 1959 Reed Dingman personally expressed his appreciation of the method. This specific high level endorsement meant very much because Dingman in his typical kind fairness helped me to withstand some of the oblique political flack that was still flying at that time. Then as late as the 1973 International Cleft Palate Congress in Copenhagen, Hugo Obwegeser stood in open forum and in his typical authoritative style declared:

In my hands Millard's forked flap absolutely is the best procedure for elongating the columella.

After full consideration I did not rise to argue the point.

V A R I O U S  U S E S

As has been discussed in primary bilateral cleft surgery, the forked flap has been used in numerous ways. It also can be modified for special problems.

Modified short fork

Many postoperative bilateral cleft lip cases with a tight upper lip and only a moderately short columella are treated merely with a lip-switch flap. The meager scarred prolabium, which had proved to be inadequate in the lip but could have served in the columella, unfortunately has been scrapped, necessitating a secondary scramble to make up for this waste. A modified shorter fork can be of value, taking the scars and tissue from the Abbe flap or lateral to it. Here are two personal examples.

This young doctor had his bilateral cleft lip treated secondarily with a W-shaped Abbe flap which was most un-philtrum-like in its spread at the top. Then, too, the columella was short and the alae were flared. Unfortunately, the prolabium had already been discarded!
Scrutiny soon showed what he had that he could spare to help his columella. A short fork was taken from the scars and the upper excess of the Abbe flap.

The operative stages of this short fork were published in *Plastic and Reconstructive Surgery* in 1963.
This maneuver shaped the philtrum and released the nasal tip. The reentrant nasolabial angle could have been improved, had the patient desired, by the Cinelli septal flap or by the lozenge-ellipse advancement described in Chapter 47.

The patient shown below with bilateral cleft lip and palate was first seen at age 27 after 34 operations, including cheek-relaxing incisions and an Abbe flap. The lip scarring was severe, the columella short; the alae were flared and the nasal tip was hooked like a hawk's beak.

A half-length forked flap, incorporating the scars on each side of the Abbe flap, lengthened the columella and released the tip. Abrasion of the lip scars gave some improvement.
Further nasal and labial work was done, but, as so often happens, the patient moved away before records could be made.

*A three-quarter-length forked flap*

In certain cases, when the prolabium has been incorporated in the upper part of the lip and lateral lip flaps have been brought together below it, the lip may not be too long and the nasal tip may be only moderately depressed. Yet there is a subtle discrepancy due to the prolabium fullness in the superior part of the lip, with relative tightness in the lower portion and only slight snubbing of the nose. Here a three-quarter-length forked flap reducing the sides of the high prolabium can be of benefit to both the lip and the nose.

An asymmetrical bilateral cleft of the lip and palate was treated in Washington, D.C., in two stages with composite skin and vermilion flaps introduced below the prolabium. The operation resulted, by age six years, in an asymmetrical nose, depressed nasal tip and a lip with transverse scars and bulging central prolabium but reasonable vertical length.

At eight years, a left alar base flap was transposed across the nostril floor to create a sill, and a vermilion V-Y was used to create a tubercle. Three months later, a three-quarter-length forked flap was elevated out of the lip and advanced along the
membranous septum with excellent tip release but obvious columella retraction. Thus a subcutaneous flap superiorly based was carved out of the center of the bulging prolabium and turned up to lie on the membranous septum increasing columella contour in profile. The resultant depression in the center of the prolabium improved its philtrum appearance.
Return inferior flaps for later forked flap

Even when all seems lost and tissue usually allotted to the forked flap has already been stolen and stuck below the prolabium, it can be retrieved. Merely steal it back, reposition it where it came from and then later incorporate it as a forked flap (see Chapter 53, Long Upper Lip). Here is an example.

The patient had had lateral triangular composite flaps transposed below the prolabium in infancy by a surgeon trained in the Brown school. The result at four years of age revealed a long lip in vertical dimension, abnormal position of scars, short columella with snubbed nasal tip and flaring alae.

There was no improvement with time.
At eight years the skin flaps below the prolabium were elevated and transposed 90 degrees into the bilateral vertical scars back where they came from along the sides of the lateral elements. The mucocutaneous ridge and vermilion was sutured up to the inferior edge of the prolabium.

This maneuver shortened the vertical length of the lip, relieved the side-to-side tightness and replaced potential tissue into a strategic position for a later forked flap for columella lengthening.

Six months later a forked flap, incorporating replaced flaps, all scars and portions of the prolabium, was incised and elevated. The prolabium also was elevated and the lateral mucosa and muscles were sutured together in the midline. The prolabium was replaced first with a dimpling stitch and then with regular suturing. The prongs of the forked flap were banked by suturing them to the alar base flaps in a type of "praying hands" position. The patient subsequently struck his lip, with partial separation of his lip incisions. The right side was revised at the time of the next surgery.

Two months later, parallel incisions anterior and posterior to the forked flap–alar base pyramids were made, followed by partial reopening of these pyramids to form longer straps. Then, with the aid of a membranous septal incision extended laterally in the upper vestibule, the straps were advanced together medially and up into the columella. Small extension flaps cut from the upper
forked flap sides were let into the vestibular defects to maintain nasal tip release. Subcutaneous alar base extensions were advanced to each other at the nasal spine and fixed with a suture. Thus the nasal tip was elevated and the alar flare reduced.

Subsequently the lip was shortened in vertical length by an excision along the entire nasal base and also along the scarred mucocutaneous line as well as the vermilion free border.

Here is another example of the same type of recovery of a forked flap from skin flaps originally misplaced by being transposed below the prolabium. This case is presented in detail in Chapter 53.
Lopsided Abbe

Keep your cool and do not overlook the forked flap just because complete cicatricial pandemonium has displaced the usual donor area. Diagnose the short columella, the misplaced prolabium and the potential philtrum Abbe flap in deceptive unilateral position.

A bilateral cleft lip and palate patient had been treated with, among other procedures, a unilateral Abbe flap and presented a mind-boggling nasal and labial deformity. He had a short columella, a depressed nasal tip and a horizontal Z scar line of the lip with one limb of an Abbe, along with scarring and even stitch marks in the lower lip.

I studied and stalled for eight months but finally turned to the scalpel with one rather comforting thought: Regardless of what
was done, an improvement was almost assured.

At age 12 years, the remaining prolabium on the right was elevated, split as a forked flap and advanced into the columella with nasal tip release. Then the unilaterally positioned Abbe flap, based on the vermilion free border, was shifted into the midline philtrum position. Improvement in the conformity was partly spoiled by the usual teenage scar hypertrophy.

Only after minor revisions over several years did the scars gradually improve. Then, just when coming of rhinoplasty age, the patient moved to California, and years later, at age 18 when he returned to Florida, he presented a nasal bridge reduced nicely by Bruce Connell. Further refinements were indicated. The tips of the flaring alar bases were denuded of epithelium and advanced to each other behind the columella, and slivers of septal cartilage were inserted along the alar margins.
And finally he is shown as professor in the English Department at a west coast university.

Forked flap forced to crisscross

This 11-year-old boy born with a complete bilateral cleft of the lip and palate and mucous pits of the lower lip had had seven operations in one of the smaller cities of Louisiana. One procedure had been a columella lengthening by division of the short columella from the lip, and insertion of an ear graft. Unfortunately, the graft had been only partially successful, leaving some shortness but a more noticeable lack of contour. There were also flaring alae, lack of muscle in the prolabium, deficiency of maxillary platform, scars of the mucosa of the protuberant lower lip and fistulae in the anterior palate.
1. Palate fistulae were closed.
2. A forked flap was taken from the prolabium to reduce it to philtrum dimensions and included the old bilateral cleft scars. Because of the previous auricular graft to the columella, the flaps were based on the nasal floor and sides of the columella.
3. The lateral lip mucosa and muscles were joined to each other behind the lifted prolabium to create a sulcus and muscle continuity.
4. The prolabium was reset into the lip with a dimpling stitch and regular suturing.
5. The forked flap was banked under the alae in whisker position temporarily.
Six weeks after the first stage, the second procedure was carried out. Because the columella severely lacked contour and was only moderately short, the ideal "continuous flow" advancement of the forked flap had to be altered. The tip of the nose carrying any normal columella was released by a transverse incision at the join of the ear graft and extended back well into the membranous septum. Most of the remaining brown-colored ear graft was discarded. The banked flaps were reelevated and wrapped around the columella defect, one on top of the other, in the spirit of Marcks and Skoog. The effect was lumpy, but in time it can be improved. The most dramatic action was correction of the alar flare by the now standard dissection of two flaps in each alar base. The dermal subcutaneous underflaps were sutured to each other at the base of the septum, and the upper skin flaps formed the nostril sills.

Time, revision of the lower lip and other secondary corrections should bring improvement eventually.

Takahashi
There is one surgeon in Japan who is probably more familiar than anyone else in the world with all my forked flap modifications. Shojiro Takahashi wrote a paper in 1972 with an impressive number of co-authors: T. Shigematsu, T. Furukawa, M. Ohi, H. Tanabe, T. Ichikawa and J. Tachikawa—one more, in fact, than
the number of modifications—(1) long fork, (2) short fork, (3)
delayed fork, (4) primary fork, and (5) banked fork. He showed
examples of several, including this secondary short fork

and a longer fork!
Merville

Maxillofacial surgeon L.C. Merville of l'Hôpital Foch, Paris, modified the lip donor area closure following the forked flap by bilateral lip-cheek advancement flaps. This is his plan:

a) Outline of the forked flap of Millard and extension of the incisions into the nasolabial folds. This is usually only possible with a supple lip.

b) Lengthening of the columella, advancement of 2 lateral labial flaps.

c) Placement of a small intercolumellar bone or cartilage graft to maintain the projection of the tip.

Neuner

It is interesting how Otto Neuner, Professor of Maxillofacial and Oral Surgery, Berne University, Switzerland, became interested in secondary cleft deformities. He recalls:

As a young boy I used to make fun of a hare-lip schoolmate. Years later during the study of medicine I was still ashamed of my mockery and vowed to do my share of rehabilitation. As a young surgeon I followed the lines of masters like Axhausen, LeMesurier, Trauner, Veau, but was never fully satisfied. Then in 1961 in Stuttgart while studying with Schmid I became familiar with your rotation-advancement and forked flap. Since then I have adopted, adapted and sometimes modified these procedures. My goal is always to restore completely a normal esthetic and functional integrity.

It is intriguing to study his artistry. He added to the forked flap Potter's V-Y intranasal advancement, scoring of the alar cartilage domes and suturing of the medial crura. He leaves the tips of the fork tails in the lip, as did Burian, but still achieves elongation of the nasal passage by more than 9 mm. At the second meeting of the Swiss Society of Plastic and Reconstructive Surgery in Zurich in 1966, he elaborated:
We extend the upper incision in a V-Y to approximate the lateral crura with their underlying mucosa, a distinction from Millard's original method. The medial crura then remain in the columella, as recommended by Meyer for Potter's procedure, thus simultaneously correcting the tip of the nose.

When columella lengthening need be minimal, Neuner notes:

As well as elongating the nose it is almost invariably necessary to raise the upper lip.

To do so he used a bilateral forked flap, transposing the prongs as nostril sills and incorporating them by splitting their tails and inserting an alar base into each split.

He has even used the forked flap in transpositions of 180 degrees for the relief of columella retraction. There is no law saying the forked flap should be used only for columella lengthening. The bilateral scars and wide prolabium often need revision and rather than being discarded can be used in the forked flap vehicle for whatever purpose seems indicated.

Summary of Neuner's goals has a familiar and encouraging ring:

Thus our operations are always performed with the aim of leaving only vertical scars which correspond with the edges of the philtrum. This, together with the union of the orbicularis oris muscle over a broad front, restores a full measure of mobility to the lip. We consider ourselves successful when such activities as whistling, pursing the lips and laughing can be carried out in a functionally and visually acceptable manner.

Neuner has published an impressive number of papers on secondary procedures, using the same group of cases repeatedly but with results so outstanding it is a pleasure to see them again.
In spite of its popularity, certain aspects of the forked flap have caused difficulty. It is not always easy to avoid a columella kink under the tip, a grossly wide columella and an unnatural join of its base with the lip and to achieve a smooth line from a raised nasal tip, along the length of the columella, blending gracefully into the lip. These results depend on craftsmanship, on knowing when and how to take the fork and what to do with it once you get it.

Sparing the Fork

When taking a forked flap out of a lip one must be sure the lip is able to spare it. If the upper lip is already tight in relation to the lower lip, especially in its upper portion, it probably cannot spare the fork. If the lip is loose at the top and tight only along the lower border, the lip not only can spare it but will benefit by correction of this discrepancy.

What to Take in Width

Of course the center guidelines are the old bilateral scars. Forked flaps are hardy and have survived old scars crossing their base and body. In fact, I do not recall a loss, and the forked flap has been taken out of many a maze of scar.

If the prolabium is wider than the normal aesthetic philtrum, the major portion of the fork should be taken from the prolabium and include the bilateral scars (A). If the prolabium is already philtrum dimensions, lateral lip tissue will have to be included with the scars in the forked flap (B).
LATERAL EXTENSIONS

Lateral skin extensions on the forked flap can be of value to fill the chinks back under the nasal tip where the lateral anterior vestibular releasing incisions have been made. Often these incisions are extended to allow further exposure for reduction rhinoplasty procedures to the alar cartilages and hump. The extra freeing will ease the closure, but still the lateral extensions fit across potential scar lines and protect what tip elevation has been gained. The extensions should be taken relatively high on the fork so that the donor areas are placed in the floor of the nose. This is a convenient and hidden position which will merely make room for medial advancement of the flaring alar bases.

If the total lip is too long vertically, the lateral extensions of the forked flap can be taken as transverse wedges from the lateral lip elements high up at the join with the alar bases and shorten the lip at the same time.

If no extra lip tissue is available for lateral extensions, then, as the forked flap is usually wider in its upper portion, it has been possible to cut side flaps off the main forks, which can be turned 90 degrees into the lateral chinks.

DEPTH OF FLAPS

It is important to take full-thickness depth including subcutaneous tissue and muscle down to mucosa in the forks. This is necessary for columella contour, vascularity of the flaps and ease of donor area closure.
LENGTH OF FLAPS

The desired length of the forked flap depends on the shortness of the columella and the amount of depression of the nasal tip. The possible length of the forked flap depends on the vertical length of the lip. Except in an unusual near-normal columella, the forked flap should be taken from the entire vertical length of the upper lip. There are two ways to handle the cutting of the flaps and closing of the donor areas at the mucocutaneous junction line. The simplest way is to extend the flaps down into the vermilion as tapering points to facilitate straight closure of the vermilion donor area and then later cut off the excess vermilion from the tips.

Another method of cutting the fork takes the flaps wide down to the mucocutaneous junction line and transects them abruptly with a blunt end, leaving all vermilion in the lip. This approach is especially beneficial when there is a whistling deformity. During closure of the forked flap skin donor area, the excess vermilion left behind can be advanced along the lower border of the prolabium to pile up in the center to increase the body of the tubercle.

This approach is also preferred when the primary surgery preserved the original miserable vermilion of the prolabium in anterior visible position. It can be displaced posteriorly as a trapdoor flap and covered by medial advancement of the lateral lip vermilion to give a clean sweep from each side to the center.

Masters and Craft in 1974 also acknowledged the advantage of this vermilion advancement in association with the forked flap.
STANDARD OUTLINE OF FORKED FLAP INCISIONS

The medial incisions outline a natural philtrum prolabium, extend the vertical length of the lip and curve to meet in an inverted V which just crosses the nasolabial join with its point transgressing into the columella base just under the nasal tip. At the inferior end, the flap tapers into the vermillion or is cut flat at the mucocutaneous junction line.

The vertical lateral incisions run parallel to their mates except where they diverge to pick up transverse lateral extensions from the nasal floor or lateral lip elements. Upon entering the vestibules, the incisions curve back behind the columella and meet each other through and through along the membranous septum. At the top of the septum, the incisions again diverge bilaterally into the upper vestibule for extra release or exposure.

SUTURING THE FORK

First the medial skin edges of the fork are sutured with 6-0 silk down the center seam as far as is necessary for columella length. The distal ends are usually left free to splay. When lateral extensions have been cut, they are guided with 5-0 catgut into the open chinks back of the tip in the vestibule on either side of the septum. The forked flap, now sutured in front, is rolled on itself with catgut sutures to imitate the column it is becoming. The column should not be forced by sutures to the membranous septum at the tip but can be rolled gently on itself and left free; the fistula will eventually close. The main body of the forked flap, as it advances into the columella, is sutured with 4-0 chromic catgut to the membranous septum. At the base of the columella the fork prongs have been allowed to splay and thus join and are sutured to the advancing alar bases as they cross the nasal floor to form the nostril sills.

FORK SUPPORT

The actual projection of the bilateral cleft lip septum just does not have the "oomph" to maintain tip lift. Even when the spread
alar cartilages are sutured to each other, further support is often needed.

If the forked flap is being done at five years, a preserved septal cartilage strut is used for a temporary tip lifter. If the forked flap is being done at 16 years, a submucous resection will supply the cartilage struts necessary. They can be inserted behind the forked flap at the time of its advancement or later when the forked flap has healed in its new position. This additional cartilaginous strutting will give a slight lift to the tip with more definition and will improve the column contour, avoiding the slight tendency toward retraction.

**Banking the Fork Even in Secondary Corrections**

The forked flap’s worst fault in design is its five points of closure, with all its scars converging to a central point and contracting at the same time. When this procedure is used as a secondary correction in the adolescent, whose scars tend to heal angrily, the result can be less than ideal or at least take years for satisfactory healing.

This is one of the advantages of banking the forks. By staging the forked flap, one can stagger the scars in time so that at no one stage do more than three scars converge to a central point. The banking maneuver has been incorporated now into the secondary forked flap. This also makes possible side-to-side muscle union behind the prolabium.

Secondary correction in bilateral clefts of scars, muscle discrepancy, philtrum construction, cupid’s bow, free border deficiency and lack of sulcus has been described in general. If all require correction, the best plan is to undo the lip entirely and reassemble it as it should have been done in the first place and as has been described in the primary procedure. If the columella is short, the scars will not be excised but included in a forked flap, which is banked. As the same amount of full-bodied forked flap has been cut and sutured end on end in a pyramid to the alar bases like “praying hands,” adequate tissue has been stored. The pyramid may flatten and the forked flap disappear into the nasal
floors, but it is there nonetheless, and available three weeks, three months or three years later when the straps are recut and advanced into the columella.

CASES IN POINT

A bilateral complete cleft of the lip and palate was closed in infancy in New York. Lateral triangular flaps were inserted below the prolabium without joining the muscles or creating an upper sulcus. There resulted a wide prolabium and an irregular arrangement of the free border with the suggestion of a whistling deformity. The columella was short, the nasal tip was depressed, the alar bases were flared and there was almost no nasolabial angle in profile.

At age four years the prolabium was reduced by paring a forked flap from its sides. The lateral lip elements were advanced to each other, suturing being done first on the mucosa to form an upper sulcus and then on the muscles for functional continuity. The prolabium was brought down and sutured to form the philtrum. The lateral vermilion flaps carrying a mucocutaneous ridge were advanced over the inferior vermilion turndown flap of the prolabium. The alar base flaps were cut free from the lip elements and sutured to the prongs of the forked flap in "praying hands" position.
Three months later the forked flap was cut free from its position in the floor of the nose. A membranous septal incision was extended bilaterally in the upper vestibule for nasal tip release. Small lateral flaps were cut from the upper sides of the forked flap. Then the forked flap was sutured together and advanced along the membranous septum with its small lateral flaps fitting into the vestibular releasing incisions. A banked septal cartilage strut was inserted behind the fork to support the lifted nasal tip.

At age 16 years, two long autogenous septal struts will be used to fill the columella and give that extra permanent lift to the nasal tip.

The forked flap can also be banked secondarily in whisker
fashion and, any time after three weeks, can be advanced into the columella.

This 6-year-old boy had his bilateral cleft lip closed in Louisiana in almost an adhesion-type procedure in infancy.

A forked flap was taken from the sides of the prolabium, incorporating the bilateral scars. Posterior prolabium mucosa was used to cover the front of the premaxilla. The prolabium was elevated to the nasal spine, and the lateral lip elements were joined to each other by both mucosa and muscle. The prolabium was replaced into philtrum position with a dimpling stitch. Alar bases with subcutaneous flap extensions were sutured to each other at the nasal spine. Lateral vermilion carrying mucocutaneous ridge was used to overlap the turndown of inferior prolabium vermilion to create a tubercle. The forked flap was banked in the subalar incisions in the whisker position.
Six weeks later the forked flap was reelevated. With the aid of an inverted V incision at the columella base and a membranous septal incision extending bilaterally high in the vestibule, the nasal tip was released. Small lateral flaps cut from the sides of the forked flap were inserted into the darts in the vestibule as the forked flap advanced up along the septum to lengthen the columella. The inferior tips of the forked flap were sutured to the advancing alar base flaps to complete the nostril sills. A strut of homologous septal cartilage was used to help support the forked flap nasal tip elevation.

The lip scars will settle in time, and minor nasal revisions, probably including an autogenous septal cartilage strut in the
columella to define the nasal tip, will be carried out at age 16 years.

This four-year-old boy from Bombay came to Miami after several operations in India with quite a good result. The premaxilla was in reasonably good position, but there were five fistulae in the difficult alveolar-anterior hard palate area following a V-Y palatal pushback. The patient also presented a short columella, kinked, flaring alae, fine scars but a wide prolabium without muscle continuity, attenuated free border vermilion without cupid’s bow or tubercle and, in fact, a mild whistling deformity.

An attempt was made to close all five fistulae in two layers. Then attention was directed toward the lip and nose. The short columella and flaring alae demanded action, but the excellence of the scars and the reasonable conformation of the lip in general caused concern. With faith that principles would ensure ultimate improvement, a banked forked flap was carried out. The prolabium was marked in the shape of a narrower, more natural philtrum, which allowed paring of a forked flap, taking a scar in each prong. All three portions of the prolabium were elevated from the premaxilla, and the lateral lip mucosa and muscle elements were sutured to each other in the midline to form a sulcus and improve function. The philtrum portion of the prolabium was split vertically down its midline posteriorly, and a 4-0
Mersilene suture picking up dermis in this split was sutured down to the newly united muscle to suggest a dimple. The better portions of the free border vermilion on either side of the prolabium were used to overlap a turndown flap of prolabium vermilion to produce a tubercle. The prongs of the forked flap based on the sides of the columella were banked into releasing incisions between the alar bases and the lateral lip components in whisker position.

Although the philtrum prolabium would have been vascularized well enough in three weeks to allow its division from the nose and advancement of the forked flap, a trip to London and a case of chickenpox postponed surgery another month. Then the whisker forks were reelevated, and, with the aid of an inverted V incision in the anterior skin of the nasal tip at the columella base and a membranous septal incision posteriorly extended bilaterally out in the upper vestibule for $\frac{1}{2}$ cm., the nasal tip was released.

Next, the flaring alar bases were freed by circumalar incisions, and their tips were denuded of epithelium so that they could be advanced and sutured to each other with Mersilene at the nasal spine. The skin portions of the alar bases were freed for eventual suturing to the columella base. The forks were then sutured to each other down the anterior seam with 6-0 silk and rolled into a partial tube posteriorly with 5-0 catgut. Small lateral flaps pared from the sides of the forked flap and based superiorly fitted into the chinks in the released vestibule. The main column of the forked flap was advanced along the membranous septum and fixed with chromic catgut. The inferior tips were allowed to splay so that the superior peak of the prolabium, the freed alar bases and the V at the bottom of the fork could all be brought together with one key subcuticular stitch.

Then one important trick was instituted to relift the lip that had dropped. Mattress sutures of 3-0 chromic catgut from the vestibule of the intact floor of the nose were passed down to pick up the muscle of the lateral lip segments, passed back up and tied inside the nostril floor to pull the lip up into normal position. This also improved the lateral slack of the lip after alar base advancement. Not only had the lovely lip been left intact, but all incisions of union were now lying along natural seams and
creases easily sutured without tension. The slight scallop of each alar rim was tailored by marginal wedge elliptical excision of skin closed with 6-0 silk. A slight depression in the columella was filled out by excess subcutaneous free grafts. The generous length of the columella and the extra tilt of the tip will settle in the next six months. It is better to overcorrect at this age, feeding enough skin into the nasal shortness, and then let the nose grow into it.

4 YEARS OF PREMAXILLARY PROTRUSION

Here is a bilateral cleft lip without cleft palate in which the projecting premaxilla was not remarkably affected by lip closure.
in Alabama. At 4 years in Miami the premaxilla was set back by vomer resection. Mucoperiosteal flaps turned on the sides of the premaxilla and alveolae were sutured to close the clefts and a Kirschner wire used to pin the premaxilla back to the vomer in its undercorrected position.

Six months later forked flap, incorporating old bilateral scars, was banked in whisker position and the lateral lip mucosa and muscle elements sutured together behind the prolabium. Two months later the forked flap was advanced and the alar bases denuded of epithelium at their tips were sutured to each other at the base of the septum. Then mattress sutures from the vestibule pulled the lip back up to its join along the nasal base.

Time and revision at 16 years will complete this little charmer's reconstruction.

**ANOTHER DELAYED FORK**

This 2½ year old bilateral cleft lip and palate had the lip closed at one month in Tennessee. Although the result was not bad the potential with growth was limited because the columella was short, the prolabium wide without muscle continuity and there was a central whistling deformity of the vermilion.

At 3½ years a forked flap narrowed the prolabium and incorporated the bilateral lip scars. The lateral mucosa and muscle elements were joined behind the prolabium in the midline and the lateral mucocutaneous ridges with vermilion were advanced along the inferior border of the prolabium to create a central
fullness. The forked flap was banked temporarily in whisker position.

Three months later the forked flap was advanced along the columella and the tips of the alar bases denuded of epithelium and sutured to each other at the nasal spine. This elevated the nasal tip and in time with minor revisions her nasolabial relationships should be good.

**THE COST OF CONSERVATISM**

Here is one of my own primary cases which, not having had a forked flap banked or the lip muscles united, required these procedures secondarily. It is true that the smallness of the prolabium and the projection of the premaxilla make it a borderline case.

At two and a half months a C-W closure without undermining the soft tissues was carried out, but the tension caused separation on one side requiring resuture. As the muscles were not joined across the lip, the prolabium, which was small originally, stretched wide. The lack of strong restraint lessened the molding action against the arch, so at five years, after vomer resection, the premaxilla was set back partially. In spite of a short columella, depressed nasal tip, flared alae, wide prolabium and unnatural scars, the procrastination continued because of the difficulty offered by the premaxillary bulge.
Finally, at seven years, a secondary forked flap was banked in whisker position so that the lateral muscles could be joined behind the reduced prolabium. Six months later, the forked flap was shifted into the columella. One modification is of interest. V-shaped extensions on the banked fork were taken from the nasal floor, and as the forked flap advanced along the columella, these side flaps fitted into the bilateral vestibular releasing incisions to give a more secure tip elevation. This also facilitated medial advancement of the alar bases with their subcutaneous extensions being sutured with 4-0 Mersilene to the nasal spine. It is well to overcorrect the snubbed nasal tip because in adolescence when the nasal bridge develops the nose will grow into proportion.
In 1976 Peter Holm, a Maytag fellow in 1974, forwarded this case with the following story:

A 5-year old Pakistani was sent to Denmark for 6 months to have his palate repaired. He was born with a complete double cleft, the lips were approximated with a side to side suturing. His palate defect extended from the lips backward, measuring 18 mm. in width. He had a short columella. I was given six months to complete his reconstruction. The palate was closed with a 4-flap Wardill plasty. A few weeks later his lip was opened, the philtrum narrowed and the excessive tissue banked as forked flaps. Before he left, the columella was lengthened with the banked flaps. The photo from the newspaper shows him before his departure—it's hard to see that he had had a serious double cleft. Everything wasn't perfect; he had two small fistulas in the front of the palate, the dimple wasn't good enough and the nosetip wasn't raised enough but there was improvement.
41. Other Odd Ways of Lengthening the Columella

A SUBCUTANEOUS FLAP AND GRAFT

When the upper lip cannot spare skin but would benefit by the production of a philtral groove, a subcutaneous tissue flap continuous with the columella base can be dissected out of its mid-vertical length. Elevation of the nasal tip draws the subcutaneous flap out of the lip the way a robin pulls an earthworm out of the ground. Its raw surface can be wrapped with a free auricular skin graft and the donor area depressed with through-and-through sutures tied over a bolster.

This method was first described by me in 1963 for a luetic absence of columella, and its one advantage was the lack of lip skin scarring. It is quite possible that a thin cartilage strut could be threaded up through the new columella as a secondary procedure.

UNIMAGINATIVE USE OF UPPER LIP SKIN

There were several early methods of obtaining skin from the upper lip for columella reconstruction. In 1833 Dupuytren raised
a rectangular flap from the midline of the lip based on the septum, twisted it 180 degrees and sutured its end to the nasal tip with the skin surface forward. In 1842 Serre based his lip skin flap on the vermilion border. Both of these methods were mutilating to the lip and, of course, are now obsolete or should be.

**Buccal Sulcus Flaps**

Columella tissue can also come from pedicles of upper buccal sulcus mucosa. In 1931 Lexer described labial mucosa, in the form of a vertical tube pedicle, being pulled through an opening in the upper lip to supply the columella. He even denuded the base of his pedicle to avoid a fistula and claimed that this mucous membrane became paler and less noticeable after a few weeks of exposure.

Yet in 1918 Gillies was faced with a columella partially reconstructed with lip mucosa. It had had plenty of time to lose its blush, but, as it still looked more like a "nasal hemorrhoid" than a columella, he excised it!

The feisty but realistic Ferris Smith of Grand Rapids, Michigan, one of the American pioneers in plastic surgery, often reminded his residents:

There is nothing new under the sun or a petticoat!

He, too, was with Gillies at Sidcup during the First Great War and later achieved some remarkable results with serial excisions. Smith designed a method of columella construction which circumvented the color problem faced by Lexer. He first lined a mid-vertical lip mucosal strap with a skin graft. Later he divided its upper end and with its base on the tubercle of the free border flipped the flap out of the mouth and up to the nose with the skin graft in front. Finally, the lip attachment was severed and the mucosa-backed skin graft inset as columella.
In rare cases this principle may be of value in the short columella. Variations of the technique were described and illustrated by me in *Plastic and Reconstructive Surgery*, April 1963:

A buccal mucosal flap can be tubed primarily, transported to its final columella position and later resurfaced with a postauricular skin graft. Another approach first lines a horizontal buccal strap flap with a chondrocutaneous graft from the postauricular area. This produces a natural skin color for the future front of the columella and at the same time produces a support and definition to the column. . . . The medial base of the flap is set just past the midline and as soon as the chondrocutaneous graft is well vascularized, the lateral end can be divided, turned over with skin in front, threaded through a slit incision at the future site of the columella base and attached to the nasal tip. Several weeks later the inferior end is divided from the lip mucosa and attached to the lip skin.

**Columella Lengthening by Septal Flap**

In 1975 in the *British Journal of Plastic Surgery*, Miguel Orti­cochea of Bogotá advocated a septal swing flap similar to that described for nasal tip support by Gillies and Millard in 1957. He released the short columella, then swung out a septal flap with its base below to form the lower two-thirds of the columella, suturing the membranous septal skin together in front and uniting it to the columella stub attached to the nasal tip.

This is another method of lengthening the columella, but it leaves a permanent septal perforation and a lack of bridge support, presents a slightly strange-looking columella with a suggestion of eventual adult inadequacy and, of course, poses the possibility of a deleterious effect on nasal growth with such early septal surgery.

Then there are the even more far-out methods that bring tissue
from a distance. The most direct is one described by Labat in 1833 using a flap raised from the skin web between the thumb and index finger. This requires the hand to be held to the nose for at least two weeks in a rather rude "thumbing" position. I used a modification of this once, and once was enough!

THE UBANGI STRETCH

In 1977, Kernahan, considering the nasolabial angle sacrosanct and lacking confidence in his ability to create an artistic columella angle during its lengthening in bilateral clefts, admitted reverting to the Ubangi tribal principle. He makes a slit in the membranous septum and, instead of inserting a ring with graduated weights, introduces increasingly larger plastic prostheses in the hope that he can lengthen the columella. The only trouble is, the columella will thin out as stretched and when the prosthesis is removed, it might contract like a released earthworm and snap back into its hole.
42. **Columella Lengthening by Nasal Floor and Alar Base Advancement; Methods of Alar Base Advancement**

**If** the mucosa and/or muscles of the lateral lip elements have been joined to each other behind the prolabium, the lip result in scarring and function will probably be quite good and will not show a later stretching, thinning and flattening. This approach, of course, suffers the same short columella-depressed nasal tip "monkey on its back," but here there is no spare lip tissue available to appease it.

In such cases, where the upper lip itself does not have skin to spare, tissue for columella lengthening must be taken from elsewhere.

**SHIFTING FLAPS FROM THE NASAL FLOOR**

William Wesley Carter, in 1914 in the *New York State Journal of Medicine* and in 1917 in *Annals of Surgery*, described a columella lengthening procedure which, in principle, advanced the nasal floors and alar bases in a medial semicircular direction. With an inverted Y-shaped incision, the columella cartilages were divided. The incisions were continued under the floor of the nostrils to form two flaps, which were advanced into the columella and united in the midline. The incisions in the nasal floor were extended under the alae, liberating them for medial advancement,
narrowing the nose. The Carter procedure was presented again by J. S. Davis in his 1919 book, *Plastic Surgery*.

In 1938 Arthur Barsky diagramed the lengthening of the columella by the medial advancement of similar flaps from the side and floor of the nostril after a transfixing incision. The defects in the nasal floors were closed by undermining and advancing the alar base.

In 1956 Duarte Cardosa, boat builder of São Paulo and innovator in cleft surgery, designed a similar V-Y for columella elongation which he presented at a Congress in Havana, Cuba. The point of his V was directed toward the nasal tip, and the side arms extended along the alar bases. Without entering the lip, he shifted the alae medially and fixed them with steel wire so that the V became a Y as the columella advanced distally.

In 1957 John M. Converse of New York University diagramed a similar columella lengthening with V-Y closure of the donor areas without medial advancement of the alar bases. Here, again, the amount of lengthening is somewhat limited.

**C R O N I N**

Forty-four years after Carter's work, Cronin refined and popularized the ingenious principle of secondary shifting of the nasal
floor into the columella. In 1958 he first voiced his objections to the Gensoul-type operations:

Very satisfactory lengthening of the columella may be obtained but this is at the expense of the horizontal length of the lip... and results in a very tight short lip from side to side and a long lip vertically; both undesirable.

He reasoned in 1958:

Observing the wide floor of the nostrils and the frequent occurrence of excessive length of the alae in the case of double cleft lip, it seemed that if the excess tissue could be shifted into the short columella, all three abnormalities would be improved.

The examples shown revealed a definite improvement in the alar flare and the columella length with the secondary scars in acceptable positions. In all cases, however, the columella seemed to be just a little short of ideal and the nasal tip never quite up enough except possibly in one case in which the procedure was carried out twice.

Here is the best of the four examples of bilateral complete cleft of the lip and palate presented by Cronin for the Kazanjian honorary lecture and published in the *Cleft Palate Journal* in 1971. Elastic traction from a headcap had positioned the projecting premaxilla so that at five months both sides of the cleft could be closed in a straight-line Veau III-type procedure, preserving a narrow cuff of prolabium vermilion. At nine months the anterior palate was closed and bone grafted. Then at four years Cronin lengthened the columella with his bilateral nasal floor and alar...
base advancements. At six years the nasal tip and columella seemed to be in good position.

SPINA

In 1968 Victor Spina and Vincente Zaputovich advocated Cronin’s modification of Cardosa’s alar and nasal floor advancement into the columella aided, in all cases, by a costal cartilage graft in the sub-septum in order to raise the nose tip. Spina said Cronin and Brown considered this cartilage graft optional but he considered it mandatory.

NEUNER

Otto Neuner of Berne University has modified the Carter-Cronin V-Y medial advancement of nasal floors and alar bases toward the columella by the addition of Potter’s intranasal V-Y advancements along with scoring of the alar cartilage domes and suturing their medial crura. He estimates an elongation of the nasal passages by this means up to about 9 mm.
This general principle is a good one, achieving simultaneous alar base and nasal floor narrowing along with columella lengthening without reentry into the lip. Although it is limited in its capacity to lengthen the columella, when extra tissue is added in the form of a banked forked flap that capacity is adequately increased, as has been and will be shown repeatedly.

**ALAR BASE CORRECTION**

In bilateral clefts, not only do the nasal tip and columella show secondary deformities, but the alar bases begin in flared position and, unless effectively corrected primarily, will remain flared. Indeed, in some circumstances the columella has been lengthened sufficiently but the flaring of the alar bases persists, requiring further surgery.

There is a standard procedure that appears in every textbook but has limited value. When the alar bases turn out severely and the nasal floor is wide, a Z-type double transposition is effective, but the trapdoor flaps ending up in the lip will be responsible for noticeable scarring and should be avoided whenever possible.

There are various V-Y procedures, such as the one championed by Spina of Brazil, which involves a Weir half-moon excision of the alar base followed by an external V-Y medial advancement of the alar base.

The other standard Y-V nasal floor medial advancement of the alar base is a better procedure, and some modification of this is the method of choice.

If the present primary procedure for bilateral cleft lip has been studied carefully and is followed, there will be minimal secondary alar base flaring. If not, then a modification of the tethering that is advocated primarily will serve well secondarily.

**SECONDARY TETHERING OF THE ALAR BASES**

If the nostrils are wide, the ends of the alar base flaps, extending into the nostril floors, can be denuded of epithelium and their raw tips introduced into a through-and-through tunnel behind
the columella base and sutured to each other across the midline. This tethering should, once and for all, stop lateral alar drifting.

If there does not seem to be enough tissue for denuded tips of the alar bases, the alar bases must be cut as rather thick flaps and each split into a skin flap and a deeper subcutaneous flap. The subcutaneous flap can be advanced to its mate under the columella base, much as in the previous procedure, and the skin flaps can advance without tension in a Y-V across the nasal floor.

If the alar bases are abnormally thick, they can be elevated by the usual circumalar incisions and the subcutaneous "heart" cut out of their thickness but left attached to each tip of each alar base. A suture can narrow each reduced alar base, and the subcutaneous flaps can then be advanced again under the columella base and sutured to each other.
LATERAL V-Y OF THE ALAR BASES

When the alar bases have been advanced medially too enthusiastically, encroaching upon the opening of the nostrils with reduction of the airways, a reverse lateral advancement of the alar bases in V-Y fashion can be effective. Richard Farrior of Tampa, who trained with Huffman and Lierle in Iowa, has promoted this method of shifting the alar bases and opening the nostrils.
DORSAL NASAL ADVANCEMENTS

It seems there are almost "no holds barred" in bilateral cleft nasal tip surgery. The width of the nasal tip has been an excuse for its use.

The first to use the dorsal skin seems to have been the German surgeon Johann Friedrich Dieffenbach, who as a young cavalryman had witnessed the maiming and crippling of young men on the Napoleonic battlefields. Inheriting the sensitivity of his poetic mother, he pursued the study of medicine and, in his 40's succeeded Von Graefe as surgeon at Charite Hospital in Berlin. His fame increased until, it is reported:

The children of Berlin sang, "Who does not know Dr. Dieffenbach . . . the Doctor of Doctors . . . he cuts off arms and legs and makes you new noses."

In fact, as early as 1824 he was practically cutting off half a nose to remake it with a V-Y advancement of the dorsal skin into the tip and columella. His comprehensive work on reconstruction was not published until 1845.
Numerous variations of the principle have been advocated through the past century and a half. J. Szymanowski in 1870 advocated a unilateral skin flap from the dorsum of the nose based inferiorly and slightly off center for columella reconstruction. Although this procedure was not specifically designated for bilateral clefts, it seems to be the forerunner of other methods.

Ombredanne also advanced the nasal tip with a V-Y without concern for external nasal skin scars.

Professor Joseph of Berlin employed an exaggerated V-Y advancement of glabella and dorsal nasal skin downward into the columella and tip in cases of wide and bifid nose often associated with hypertelorism. His name for this procedure is as good as, if not better than, the procedure itself—Glabellare Schizzorhino-plastile.

Some 25 years later, in 1955, Burian of Prague described the use of external incisions extending through both alae so that the alae could be shifted from a slanting position to a more normal horizontal position. This shortened the nose length and gave a relative lengthening to the columella. He advised this approach for extreme cases with the nose shaped like a parrot's beak.
The same principle was elaborated upon by the cool, courteous Daniel Morel-Fatio of Hospice des Incurables at Ivry, Paris, whose restrained confidence is reflected in the unostentatious smartness of his dress, the impeccable technique of his surgery and the repeated use of *absolument* to punctuate his teaching. In 1966 he described his use of dorsal skin for columella lengthening in bilateral clefts with depressed nasal tips. He refined the design by resecting the deeper tissue to thin the thickened nose and to facilitate closure of the donor area on its dorsum. The incisions across the alar arches necessary to slide the dorsal skin over the tip and into the columella give a rolled effect, with the tip and column overly rounded.

Then, in 1973 at the International Cleft Palate Congress in Copenhagen and in 1974 in the *Scandinavian Journal of Plastic and Reconstructive Surgery*, the conscientious René Malek of Hôpital Saint-Vincent de Paul, Paris, also advocated dorsal skin of the nose for the columella:

In bilateral cases, the nose is not deviant but its tip is enlarged and flattened. Shortness of the columella is the main deformity. This can be corrected . . . when the lip is cosmetically acceptable, a V-Y flap raised from the nasal dorsal skin is used . . . A complete rhinoplasty is usually necessary in a second time.
In 1977 at the Chicago meeting of the American Association of Plastic Surgeons, M. T. Edgerton and J. L. Marsh gave a 12-year follow-up on lengthening the "short nose" in bilateral clefts by sliding nasal mucosa and this same general external V-Y of dorsal skin. The procedure was done at the age of 11 years, long before the nose has its final growth in bridge height and nasal length. Such drastic surgery, if not avoided, should at least be postponed until 16 or 17 years to prevent irreversible scars until growth has a chance to render this action unnecessary.

**OTHER DORSAL SKIN MIGRATIONS**

The seemingly mild Milton Edgerton, with C. M. Lewis and L. O. McKnelly of Baltimore, noted in 1967, as had Morel-Fatio, that even after the short columella has been lengthened:

The released tip of the nose and nasal dorsum often remain wide and bulky.

They acknowledged that the excess dorsal nasal skin could be used as a free composite graft to the columella, but the amount would be limited to 7–8 mm. Therefore, they suggested two ways of flapping dorsal skin to the columella area:

1. "...Use of a 90-degree rotation of an island or 'stalk' flap from the nasal dorsum." Pedicled on branches of the anterior septal artery, the dorsal skin ellipse is passed through a tunnel at the tip which exits at a transverse releasing incision at the top join of the columella with the nasal tip. The "stalk" flap is let in transversely to lengthen the columella or longitudinally as an overlap for columella retraction. Of the seven "stalk" flaps that had been used up to the time of publication, they reported that "two of these showed necrosis of a significant portion of the flap."
2. "A retrograde pedicle at the superior end of the short nasal columnella may be left attached to a midline strip with lateral extensions of the nasal dorsum. This allows downward advancement of the flap into the columella area."

This "retrograde trifoil" procedure had been used five times and was found less "tricky" than the "stalk" flap but it left "slightly more scarring."

After discussing his 12 cases, Edgerton editorialized on his external dorsal nasal scars:

The senior author has now used this external dorsal incision in well over 100 cases. Most of these incisions heal with a fine line scar and are not a source of complaint. Approximately 25 percent of these incisions widen or are noticeable to the extent that dermabrasion of the scar is recommended 6 to 12 months after the initial surgery. No patients have found the scar so unsightly that they or their parents have stated that they wished the operation had not been done.

Edgerton, Lewis and McKnelly gave as one of their prime excuses for scarring the dorsum of the nose the small size of the prolabium, which rendered it unable to supply columella tissue. Yet in the cases they published, the prolabium was unnaturally wide and in actual need of an artistic reduction.

Most plastic surgeons, it is hoped, will not take the exposed route over the dorsum of the nose for transporting skin to the columella. There are times when it is tempting but rarely ever justified in my opinion. It produces a round nose, and after
rhinoplasty the scars remain as seen here. Some scars are excellent, but I have had to try to revise some that were impossible.

Edgerton himself described the bilateral cleft nose problem vividly:

The face has an appearance similar to that seen when a child's nose is pressed against a pane of glass.

All the more reason for any surgeon contemplating external nasal incisions to consider and reconsider carefully the chance that the nasal tip flatness will be replaced by nasal skin eventually looking as though the pane of glass had actually shattered under the pressure.

**ALAR RIM ADVANCEMENT**

Ray Brauer of Houston, with D. W. Foerster, almost started a Texas shoot-out with his partner Cronin when he reversed the "Cronin" shift by advancing the alar webs into the columella from above. At least this approach is sound in principle as it is taking tissue from where it is undesired and placing it where it is needed.

Brauer thinks of the nasal tip as having three components: (1) dorsal tip above, (2) columella below and (3) two alae, one on either side. Of course, in the bilateral cleft lip nose the dislocation of the alar cartilages presents webbed alar margins that widen the nasal tip and encroach upon the columella length. With a forked design, Brauer first makes his external incisions through skin. Thus he has access for dissection of the medial crus of the lower lateral cartilages out of the columella so that they can be sutured together up into the nasal tip. Then, without including cartilage in the alar flaps, he extends the incisions through the vestibular lining, creating two alar web flaps which are rotated away from the alar rims medially and down into the columella. The tail of each flap is incorporated within the alar margin in a V-Y closure to avoid notching. There is sound economy of tissue shifting in this maneuver, but special craftsmanship is required to blend the alae into the columella at the tip.
without pig’s-ears, notching, columella overhang and visible tip scar marks. Yet, as Brauer indicates, if the prolabium is small and tissue in the nasal floor sparse, the alae are another possible source for columella lengthening.

**ALAR RIM TRANSPOSITION**

In 1946 Claire Straith, of Detroit, adapted the Z-plasty, which by then was famous for its correction of axillary and extremity skin webs, to the congenital alar rim web of the unilateral and bilateral cleft lip nose. The double Z in the bilateral cases not only removed the excess curtain drooping over the upper nostril but gave an illusory lengthening of the short columella on its upper end and, in fact, did elongate it a bit. Although the principle of the zigzag broke the web line, its interdigitation in an area of the gentle curving flow of columella blending into alar arch was responsible for some unnatural abruptnesses.

In 1958 F. Wirth tried to smooth out this design when he transposed alar web flaps with columella side flaps in a similar Z-plasty after dividing the alar cartilages laterally and suturing the medial crura together at the tip.

**OTHER TRANSPOSITIONS**

The ingenious Onizuka of Japan capitalized on the width of the tip above the columella to produce double transposition flaps, which he takes from the lateral vertical axis and interdigitates in the sub-tip as a Z or shortens and brings together in a lying-down H. The effect is a narrowing and lengthening of the columella, but there is an increase in the sub-tip area from the height of the alar arch to the height of the tip. This may be
acceptable in the Oriental but is less so in the Caucasian. The
double transposition of medial alar rim into the sub-tip brings
with it rather “mod” external scars.

In 1974, Musgrave and Garrett of the University of Pittsburgh,
in reference to methods that take skin from the broad nasal tip,
stated:

We have had no experience with these methods. However, we are very
reluctant to add any further visible scarring to the nasal tip when there is
already abundant scarring in the adjacent lip.

In reference to external nasal scars, Herold Griffith of North­
western University, while a resident at Cornell, did a cleft lip
nasal correction using an accepted external scar approach. He
recalled:

The early post-operative result was excellent, but about two months later,
the patient came for presentation to our team at the Cleft Palate Conference
and I was startled to see the scar had contracted enough to cause distortion.
There was no way I could hide her in a closet so I had to present her in
our conference. Dr. Conway looked at her very critically and after the patient
had been ushered out of the room, he turned to me and said,

“She looks great, Hal, and I’ll bet she’d look even better if you had had
a sharp knife.”
AN incision at the base of the columella followed by a membranous septal incision can release the nasal tip along the septum. The resulting gap in the lower portion of the columella has been filled with various composite auricular grafts.

König in 1914, Davis in 1919, Limberg in 1923 and Joseph in 1931 all described composite auricular grafts to the nose, but König must be knighted with priority. Gillies advocated the chondrocutaneous ear graft for nasal reconstruction in 1943. Yet it was Barrett Brown with Cannon in 1946, and the entire St. Louis contingent thereafter, who popularized this method.

Robert Meade of New Orleans has given the most elaborate description of the use of the composite auricular skin and cartilage graft for the columella. Possibly overreacting to the super droop of all that Spanish moss in the Cajun bayou, Meade slipped extra cartilage spines behind his grafts.

As illustrated by the fabulous drawings of E. M. Freret in *Plastic and Reconstructive Surgery*, February 1959, the columella was released and a composite wedge graft from the ear was cut to fill the columella defect. Several extra cartilage struts were inserted behind to add contour and support. My only concern would be the possible interruption of the incoming vascularity by these struts, to the utter dismay of the struggling graft.
Meade philosophized:

Smith, Slaughter and Brodie and Schultz among many others insist that the prolabium is a natural part of the upper lip and should be included in the lip in any plan of repair of bilateral clefts. . . . With use of a composite, auricular graft for construction of the columella, the prolabium can be left in its normal position. . . . Sufficient time has not elapsed since the inauguration of this procedure to estimate adequately growth factors as related to the nose and the grafts. . . . Peer reports observation on the growth of young, human cartilage autografts of ears, septal and rib cartilage. He noted that these grafts retain their characteristic structure, and that there was evidence of growth in the ear and septal cartilages.

**FREE SKIN AND FAT GRAFT**

Zino, in 1943, seems to have been the first to advocate the use of the composite graft of skin and fat from the lobe of the ear to lengthen a short columella.

Meticulous Samuel Milton Dupertuis, of the University of Pittsburgh, who had early training in Paris with Professor René Leriche and later with J. P. Webster at Presbyterian Hospital in New York, in 1946 reported his experience with free composite grafts of the ear lobe to the columella. As a reflection of the frustration experienced in bilateral cleft surgery, Dupertuis once wrote in a letter to Webster:

One sometimes suffers from being a perfectionist, but in most instances it seems manifestly worthwhile.
In Webster’s memoriam to Dupertuis, the story of his ear lobe grafts is complete:

His fairness and integrity are illustrated by his readiness to give credit to others when it was due. For instance, in publishing a series of cases showing excellent results from free grafting of skin and fat as composite grafts from the ear lobe, a method which he independently devised, he discovered that the procedure had previously been described in a little known report and gave that author credit for priority. He later had the courage and broad-mindedness to show cases in which this method had not been so successful as a warning to others of possible limitations in its use.

Influenced by Dupertuis, Musgrave and later Lehman described interesting results with this approach.

Then, in 1974, Musgrave and Garrett published a 14-year follow-up of a composite ear lobe graft which demonstrated a definite lengthening of the columella but a stuck-on unnaturalness without the graceful sweep of the columella into the nasal tip or the lip.

A COMPARISON

In 1949 Donald Pelliciari of Columbus, Ohio, compared the two types of composite auricular grafts. At this time he seemed to favor the lipocutaneous lobe graft over the chondrocutaneous helix graft:

The lobe is especially handy as a donor area since it can be repaired immediately after taking the graft, needs little aftercare and leaves no noticeable scar. It is also a perfect match for color and texture.
The helix graft, however, has several disadvantages:
1. Must be no wider than 1 cm.
2. Requires two stages to repair the donor site.
3. May take on a darker pigmentation.
4. Care must be taken not to separate skin from cartilage.

Yet he acknowledged that the presence of cartilage led to rigidity, producing a columella without creases. This to me is the crux of the choice, for a lobe graft tends to be pudgy like a marshmallow and a chondrocutaneous graft is like the columella it is constructing.

It seems that using the ear for the columella in bilateral clefts, although easier for a compromise result, can be considered somewhat of a desperation move. Nevertheless, fine surgeons find it tempting. In 1973 Broadbent, discarding much prolabium while using rotation-advancement incisions in the Manchester primary bilateral cleft closure, often ended up with a flat nose and short columella. When challenged what he does about this shortage, he admitted using free grafts from the ear. Knowing Broadbent, one could wager he gets quite good results. Then, in 1974 with Woolf, he wrote again about ear grafts:

A composite free graft from the ear may be used to elevate the tip and also avoids operating on the lip.

In the cases presented in 1977, their ear grafts had an unnaturalness. In principle there must be a better way.

Recently, I have had occasion to treat secondarily a bilateral lip cleft which had had transection of the columella at its base and the insertion of an unsuccessful composite auricular graft. This failure compromised my execution of a forked flap and forced use of a less satisfactory method. The case appears in Chapter 39.

**ALAR BASE GRAFT**

In 1954 Max Pegram of Wilshire Boulevard, Los Angeles, California, described use of composite alar base wedge excisions for staged free grafting of a congenitally short columella. At that time he stated:
The use of the ala composite graft for lengthening of the short columella of the bilateral cleft lip is under study at the present time.

Such action has commendable economy if indeed the alar bases can afford it. Few bilateral cleft lip cases could spare enough to lengthen the columella sufficiently to lift and maintain this elevation. As no further publications appeared from Pegram, I wrote him for an up-to-date report.

This is his answer on June 11, 1974:

I have been very derelict in not publishing a follow-up article on ala grafts to elevate the columella and unfortunately all of my photographs were lost.

It is the only procedure I have ever used to elevate a columella and have used the procedure approximately 25–30 times. The grafts measure 5 mm. along the free edge and they have all survived. On several occasions about six months after the first ala graft, I have taken a second graft from the opposite ala and grafted it in the columella for further elevation. They too have all survived. Trophic changes have been minimal, if at all.

I like the procedure because of its simplicity and the columella looks quite normal.
45. Cartilage Grafts

THE FINISHING TOUCH OF CARTILAGE

Because of the original super flatness of the nasal tip in the bilateral cleft deformity with the absence of septal development, the open angle of the alar cartilages and their actual separation from each other, even when the alar cartilages are brought together, the tip is released and the columella is lengthened, there tends to be a lack of definition in tip projection. Then, too, the columella may not present a smooth convex column from lip to tip. Both of these discrepancies are best alleviated by a straight, slim, stiff strut of autogenous cartilage.

In 1932 Gillies and Kilner, noting the lack of septal development in the bilateral cleft lip nose, advocated a supporting graft of autogenous costal cartilage. Others, before and after that time, followed a similar plan.

As plastic surgery became more sophisticated, the soundness of autogenous grafting was forgotten, and more expedient methods were developed. Barrett Brown became infatuated with fresh and preserved homologous cartilage in 1940. In 1948, with DeMere, he wrote an instructive and persuasive paper on the preservation of cadaver costal cartilage in aqueous Merthiolate. The dynamic Brown was at the height of his power, and most surgeons followed him like sheep into a pen. Hundreds upon hundreds of preserved L and other-shaped costal cartilage grafts were inserted. Lamont, Straith and others published reports of their use of preserved human rib cartilage in the bilateral cleft lip nose. As utilizing human cadaver cartilage was unlawful in England, Gillies became one of several to simplify the process by using preserved ox cartilage, and, not to be outdone, McIndoe began using preserved whale cartilage. Having climbed on the preserved cartilage bandwagon myself and after many hours in autopsy
rooms, I went off to Korea with the marines carrying a bottle of peeled ribs jiggling about in 1:1,000 aqueous Merthiolate. As with many others, it took me about 10 years to realize that this preserved cartilage was gradually absorbed in too great a percentage of cases. It was also noted that smaller, thinner grafts seemed to be easier prey to the phagocytes, being absorbed quicker and more completely. As a columella strut must be slim to be aesthetic, its ultimate chances were nil.

In 1961 Dingman and Grabb advocated preservation of cadaver cartilage by radiation, and to this day Dingman reports little problem with absorption.

Whether suspicious of or disenchanted with the preserved cartilage trend he had started, and always searching for something better, Barrett Brown reported an interest in silicone with Fryer, Randall and Lu in 1953 and again with Fryer and Ohlwiler in 1960. Of course, the general value of silicone is now well established, but its use in the columella can be dangerous, as I wrote in 1966:

And foreign bodies are hazardous when implanted as superficially as the columella or when called upon to produce enough thrust to lift the tip.

**RETREAT TO THE EAR**

Some surgeons turned to the less supportive autogenous auricular cartilage and devised ways of using it effectively. In 1964 Cronin, for Converse, described taking a long narrow ellipse of auricular conchal cartilage, slicing it into two slim strips, suturing them back to back, except at the upper end, and then inserting this bifid support into the tip above the medial alar crura.

A spoon-shaped piece of auricular conchal hollow cartilage is removed through an anterior or posterior incision. The cupped end is split so that the cartilage curls out like a pair of gull wings. The remaining shaft is scored down its mid-vertical length, folded back on itself for reinforcement of the stem and fixed with sutures.

The gull-wing graft is introduced through a mid-columella incision which "heals to near invisibility," but Gorney and Falces warn:

Do not bring the incision onto the tip proper, especially in dark individuals.

Of course, many have continued with autogenous rib cartilage struts, but most surgeons consider this adjunct more or less optional. Victor Spina has not been so tolerant on the subject, proclaiming a costal cartilage strut absolutely essential in the bilateral cleft lip nose.

In 1974 Musgrave and Garrett stated, with respect to their columella lengthening:
A strut of preserved rib cartilage is almost always incorporated in the small child although occasionally we have used the tail of the helix as an autogenous cartilage graft. This inverted obelisk-like graft is anchored to the deficient distal septum with two transverse mattress sutures of 5-0 white silk.

In 1964 I proposed septal cartilage struts for this purpose and still feel that, when available, this is the best method by far. In the symmetrical bilateral cleft secondary deformity there should not be much deviation of the septum, and unless some overenthusiastic otolaryngologist has gotten ahead of us, cartilage for grafting should be ample. Long, slim, straight, stiff struts of septal cartilage, resting on the nasal spine and running up through the columella, will give lift and definition to the tip. It is important not to make the strut so long that the tip skin blanches over its end at rest, or even with smiling. The septal cartilage is stiff enough to be effective and slim enough to allow the insertion of two pieces for extra and symmetrical tip lift and still maintains a sleek column.

In 1967 Paul Tessier of Paris suggested splitting the tip of the septal cartilage strut so that it curled over on each side, not unlike a fleur-de-lis, presenting quite a natural and benign tip for nasal support.

Otto Neuner of Berne proposed the nasal hump, when there is one, as a good tip support in cleft lip cases.

In 1972 J. Pollet of Paris was reported by Stephenson for the 1974 *Year Book of Plastic and Reconstructive Surgery* also to advocate use of the nasal hump:

The nasal hump removed as a block and thinned can constitute an osteocartilaginous graft whose bony portion is osteosynthesized to the nasal spine and the portion corresponding to the triangular cartilage is sutured to the septal portion. If the hump is too short, a wider piece including the lower septal edge attached to the hump can be removed. The nasal hump with its septal expansion constitutes a large graft whose anatomy is similar to that of the alae with the dome and the lateral crus.

Editor Kathryn L. Stephenson’s personal comment noted that Pollet gives Tessier credit for the trifoil-type support and compared this with the auricular gull wing of Gorney.
The septal cartilage has the advantage of giving a bit more rigidity and would possibly be more useful for the secondary repair of cleft lip nasal deformity, where the tissues are scarred and heavy.

No one seems concerned that when the hump is short so much additional septum will have to be removed from the bridge that there is a good chance both tip and bridge may then need support!

In 1974 Oneal, Greer and Nobel, of the University of Michigan, suggested temporary and permanent cartilaginous support immediately after the banked forks have been shifted into the columella for nasal tip release:

We attempt to place the prominences of the "banked" flaps at the base of the columella. . . . This should rotate the medial crura upward and raise the tip of the nose. We have noted some tendency of the tip of the nose to settle with healing. [This may be similar to the mechanism Anderson has discussed for the "pollybeak" deformity following rhinoplasty due to lack of medial crural thrust and downward pull of the healing scar tissue in the transfixation incisions.] This observation has prompted us to insert a columellar strut of septal cartilage between the feet of the medial crura and the premaxilla in older children. In young children, we use irradiated costal cartilage. Even if this cartilage absorbs, it may function initially as support until the active scar tissue phase is passed.

I think this last point is an interesting thought, but I suggest homologous septal cartilage banked in antibiotic solution may be a better early temporary tip support.

**BOWIE KNIFE STRUT**

David G. Dibbell of the University of Wisconsin in 1976 advocated support of the cleft lip nose with a costal cartilage strut shaped like a Bowie knife with the butt of the handle resting on the nasal spine and the scooped tip allowing nasal tip definition. He reported using it in conjunction with a forked flap in secondary bilateral cleft lip nasal corrections. He obtained cover of this graft with forward advancement of the septal mucosa on each side of the septal cartilage to be sutured to the forked flap. As a testimonial to both the forked flap, which Dibbell graphi-
cally referred to as the "elephant's trunk" approach, and his special costal strut, he presented two bilateral cleft cases with impressive secondary nasal corrections.

It should be noted that if this Bowie knife-shaped strut is desired, it often can be cut quite well from septal cartilage. In fact, I cut a Bowie knife-shaped strut out of septal cartilage for a retracted columella the day after I read Dibbell's description. The case appears in Chapter 17.

**STRUTTING COMPOSITE EAR GRAFTS**

Composite auricular chondrocutaneous grafts to the columella, of course, carry their own thin built-in cartilaginous support. As already noted, Robert Meade adds an extra auricular cartilage strut in back of his composite ear graft at the same time to bolster further this portion of the new columella. Certainly ear lobe grafts warrant a cartilage strut at the time of grafting or as a secondary procedure to give a "little spine to the marshmallow."

**PLASTICS**

Although there are exceptions to all rules, in general it is my feeling that the silicones and other synthetic foreign bodies should be avoided when possible in the support of the cleft lip nose. They are the "easy way," and undoubtedly one will sneak by occasionally. Yet when they are inserted into scarred tissue in superficial positions where there are demands for adequate thrust and long-term active support, the chances of a happy ending are by no means constant. As Kilner once said,

They are the Royal Road to contour,

but he promptly dismissed them without reservation.
46. A Note on Vestibular Lining Shortage

As in the unilateral cleft deformity, only in double proportion, there is a bilateral shortness of the vestibular lining. This discrepancy is partially hidden within the nostril and has, more often than not, been ignored. In the original deformity the alae, attached medially to the short columella on the projecting premaxilla, arch the clefts with their alar bases flared and dragged backward by their attachments to the retroposed maxillae. The bilateral shortness of the vestibular lining is seen and felt along the intercartilaginous line from the nasal tip to the alar base, and unless this has been relieved, the problem still exists in the secondary deformity.

When the shortness is unilateral, it is more obvious and has stimulated various designs to correct it. Berkeley advocated a primary Z-plasty of the vestibular lining with his horizontal limb along the intercartilaginous line. Uchida used a double Z, Potter incorporated the V-Y principle and Rees added a free skin graft.

In the bilateral cleft, the vestibular shortness may be missed, hidden in its symmetry or overshadowed by columella shortness and alar base flaring, but it still exists. Few have directed much attention to it primarily. Yet, for the posteriorly displaced and flared alar base to move forward and inward during the primary surgery, it is necessary to free it. Most surgeons, I believe, divide the lateral attachments of the vestibular lining to the maxilla, and, as the defect is out of sight, it is soon out of mind but never quite out of the squeezing reach of the fibroblasts. So what may seem to be adequate release will eventually be contracted with
scar pulling the alar bases back and holding the nose in restraint.

I admit to this "sweeping the defect under the rug." Finally, after years of guiltily casting a last side glance into the vestibular raw area just after the alar base release but before lip closure, I decided to maneuver the pared vermilion from the cleft edge of each lateral lip element to line the release and to put an end to the contractures. This bilateral vermilion flap I transposition has been used for years and is described in minute detail in the primary procedure. If this flap or another that increases lining length has not been carried out primarily, the vestibular shortage is still present in some degree and will require secondary attention. As the cleft edge has long ago been shorn of its vermilion, flap I is only a memory and it is now necessary to look toward Z's, V-Y's or free grafts. Potter had the foresight to combine the V-Y with the columella lengthening, and Neuner followed his example.

It is worthy of note that the lateral extensions on the Gensoul flap as designed by Blair and later Brown and McDowell, as well as similar extensions on the forked flap as suggested by Peskova and Fara, Limberg and later Pfeifer, do fit into bilateral releases of the vestibule at the tip. Thus in a minor way at least a little extra tissue is added across this tight line.
47. **Columella Retraction**

In bilateral cleft deformities the columella may vary in shortness from near normal to near absence. It also may be retracted, but this condition is not so common and is usually a secondary sequela with columella lengthening. If the retraction is minor to moderate in degree, it may be improved by a columella strut of septal cartilage to increase anterior projection. It may be corrected by a composite auricular graft inserted into a membranous septal releasing incision.

Muir and Bodenham, for Gibson’s *Modern Trends in Plastic Surgery* in 1966, advocated this ear graft for the mildly retracted columella:

A simple and effective method used by the authors utilizes a double-sided elliptical graft of ear lobule let into a horizontal incision parallel to and just above the columella, and below the septal cartilage. The graft is totally surrounded by vascular tissue, takes well and is hidden from view.

This is but one of many examples of direct simplicity in corrective design as advocated by gracious, perceptive Denis Bodenham of Bristol, England, site of the launching of the *Hispaniola* in Robert Louis Stevenson’s *Treasure Island*. An international expert in melanoma and a clear thinker in all of plastic surgery, Bodenham reflected upon the effects of our efforts to camouflage cleft anomalies:

By constantly raising the standards of our treatment of congenital deformities we are enhancing their matrimonial prospects and ensuring for our successors a steady flow of new cases to treat.
Retraction Plus
Nasal Tip Shortness

If there is shortness of the nose associated with retraction of the columella, the membranous septal incision is extended laterally on each side in an anterior vestibular or intercartilaginous incision. This allows the entire front of the retracted nose to come forward, leaving an ominous gap. Reed Dingman of the University of Michigan has courageously designed a composite ear graft which he peels and slices like a “banana split” to fit perfectly into the defect, supplying both lining and support along three axes. Not many surgeons have enough of the daredevil in them to gamble such a large and complex composite graft inside a scarred nose. When successful, however, it promises to be a fine trophy.

The same adventuresome spirit has lured Dingman off to big game country many times. Once on the plains of Uganda, East Africa, Dingman with a Remington 7 mm., a black scout and a white hunter had climbed into an open-backed twig and brush blind about 75 yards from a baited tree. Through a small hole in the front of the blind he could watch a branch cleared of leaves and lashed with the hindquarter of a zebra. There they waited in the hot, steamy afternoon with the flies buzzing. Dingman had just begun to doze when there was the slightest snap of a twig. The white hunter tapped him and pointed over his shoulder with his thumb in a hitchhiking motion, doubly indicative. Dingman half turned his head toward the open back of the blind to face, not 15 yards away, a large lioness, the killer of the breed, crouched ready to spring. The next few seconds were somewhat exciting, but fortunately for plastic surgery Dingman’s aim was accurate and it is the lioness’ skin graft that adorns the Dingman den!
I have always had a little less love for free grafts than flaps—not that both do not offer their own hazards. Yet here is a case in which there just was no immediate local tissue for flaps, and so the composite ear graft was about the only way out. This secondary deformity actually occurred in a unilateral cleft case but it demonstrated a problem more often encountered in bilateral clefts. Through a membranous septal incision extending laterally as anterior vestibular incisions, the contracted tip and retracted columella were released. Into the three-dimensional gap was inserted a composite chondrocutaneous auricular free graft. In this case, the “banana split” was peeled with only skin for the non-cleft side and skin with cartilage for the cleft side, maintaining an intact main stem of skin, cartilage and skin to fill the releasing space between the septum and the columella.
As a final nasal refinement in symmetry, a strip of alar cartilage from the non-cleft side was used as a second-stage onlay graft for the cleft side.

**M O D E R A T E T O S E V E R E C O L U M E L L A R E T R A C T I O N**

Here again the Dingman composite graft can be of value, but for those fearful of large composite grafts’ “taking” inside the nose, other methods are available.

*Turning the fork*

Otto Neuner of Berne has modified the forked flap for correction of the retracted columella. Two vertical flaps, incorporating the bilateral scars and based on the alar bases, are transposed 180 degrees and let into a membranous sepal releasing incision. This maneuver will certainly correct columella retraction, and if the columella is long enough in the first place, there is no reason the forks cannot be used to correct a secondary deformity with a secondary priority.

*Transverse lip flaps*

When columella retraction is not accompanied by shortness, as after a forked flap, and at the same time the lip suffers vertical length, lip flaps described in 1954 by Richard E. Straith, M. G. Von Linde and J. L. Teasley, of Detroit, or a modification of this principle, can be of value. Straith ingeniously took bilateral flaps from the lip in front of the columella and transposed them into a membranous septal releasing incision, allowing shortening of the central portion of the lip.

A modification that has been used in Miami designs two lateral transverse full-thickness flaps taken high in the lip at its junction with the nose based medially. They also can be transposed into a membranous septal releasing incision, resulting in correction of columella retraction and shortening of the long lip.
In 1974 Randall and Lynch, after experience with primary columella lengthening with the forked flap, noted the problem of retraction:

Some of these columellas have lacked bulk so that the contour in profile has shown a retruded or "keyhole" type deformity. This defect would appear to be easily corrected by inserting a cartilaginous strip behind the columella or inserting a composite graft in the newly constructed membranous septum at a later date.

In their attempt to maintain the extended V wedge of the columella-lip angle on the prolabium, they are forced to take more tissue from the upper columella than probably can be spared from this relatively narrow element. This maneuver may account for their columella deficiency and retraction, which incidentally can occur occasionally even without this extra sacrifice.

**Bilateral alar chondromucosal flaps**

My favorite approach to the correction of the retracted columella, when its length is adequate and the lip is satisfactory, is achieved with flaps inside the nose. It was first described in 1963 and again in 1969 and 1972. It involves the use of alar chondromucosal flaps, and although it can be used in the snub nose associated with columella retraction, its more classic application is in a long or bulbous-tipped nose with overhanging sidewalls and a marked retraction of the columella.

In certain secondary bilateral cleft lip noses that have had their columellae lengthened, there sometimes results a retraction which can be quite deforming.

First, a generous membranous septal incision is made to release completely the retracted columella. Then two standard chondro-
Mucosal flaps are cut long and narrow (3.0 × 0.5 cm.), composed of lateral vestibular lining carrying a corresponding strip of alar cartilage. These flaps are based superiorly and anteriorly high up under the tip just above the front point of the septum. They are created by extending the membranous septal incision bilaterally out along the intercartilaginous line and then turning forward and cutting back toward the tip in cartilage-splitting anterior vestibular incisions. Their vascular dependability is remarkable considering the hazardous width-to-length ratio but probably can be explained by the cartilage backing of the flap, which acts as a splint preventing collapse or kinking of the vessels. Based under the tip, these flaps are free to move forward with advancement of the tip and columella following the membranous septal release. Each flap makes half a turn as it swings down into the membranous septal gap to join its mate from the opposite side. With cartilage touching cartilage and mucosa turned out, the flaps are sutured together between columella and septum. The cartilage in the flaps mimics the medial alar crura and maintains the forward projection of the columella. These flaps are usually available even after a conservative rhinoplasty. Taking them from the lateral vestibule offers several welcome assets such as the lifting of overhanging sidewalls and the reduction of a bulbous nasal tip.

A classic example using the procedure just diagramed is seen in this bilateral cleft lip and palate case from Bombay, first treated in India and then by Gillies in London. When seen in Miami at age 26 years, the patient had a short, tight upper lip with a slightly protuberant lower lip, a humped nose with a hooked tip and a retracted columella. Remarkably enough, the columella had been lengthened adequately.
Cleft lip rhinoplasty included hump reduction, septal shortening and bilateral osteotomy. Bilateral alar chondromucosal flaps based anteroinferiorly were swung into a membranous septal releasing incision achieving five things: (1) The long sidewalls were elevated. (2) The retraction of the columella was corrected. (3) The nasal tip was elevated. (4) The alar cartilages were reduced. (5) The airways were improved. The upper lip was divided in the middle and a midline shield-shaped 2.0 × 1.5 cm Abbe flap inserted. The pedicle was divided after 10 days.
Six months later, double-breasted-vest-type scar revisions were used on the lip, but the final result was never recorded as the patient returned to India.

COLUMELLA RETRACTION
WITH ALAR ASYMMETRY

Here is an asymmetrical bilateral cleft which, after 33 years and numerous operations, presented a tight upper lip and an odd nasal distortion. The retracted columella was the key to the correction. Bilateral chondromucosal flaps from the lateral sidewalls were used to symmetrize the alae and release the columella. Then an S.M.R. (submucous resection) produced a septal cartilage strut which was inserted into the columella for skeletal support. The tight upper lip was divided in the center and a midline shield-shaped 2 cm. Abbe flap transposed into the defect with its tip inserted into the columella base. The pedicle was divided after 12 days.

COLUMELLA BASE RETRACTION

There is columella base retraction which is unattractive and eye-catching but quite common following certain columella lengthening procedures. The major portion of the columella is prominent enough in profile or, more often, it actually bulges with greater than ideal prominence to present the appearance of a hanging columella. Then, at its base join with the lip it fades
away in retraction forming an acute nasolabial angle, often referred to as a reentrant angle.

This secondary deformity is rather likely to follow the use of the entire prolabium for lengthening the columella. The natural column shape of the original short columella is difficult to duplicate with the thick, flat prolabium attached to it, even after thinning and rolling it into a column. Moreover, the end of the prolabium flap may not be quite long enough so that it flattens out at the base of the columella where it is forced to tuck in at an acute angle as it joins the lip with an encircling scar. Of course, the superior bulge accentuates the inferior tuck!

When there is enough prolabium to lengthen the columella adequately and still split its end to splay into the nostril sills or even to tailor it into a point to extend several millimeters back into the center of the upper portion of the lip, the deformity may be avoided.

If this little deformity does occur, the principle of a solution is the same as that in most problems, large or small, of plastic surgery. With the ideal in mind, determine what is missing, search for what you have but do not need that can be used to make what you do need and then execute the shift.

Determine the amount that the columella bulge requires for ideal reduction. Mark this as a lozenge-ellipse and circumscribe the area with an incision maintaining an inferior subcutaneous pedicle base with parallel incisions; use a back-cut in the pedicle for extra release if necessary. From the lower end of the lozenge-ellipse incision extend a midline releasing incision vertically down through the retracted columella zone, the encircling scar and a short way (mm.) into the actual lip. Then advance the lozenge-ellipse out of the columella hill across the gully to round out the nasolabial angle with one clean sweep.
This patient was first operated on in infancy by a pioneer plastic surgeon in Miami. After several operations by other surgeons, the result presented a prolabium half in the lip and half in the nose with grief to both, a tight lip and a depressed nasal tip.

The remaining prolabium was thinned, rolled and advanced into the columella with release of the nasal tip, and an Abbe flap immediately followed in its wake.
After one attempt at defatting of the columella 10 years later, the deformity of base retraction under a columella bulge still persisted. The lozenge-ellipse from the bulge was advanced on a subcutaneous pedicle across the scarred nasolabial angle with reduction above and filling out below.

When first seen at 18 years of age this girl had already had a prolabium advancement into the columella and an Abbe flap but she still had a flattened nasal tip. Transfer of more tissue into the tip left the base of the columella retracted. The retraction was corrected in turn with the lozenge-ellipse advancement across the reentrant nasolabial angle.
The cleft lip nose is renowned for its stubborn resistance to correction. Musgrave and Garrett in 1972 expressed the surgeon’s frustration eloquently:

As have many of our colleagues, we have whittled, pared, maneuvered, coaxed, and even lashed together these ponderous alar cartilages with what looked to be a fair result on the operating table, only to be most disappointed with the end results months and years later. The patients’ families are frequently pleased with our gamesmanship, but we usually are not, and neither are the young adults whose misfortune it was to have been thus affected.

It is indeed extremely difficult to transform a flat and flared nose into a graceful, natural one but it can be done.

The secondary bilateral cleft lip nose usually presents a reasonable symmetry. There is, of course, the inherent central shortness of the entire frontonasal component as reflected in the flatness of the nasal tip, acute angle of the alar cartilages at the tip and their separation and downward dislocation, shortness of the columella, shortness of the vestibular lining with contracture folds, webbing overhang of the medial alar rims, width and flatness of the nasal floors, flaring of the alar bases and retroposition of the maxillary platform under the alar bases. Any or all of these can appear and must be dealt with to the degree of their need.
TIP FLATNESS AND COLUMELLA SHORTNESS

For nasal tip release and columella lengthening I most commonly use three methods.

1. In general, if the lip is not tight in its upper portion, the F.F. forked flap is first choice.

2. If the lip is already slightly tight and the lower lip is relatively protuberant, the total probrium is shifted with an Abbe flap to follow. When the probrium constitutes the full length of the central lip segment, it is shifted as a single unit into the T.P. columella and an Abbe flap is transposed to fill its place.

When the probrium has an inferior spear shape with lateral lip flaps joining tip to tip beneath it, the probrium is shifted into the columella similarly, but its point is split to accept the tip of the Abbe flap.
When the prolabium constitutes the upper half of the central lip segment with lateral lip flaps beneath it, the entire central segment can be cut as a unit out of the lip and shifted into the columella and an Abbe flap switched to fill the philtrum defect.

3. If the upper lip is natural and in good relationship with the lower and the columella is not severely short, advancement of the nasal floors and alar bases is a possibility. N.F. and A.B.

COLUMELLA RETRACTION

This deformity occurs in bilateral clefts and should be treated according to its severity.

1. Septal cartilage strut graft. S.C.S.
2. Composite ear lobule graft. E.L.
3. Banana split chondrocutaneous auricular free graft. B.S.
4. Lip skin flap transpositions. L.F.
5. Lateral alar chondromucosal flaps. C.M.F.
6. When associated with a flat nose, costal osteochondral hinge graft. C.O.C.H.

REDUCTION RHINOPLASTY

Both the forked flap and the prolabium flap require a membranous septal incision which can be extended laterally as anterior
vestibular incisions, bringing about exposure for reduction rhinoplasty. At this time alar cartilages can be reduced, hump lowered, septum shortened and nasal bones narrowed by osteotomy.

A.C.S. If the alar cartilages are severely separated, they can be sutured to each other during the reduction rhinoplasty.

**SUBMUCOUS RESECTION**

S.M.R. There may be a septal deviation, explained by the accordion principle. Early closure of the lip over the projecting premaxilla produces pressure with varying degrees of telescoping as reflected in the septum by its deviating curves. Yet in the bilateral cleft a submucous resection, although occasionally relieving obstruction, more often produces fine cartilage for struts valuable for columella and nasal tip support.

S.C.S. A septal cartilage strut is inserted in the columella to obtain column contour and retain elevation of nasal tip after a forked flap or prolabium advancement and also to give that little extra tip definition of which the septum of the bilateral cleft lip nose is incapable.

S.C.S.1 One straight strut.

S.C.S.2 Two straight struts.

S.C.S.3 Fleur-de-lis split-end strut.
Alar margin strut.  

When septal cartilage is unavailable, then cartilage struts from the nasal bridge, rib, or concha can be used.

**SHORTNESS OF VESTIBULAR LINING**

If the mucosal paring flaps from the lateral lip elements during the primary lip closure have not been introduced across the vestibular lining shortness with release, evidence of this shortness will become apparent secondarily as vestibular folds. They can be lengthened by a V-Y or a Z-plasty or skin can be free-grafted.

**FLARING ALAR BASES**

It is important to cut the alar bases free from the lateral lip elements so they can advance medially even more than the lip elements. The best method of correcting the alar base in a simple flare with a normal nasal floor width is an alar base wedge resection.

When the flare is severe and nasal floors are wide, flaps of this area are denuded at the tips, advanced to each other and sutured with Vicryl to the septum at the nasal spine.

When the flare is not wide, the alar bases are taken as thick flaps, and each is dissected into a skin flap and a subcutaneous...
flap. The subcutaneous flaps are sutured to each other at the nasal spine, and the skin flaps form the nostril sills.

When the alar bases are flared and are also thick, subcutaneous pedicles are cut out of their "hearts" and left attached at the tip to be used as "tethering strings" to be sutured to each other at the base of the septum. Closure of the donor areas, of course, narrows the alar bases.

**ALAR BASE WIDENING**

V-Y lateral advancement of the alar bases can open a constricted airway and when carried out unilaterally can symmetrize the nostrils.

**ALAR RIM**

Bilateral webs overhanging the alar rims can be treated according to the severity of the deformity.
1. Marginal excision.
2. Alar margin rim flap turned to the side of the columella (Z).
3. Alar margin rim flap turned into vestibule. Either of these can round out a sharp columella-ala angle.
4. Alar margin folding up of cartilage and tucking in of lining.

RETROPOSED MAXILLA

When the maxillae do not supply enough anterior projection for an adequate platform to the alar bases, additional contour is necessary. If maxillary osteotomy is not indicated, implants are used. Through upper labial sulcus incisions the retroposed alar bases are dissected free of the hypoplastic maxilla. Then cancellous bone chips and strips from ilium or rib are implanted as onlays beneath the periosteum to maintain the forward positioning of the alar bases.

In certain cases Silastic sponge has been inserted under the alar base on top of the periosteum for the same purpose.
49. The Lip-Switch Flap Principle

B E F O R E dealing specifically with cases involving a combination of a short columella and a short or long and tight upper lip, I believe it is well to review their constant savior and righter of wrongs, SUPER flap, also known in the specialty as lip-switch or Abbe flap.

The lip-switch principle has been called upon often in secondary cleft lip surgery. It has already appeared in Volume I and in primary bilateral cleft surgery and now reappears in the bilateral cleft secondary surgery, but it first deserves a general basic introduction. Let it be understood that, had the primary surgery been planned and executed correctly, a lip-switch flap would be most unlikely ever to be required. Unfortunately, this is not the case because tissue misappropriations, violations of principles, destruction of landmarks and retardation of growth have set up too many bilateral clefts in which tissue must be brought in from outside and used to remove scars, bring in muscle continuity, create a philtrum and even a bow, correct free border defects and, of course, relieve tension.

C A U S E A N D E F F E C T

In congenital clefts of the lip there are varying degrees of actual missing tissue in the first place. After parings, excisions and scarring have taken further tissue toll, the horizontal shortness may become acute. When primary and secondary maxillary platform retraction is added, the effect of the tissue lack is multiplied.
SIMILAR KIND OF TISSUE

Only the upper or lower lip has similar tissue in kind for the opposite lip. As a normal lip can usually spare as much as one-third its width, switching flaps from one to the other is a principle that has been found of great value through the years in secondary cleft deformities as well as other defects.

SABATTINI

In 1837 Pierre Sabattini of Imola, Italy, carried out what seems to be the first lip-switch flap. A patient had lost the center of his nose and lip by a saber cut. Sabattini used an Indian forehead flap for the nose and a full-thickness flap from the lower lip to fill the upper lip defect. Schuh, Crikelair and Cosman noted in the *British Journal of Plastic Surgery*, 1970, that he divided the pedicle at seven days, goaded by “the incessant prayers of the patient.”

STEIN

Poul Fogh-Andersen, a Dane, brought attention in 1948 to the hundredth anniversary of another Danish surgeon, Professor Sophus August Vilhelm Stein, of the Royal Fredericks Hospital in Copenhagen, who in 1848 published a “new method of cheiloplasty” in Danish, using the principle of replacing a defect in the lower lip by a transposition flap from the upper lip. Actually, his patient was a 48-year-old sailor with an extensive lower lip cancer which, after excision, presented a huge V defect. Stein used a double transposition-plasty from the upper lip with two vermilion bordered pedicles that divided the oral orifice into a medial cleft. The pedicles were divided after three weeks and the clefts closed.
N. C. Petersen has reported a hospital record of another of Stein's cases in which he transposed a single-pedicled flap of the philtrum of the upper lip to a gunshot deformity of the lower lip, dividing the pedicle after five weeks.

These procedures, having taken the entire philtrum, seem to have created a secondary deformity in the upper lip, similar to a postoperative congenital cleft, while treating a lower lip defect.

**BUCK**

It is interesting, as noted by Conway and Stark, that in 1862 Gurdon Buck at the New York Hospital was rotating full-thickness lower lip flaps on the coronary vessels to fill defects of the upper lip. His flap was similar in principle to a design used by Gillies during the two great wars and, as it rotates like a fan, became known as the fan flap.

**ESTLANDER**

The Finnish surgeon J. A. Estlander became professor of surgery and ophthalmic surgery at Emperor Alexander University, Helsinki, Finland, at the age of 28 and died in Italy and was buried there at the age of 35. During just seven years he became famous for a thoracoplasty procedure and a lip-switch flap. In 1865 he treated several lower lip deformities: The first was the result of a resection of an epithelioma; the next two followed typhus with gangrene. Estlander repaired these defects with flaps from the...
lateral portion of the upper lip utilizing the coronary artery at the angle of the mouth. As the blood-supplying pedicle consisted of the mucosa and vessels at the commissure, the permanent oral orifice was reshaped at once and the operation usually completed in one stage. Estlander published his method in Germany in 1872 and in France in 1877, and thus it entered the world literature and textbooks.

The present fine Finnish plastic surgeon Borgie Sundell is working in the hospital that Estlander planned.

NEUBER

From Aachen, Germany, Momma, Koberg and Mai noted that a German named Kreche in 1899 reported that another German, Neuber, had been using the lip-switch flap since 1891.

ABBE

Yet, as Abbe was the first actually to switch a lower lip flap into the upper lip for a cleft deformity, this flap will be referred to simply as Abbe in this book. Richard Stark, also of St. Luke's Hospital, New York, researched and later reported on the life and works of Abbe. A descendant of the French who escaped to England during the Huguenot persecution, Robert Abbe was born on Dutch Street in New York City, destined to become a brilliant American surgeon. He set up his practice at 32 East 20th Street and often drove his horse and carriage past Theodore
Roosevelt’s home, just down the street, on his way to the hospital.

Abbe first considered the lip-switch idea in 1895, and in 1898 he wrote a description of “A New Plastic Operation for the Relief of Deformity Due to Double Harelip” that was published in a weekly journal, *The Medical Record*:

A lad of twenty-one years recently presented himself for a conspicuous deformity of the lips, the sequel of an operation for double harelip in infancy, consisting in an extreme flatness and scantiness of the upper lip, with an enormous pouting and redundance of the lower one. . . . Their inequality was admirably corrected by transplanting the middle portion of the lower lip into the upper. . . . A median vertical incision was made in the upper lip, and the central scar portion excised so as to obtain edges of an excellent quality of skin. The gap thus created was about three-fourths of an inch in width. A flap taken from the central portion of the lower lip, a little wider than the upper gap, was then made, in such a way as to make a hinge upon one side containing the lower branch of the coronary artery on the left, which flap was turned upward so that its lower edge on the skin was placed beneath the columna nasi. The vermilion border was exactly stitched on one side, as shown and numerous very fine stitches were applied so as to secure apposition around three-fourths of the flap. . . . On the twelfth day, the flap having grown perfectly in its new position, its base was very carefully cut from the lower lip so as to leave an ample portion of the red middle lip. . . . The lower lip was then refreshed and sutured. The nutrition of this transplanted flap by its new capillary nourishment was so perfect that in color and texture, it seemed to have been always a part of the upper lip. . . . The two lips were afterward in about their normal proportion, and gave the patient perfect satisfaction.

This Abbe was a remarkable man, a pioneer in neurosurgery and in photography, the founder of radium therapy in America and an innovator in general as well as plastic surgery. He was as courageous in life as he was in surgery. Conscious of a growing tightness of his hat, he had his suspicions of Paget’s disease confirmed by X-ray examination and then, as an aplastic anemia took him down, revealed the true measure of his character in a letter to a friend:

So closely do I note every sign that I almost feel that I have never before done justice to any one. This makes me wish to start life again and to do better.
He died at age 77 and was buried in the chapel of St. Luke’s Hospital, where he had trained and later served so brilliantly.

KAZANJIAN

In 1947 Varaztad Kazanjian of Boston noted that secondary deformities in cleft lip and palate cases often are not apparent in infancy and young childhood but become quite marked in adulthood. He stated:

With the improvement in surgical technique the patient as well as the surgeon has become more critical of the final result.

He presented a series of 50 cases treated over an eight-year period which varied from tense, retracted upper lips to cases with loss of upper lip tissue, marked with ugly adherent scars and combined with retraction of the alveolar processes and loss of many teeth. He advised excision of the original scar to allow the lip elements to separate into a triangular defect. Into this defect he transposed a triangular flap of the desired size from the lower lip which he called the Estlander-Abbe operation. In unilateral cases the flap was placed in unilateral position and the pedicle divided after two weeks.

BLAIR

As early as 1925 Vilray P. Blair commented on the value of secondary cleft correction:

The results of operative repair of harelip vary from nearly perfect to plain bad; but unless the original operator has been more than ordinarily inconsiderate in his denudation and suturing, the tissues can usually, by secondary operation, be rearranged to produce an approximately happy result.

Twenty-five years and a horde of lip-switch flaps later, Blair prefaced a 1950 presentation with a typical V. P. B. twist:

The broad idea of switching a flap from one lip to the other is old and one or another pattern of it has been claimed and credited to many people, so much so that Dr. Jerome P. Webster started looking for the original publication. He found first a publication by S. A. C. Stein of Copenhagen reporting a case of lip-switching in 1848. Later in his research he found that
Pietro Sabattini of Bologna had done one in 1837. How these ancients steal our thoughts!

Through all those years Blair did a tremendous volume of secondary cases sent to him from all over midwest America. He was in such demand that he had two or even three tables going at one time. Swathed in gauze and comfortably outfitted in a pair of old white sneakers, he would sit and hum while he worked at one table, then move over to the next. His artist, Hance, recalls:

He had a terrible temper and in a rage would kick over a table but the next day send roses to the operating nurse.

His eccentric combination of artistry and kindness caused him to have the walls of his operating room at Barnes Hospital decorated in color with fanciful jungle scenes and such children’s bedtime stories as Little Red Riding Hood and the Three Bears. These were over the head of the infants, but children and adults coming up for secondary cleft work were particularly delighted.

In January 1950 Blair, with Gordon Letterman, published in *Plastic and Reconstructive Surgery* an impressive group of 22 secondary cleft deformities treated with a flap switched from the lower lip. Those that could be reproduced reasonably well have been included here. As the authors noted:

The majority of these cases had had more or less complicating attempts at correction before coming into our hands. . . . Some had had lip pits removed and most have an upper advancing denture to give the desired curves and to hold the upper lip forward in proper relation to the lower. . . . Most of the cases have a real protrusion of the lower lip due to the transverse shortening of the upper and the switch gives both needed fullness to the upper lip and better symmetry to the lower.
In his typical manner of using eye and hand for preliminary measuring, Blair suggested:

A tentative plan is to mark off on the mucocutaneous border of the lower lip the amount desired for transplant, and then to draw each of these marks in turn to a little beyond the midline. This procedure will give a fairly good idea of the amount available for the upper lip without too much distortion of the lower... The flap is taken from the center of the lower lip where the scar is less noticeable; however, if the upper defect is one-sided, the pedicle is retained on the opposite side.

The cases reported revealed a variety of flaps—some narrow, some wide, others short or long and most oblong but occasionally triangular in shape. They were inserted unilaterally in unilateral clefts and centrally or unilaterally in bilateral cases. Portions of the upper lip were shifted by oblong or trefoil flaps into the nose and columella prior to transposition of the lip-switch flap. The results were truly dramatic, particularly considering the secondary problems, but according to modern standards some might be considered unrefined or even rough-hewn.

**THE VALUE OF A NARROW PEDICLE**

It is well to emphasize that the pedicle required for the transport of these flaps need be little more than the coronary vessels themselves. The main inferior labial artery runs between the mucosa and the orbicularis oris muscle along the upper inner edge of the free border of the lower lip. Thus the flap can be cut loose well across the vermilion anteriorly and down to a frighteningly narrow base. The position of the vessels, varying slightly in each case as it does, only adds to the sport. For those who are
not gamblers, the exact position of the vessels can be spotted, of
course, during the complete severance of the lip while developing
one side of the flap. Once the base has been narrowed, it allows
almost complete inset of lower lip flap in the upper lip position
during the first operation.

Writing in 1952–1953 for publication in 1957, Gillies and
Millard described in laborious detail this specific aspect:

To cut the flap, first ease through the skin and muscle with a No. 10 scalpel,
pick up spurters, then divide the remaining mucous membrane with scissors.
At the tiny base of the flap the incision should be carried just through the
vermilion border in front, so that when the flap is rotated 180° it can be
sutured into position plumb vis-a-vis, requiring no important readjustments
on division of the pedicle.

In fact, it was Gillies’ feeling that, even if the coronary vessels
were divided, so vascular is labial mucosa that the flap would
survive on a mere mucosal hinge. This prized piece of lip tissue is
so valuable, however, that he never challenged his theory by
actual trial.

In 1953 Cannon and Murray in Boston emphasized the ad­
vantages of cutting through the anterior mucocutaneous junction
line on the pedicle side of the Abbe flap to form a thin posterior
pedicle and facilitate more accurate inset of their split-tail flap
with its tips in the nostril floors.

J.-L. Grignon of Paris described his way of reducing the size of
the pedicle for the Abbe flap in 1962. To less daring surgeons this
frightening encroachment on the pedicle by Grignon’s scalpel
might be considered another Grand Guignol theatrical but actually
it is both safe and sound.

In 1963 McGregor reemphasized the importance of cutting the
pedicle narrow by extending the incision through all skin so that
the flap is tethered only by mucosa and the inferior labial vessels
to facilitate accurate insertion of almost the entire flap.

A N O P P O S I N G V I E W

Although most surgeons agree with a narrow pedicle divided
evily, there are some who do not. Professor Karl Schuchardt, at
his 1964 Hamburg Congress, took an opposite stand with typical dictatorial eloquence:

If you use an Abbe-flap for whatever indication, it is advisable not to sever the pedicle too soon, as the longer you leave the triangle flap from the lower lip attached to the vermilion border, the better it stays and the less atrophy occurs (I leave it at least 4 weeks!).

The professor has always been impressive and convincing, but this seems nonsensical.

John Erich, one of the plastic pillars of the Mayo Clinic, also held to the old standard Abbe rules ignoring philtrum shape, central donor area, narrow pedicle, and early division when he wrote for Converse's book in 1964:

The proposed triangular flap on the lower lip should not be located in the center of lip but to one or the other side of the midline. . . . The incision on the pedicle side of the flap should fall 2 or 3 mm. short of the mucocutaneous border, ensuring that the inferior labial artery will not be severed during elevation of the flaps. . . . When healing is complete—a matter of three weeks—the pedicle is divided.

Conservatism outside of politics can hamper effectiveness.

**TOO WIDE OF THE MARK**

In 1974 Momma, Koberg and Mai of Dusseldorf and Aachen reported their experience with the Abbe flap in detail, presenting one pleasant case out of a series of 204. They noted the width of their Abbes at the vermilion border to be 8 to 30 mm., averaging 18 mm., which is a bit wide for a philtrum. The upper lip width after the Abbe flap of 49.3 mm. compared favorably with the 52 mm. of their normal controls. They found 74 percent satisfactory upper lip scars, with 44 percent of patients having complaints about vermilion border and 33 percent unhappy with the lower lip scar or the vermilion bulge. They concluded with the profound statement that the Abbe flap plasty should be used as seldom as possible, as often as necessary.

As seldom as possible, as often as necessary.

In what must have been a language misunderstanding, they made these incorrect statements:
Opinions as to the indications for Abbe operation are diverse in the literature. Whereas Antia and Honig (1964) recommend Abbe-plasty in all bilateral clefts of the lip and palate, Millard (1964), Schuh, Crikelair and Cosman (1970) and Perko (1973) more or less deny Abbe-plasty its right to existence.

These assertions are nonsense.

POSTOPERATIVE HANDLING OF AN ABBE FLAP

When the usual rhinoplastic procedures have been combined with columella lengthening and an Abbe flap, the postoperative course requires a little closer supervision. Nasal packs for 24 hours ensure adherence of the mucosal lining and prevention of hematoma. Yet they temporarily block the nasal airways, and with the lips attached, free breathing is hampered. Stiff rubber tubes inserted on either side of the Abbe pedicle and long enough to be held by the teeth will facilitate an airway until the patient regains his confidence. Then they can be discarded. A Logan bow is placed across the lower lip to reduce any tension, as this is the only lip that has been tightened. There is no need to wire the teeth or wrap the head to hold the jaw shut, because tenderness of the stretched pedicle is enough warning to the patient that the mouth is open too wide. Feeding during the flap attachment time is limited to fluids and any soft diet that can be sneaked through either side of the pedicle. The patient is allowed to go home as soon as he adjusts to the lip synechia—often as early as the first postoperative day. Skin sutures are removed at 3 to 4 days, and after 7 to 12 days the pedicle is divided.

A FUNCTIONAL FLAP

Not only is the lip-switch flap effectual in achieving an artistic lip reconstruction but also it is capable of regaining its function.

When writing the cleft lip and palate section of our *Principles and Art of Plastic Surgery*, Gillies and I recalled a patient who had
had an Abbe flap placed in his tight postoperative cleft lip. Review of the case caused us to note in 1953:

Recent review of this case suggests that the muscle in the Abbe flap itself has become reanimated. It is difficult to test electrically, but it seems to contract with whistling. He is a flutist.

James W. Smith of the New York Hospital–Cornell Medical Center, in 1960 and finally in 1961, studied return of function in vermilion bordered lip-switch flaps. He concluded:

An analysis of 50 consecutive cases is presented in which Abbe or Estlander flaps were used. . . . Fifteen of these cases have been studied extensively to determine the ultimate functional role they play in their new site. Examinations were made on the regeneration of sensory, sympathetic and motor nerves. It has been conclusively demonstrated that complete return of sweating and of sensitivity to pain, touch and temperature occurs within two years. Electromyography has shown that the transplanted muscle is reinnervated within one year.

Smith won honorable mention in the Educational Foundation Essay Contest for his electromyographic studies demonstrating the return of muscle function in the transplanted flaps. Jim recalls that when he was preparing to submit his award-winning paper for publication Dr. Herbert Conway refused to approve the illustrations. His keen eye caught the discrepancy that all the sketches, the preoperative, the postoperative and even those showing the flap in transfer, revealed the same ideal lip relationships. Only after Smith and the artist labored several months sketching in the preoperative deformities did Conway finally give his permission, muttering,

Who were the Foundation judges? Anyone awarding a prize for such unrealistic sketches must have poor vision and should not be selected to judge again!

In 1961 the austere and innovative Noel Thompson of Middlesex Hospital, London, with morbid anatomist A. C. Pollard of Stoke Mandeville Hospital, Aylesbury, Bucks, studied the motor function in Abbe flaps and gave a report based on biopsies taken at intervals of from 11 months to 10 years after separation of the flap from the donor lip. They concluded:
Following histological and histochemical investigation of muscle biopsies taken from the Abbe flap and the normal lateral lip elements of six patients, evidence is submitted to support the concept of motor reinnervation occurring in such flaps. Such evidence is based chiefly on the demonstration in the flaps of:

1. Normally striated skeletal muscle elements.
2. Motor end-plates exhibiting cholinesterase activity of normal intensity.
3. Nerve axons exhibiting some of the characteristics of motor nerve fibers.

Professor K. Schuchardt, in 1964 in Hamburg, reported the findings of one of his assistants:

Dr. Lentroidt, one of my assistants, made an electromyographic investigation on the reinnervation of Abbe flaps after they had been sutured into the upper lip. Twenty patients were investigated and in 15 it was possible to follow up the innervation for from 1 to 2 years. . . . 2 to 4 weeks after the operation there was a total deinnervation, and no electromyographical response. Between the fourth and sixth postoperative week a recovery of the action potential was recorded. This was probably due to a rest-innervation through the unsevered pedicle . . . after the pedicle was severed there was a complete de-innervation . . . After 2 months in most of the patients, mostly after the 3rd month, a slow progressive re-innervation occurred . . . the re-innervation started from around the ala wing and columella . . . nerve growth into the flap was innervated half a year postoperatively, and this was found in all our patients . . . Muscular function is markedly improved in the second half year after intervention. The maximal result is observed near the end of the first postoperative year and differs only slightly from the function of normally innervated muscle.

At this point Bengt Johanson of Göteborg rose to remind Schuchardt of his studies on the subject three or four years before:

They are really very careful studies over a very long period of years. We have shown exactly where this reinnervation starts in the Abbe flap.

In fact, in 1962 I. Isaksson, B. Johanson, I. Petersen and U. Sellden reported:

Reinnervation of ten Abbe flaps and five fan flaps was studied by an electromyographic technique. Results of the two groups were equivalent.
Voluntary activity was not manifest until at least five weeks had elapsed. Although electromyographic findings evidenced a high degree of functional restitution, in no case was complete normalization observed.

Takahashi, with Koto in 1966 and with Koto and Ishii in 1967, reported studies on the degree of motor function, changes in skin temperature and function of the salivary glands in the transplanted part of the lower lip living in the upper lip. They found that in their series functions became normal within nine months of the Abbe transposition.
50. Shaping the Abbe Flap for Secondary Bilateral Deformities

Surgeons have varied the design of the lip-switch flaps, beginning with the bell shape by Abbe himself. Kazanjian seemed to prefer the triangular shape while Blair favored the oblong. Then there are the cookie-cutter surgeons who copy a set design for all cases.

Splitting the Tail of the Prolabium

Gillies had a favorite little trick of shifting most of the prolabium into the columella, leaving its distal portion in the lip. He then split it and inserted the tip of his rather wide triangular Abbe flap into the slit.
A SPLIT-TAIL ABBE

Bradford Cannon of the Massachusetts General Hospital was the son of W. B. Cannon, renowned Professor of Physiology at Harvard Medical School, and is the father of four expert glider pilots. He was trained by Vilray Blair in St. Louis and later joined James Barrett Brown to help head the plastic surgical service at Valley Forge General Army Hospital in Phoenixville, Pennsylvania. Fellow Bostonian Joseph Murray of the Peter Bent Brigham and kidney transplant fame capsulized Cannon’s talents:

His skill as a surgeon, his knack for three-dimensional planning . . . his unassuming low key method of bedside teaching. . . . But in the long run, I think it is his innate ability to reduce a problem to basic components, and then apply general principles to the specific patient’s problem that is his major talent.

In 1941 Cannon suggested splitting the tail of the Abbe flap to accommodate a Y incision in the upper lip, with the fork of the Y placed at the base of the columella. This maneuver achieved partial vertical lengthening when the upper lip was short as well as tight.

He presented two cases. One was a tight postoperative bilateral cleft lip. The second was a partial double cleft lip closed in childhood but still showing a diminutive midsection of upper lip. Cannon suggested that his split-tail Abbe be used in such cases at the age of 10 or 12 years to replace the prolabium, which he excised and threw away.

Twelve years later Cannon, with Murray, gave “Further Observations on the Use of the Split Vermilion Bordered Flap,” noting:
It has been customary in secondary harelip repairs with vermilion bordered flaps to insert the apex of the triangular flap into one nostril or the other, or to amputate the tip and leave a horizontal scar beneath the columella. By splitting the apex of the flap, a symmetrical correction of the upper lip can be obtained. With such a flap the vertical lateral suture lines of the upper lip lie equidistant from the midline and the scars disappear within the floor of the nose. Oblique suture lines emerge from the nostrils and meet at the base of the columella where they are not apparent.

**THE W SHAPE**

This split-tail design has been elongated and modified and has become popular through the years. Cannon, after personal communication, determined that Gordon New, a Canadian who joined the Mayo Clinic staff in 1910 and served as the head of their Section on Laryngology, Oral and Plastic Surgery for 40 years, deserved priority credit for the W-shaped Abbe. Cannon wrote in 1953:

New and Havens . . . have used the split vermilion bordered flap but have outlined the flap on the lower lip in its final form. Closure as a Y instead of a vertical line may reduce the tension on the suture line and minimize the scar.

The W-shaped flap is most appropriate where the prolabium has been shifted into the columella, leaving an M-shaped defect in the upper lip. Then the W-shaped flap, when switched, becomes an M with its prongs straddling the columella and the points entering the nasal floors. The donor area is closed with the scar in an inverted Y. Of course, its shape is best adapted to bilateral clefts as diagramed by Tessier in 1969.
Another surgeon infatuated by the W-shaped Abbe flap was Onizuka of Tokyo. When the lateral lip elements have been pulled together below the prolabium, there is often a long lip but there is always a tight lip, especially in its lower portion. A Y-shaped excision of the scar releases the purse-string effect as the upper lip springs open into a W-shaped defect. If our goal were simply stamping cookies with a cookie cutter and not the construction of a natural philtrum, Onizuka’s W-shaped Abbe would be perfect for a W-shaped defect. However, it brands the upper lip with a strange M-shaped scar which may be an improvement but is not ideal.

Musgrave and Garrett in 1974 expressed preference for the M shape over the split-tail Abbe flap:

When the reconstruction involves the entire vertical dimension of the lip, an M-shaped flap probably will be most satisfactory. . . . Usually the “M” configuration is best achieved by in situ design, with actual excision of tissue from the tip of the flap . . . rather than by just splitting the apex of a wedge-shaped flap.

I was taught the W flap at Rooksdown House in 1948–1949 and, considering it both clever and appropriate for bilateral scars, used it in my first few cases—that is, until I was mature enough to get back and look beyond the obvious improvement in the case toward an ideal normal. . . .

One of my early cases in 1951 has an interesting story. The patient was a young Texas cowboy who had become a junior rodeo champion in calf roping. As a plastic surgery resident at Jefferson Davis Hospital in Houston, I used to spend my day off each week involved in the same sport and was impressed with this boy’s ability to throw his loop and dismount. Starting to get off a quarter horse at full speed while he draws up to a dead stop was always the most difficult part for me in reducing my roping time. I was watching this young champion closely when I noticed that he always went in and came out of the shoot with his hat pulled down over his face. Closer observation revealed a severely short, tight, secondary bilateral cleft lip with the usual depressed nasal tip. After an introduction, we arrived at the happy arrangement of a facial dismantling and reassembling for him in
return for lessons in dismounting from a galloping cow pony for me.

What was left of the scarred prolabium was shifted into the columella, with a dramatic release of the nasal tip. A W-shaped Abbe flap was transposed into the upper lip defect. This arrangement encouraged the cowboy to tip his hat back, and he was soon back “home on the range” demonstrating the tricks of riding and roping.

**P L A C E M E N T I N B I L A T E R A L C L E F T S**

Central positioning of the Abbe flap in bilateral clefts would seem obvious and is necessary when the total prolabium is shifted up out of the lip into the columella. When the prolabium is halfway up the lip, it would seem expedient to make up the lower half of the lip with a small square Abbe flap.

John S. P. Wilson of Great Britain, with hobbies in sculpturing and painting, presented an interesting, if segmental, design in 1964 in Hamburg:

Repaired bilateral clefts of the lip may present with various degrees of tissue shortage. . . . The free border of the lower lip should be taken as the base line. This should ideally be 1 mm. above the incisal edge of the upper incisors (Gillies and Millard, 1957). . . . The rational procedure is to release the scar of the lip and allow the lateral elements to drop to the base line but
no further. . . . The exact tissue defect is now established and is reconstructed by a midline Abbe flap cut to pattern.

Wilson showed a rectangular Abbe flap stuck under the prolabium which, indeed, filled his defect and improved the lip but with too much of a segmented effect. If the remaining prolabium in the upper center of the lip has any semblance of a groove, then Wilson’s small rectangle, if also carrying a midline groove, can be lined up so that this plug, in spite of its mid-transverse scar, can be camouflaged as part of a natural philtrum. If not, it seems more artistic to shift the rest of the prolabium into the columella or nasal floor and construct a total philtrum with one Abbe component.

When the prolabium is present in the lip but the lip is still too tight, there may be a temptation to split the prolabium in the middle and insert the Abbe. Resist this temptation; it adds two scars to the bilateral scars for a total of four.

An even more unbelievable action is the introduction of the Abbe flap into one of the two bilateral scars in an asymmetrical unilateral position, which then presents a mind-boggling problem! A solution is shown in Chapter 39.

MIDLINE PLACEMENT OF ABBE
THE TOTAL LIP LENGTH

In the secondary bilateral cleft deformity, when an Abbe flap is indicated, every effort should be employed to have this flap form the total central vertical length of the upper lip. It will then resemble the natural philtrum and, if correctly shaped, can appear quite normal in spite of its scars.
Of course, the use of an Abbe flap is decided in the first place by the need of the upper lip. Some might even say that the actual shape of the Abbe should be dictated primarily by the defect in the lip. The various odd shapes that have been advocated are the surgeon’s interpretation of what was needed. Some years ago it occurred to me that unnatural shapes such as the W that end up an M or the weird patterns of lopsided sickled Soviet stars are actually more reminiscent of primitive scribblings on the walls of caves than natural lip landmarks. In fact, to cut odd-shaped flaps caters too much to the apparent upper lip defect and not enough to the shape of the coveted normal philtrum. There are, of course, circumstances in which the shape of the lip flap must take into account the lip deformity, but in general the lip of a secondary bilateral cleft deformity can be coaxed to accept the shield-shaped philtral flap quite happily. This flap should be taken from the middle of the lower lip, transporting any central depression that might be present to simulate a philtrum even more realistically.

In 1974 Garrett and Musgrave acknowledged:

Millard properly points out that central flaps in patients with prominent central dimples of the lower lip offer an advantage in reconstruction of the philtrum dimple.

Sometimes the upper lip defect seems too wide for a philtrum-sized Abbe flap. Then, rather than cut an Abbe flap that is large and unnatural, as shown, it may be to advantage to reduce the size of the defect. To this end the principle of perialar crescentic excisions has been used. In 1908 Stone described partial closure of a wide central quadrilateral upper lip defect by approximation of the sides of the lip aided by advancement of the cheeks following excisions. This action reduced the size requirements of the Abbe flap and might occasionally be of value in those adult cases in which the entire prolabium is shifted into the columella. J. P. Webster later elaborated on this principle; diagrams appear in Chapter 54.

A cleft lip surgeon must know the beautiful normal by heart and ever work toward its creation with heart and soul. The advice
of a wise English Jewish merchant during the post–World War II period was to me pertinent:

You can make a living in fish, fruit, furniture or furs. If you’re not in one, get in it.

Here are some rules for those with an artistic sense. Anyone without this sense is in the wrong business and might be better off in one of the above four F’s!

Besides the general avoidance of odd-shaped flaps, there are three no-no’s in Abbe flaps in bilateral clefts.

1. Do not insert the flap into the middle of the prolabium—four scars!
2. Do not insert it into one of the bilateral scars in lopsided position.
3. Do not insert it halfway up the vertical length of the lip so that it appears as a stuck-on half philtrum.

There are exceptions to all rules, but beware breaking these.

"FRINGE" BENEFIT

When the prolabium is completely bald and the columella is very short, there is no excuse to postpone transfer. The prolabium slides out of the lip into the nose making way for an Abbe flap from the lower lip to bring in hair to amplify the center of the mustache.
A CHALLENGE FROM BELOW

Rules just set to guide the preparation of the upper lip defect and the positioning of the Abbe flap were suddenly threatened in Boston by a scar of the lower lip. Again the supreme plastic surgery principle of using what we have to make what we want was called upon and in the O.R. at the M.G.H. under the shadow of B.C., no less!

A bilateral cleft lip and palate with lower lip mucous pits was treated primarily by incorporating the prolabium as the entire central segment of the lip. Subsequently the pits were excised with rather severe scarring. At age 15 years, at the Plastic Surgery Clinic of the Massachusetts General Hospital, Boston, the patient presented a marked maxillary retrusion, a tight upper lip with a wide, flat prolabium, a short columella, a broad nose with a snubbed tip and a protuberant scarred lower lip. The chief plastic surgery resident, Joshua J. Tofield, carried out a Le Fort I osteotomy which brought her maxilla forward 12 mm. and achieved normal dental occlusion. This was well healed when the patient was presented to me in March 1974 while I was visiting professor at Harvard.

The flat nasal tip and short columella accompanied by a wide, flat prolabium, of course, tempted me to suggest a forked flap. The tight upper lip and protuberant lower lip were better points in favor of an Abbe flap. Yet destruction of the central, normal mucocutaneous junction with scarring of the lower lip following mucous pits excision posed a dilemma.
The specific procedure designed for this case could be of value in other such cases. It was a pleasure to assist Tofield in his skillful execution of the plan. As much prolabium as necessary to release the snubbed nasal tip was shifted into the columella. Still left was an intact strip of unscarred skin including the mucocutaneous junction line spanning the defect of the upper lip. This bridge maintained its inferior natural curve along the mucocutaneous junction but was cut in a flat inverted V above so that when inset in the Abbe flap the V point would push from above a slight cupid’s bow V in the mucocutaneous line. Of course, the V out of the prolabium columella flap merely allowed the prongs to spread and join with the advancing alar bases as nostril sills across the nasal floors. The alar bases were cut as flaps and their tips denuded of epithelium. Then they were advanced medially and their tips sutured to each other and the septum at the nasal spine. This maneuver also reduced the width of the central lip defect. Then the posterior mucosa of the prolabium, still attached to the premaxilla, was folded as a flap over the raw area of the premaxilla to line the back side of the upper labial sulcus. Now the stage was set for the Abbe flap.

A shield-shaped Abbe flap of philtrum dimensions was cut out of the center of the protuberant lower lip. The border scarring was excised from its mucocutaneous junction area. Then the Abbe flap, ducking under the mucocutaneous junction bridge, was slid into the upper lip defect, force-fitted like a piece in a
handmade jigsaw puzzle and fixed with sutures. The pedicle was divided 14 days later, and shortly thereafter a bilateral osteotomy was used to narrow the bony bridge of the nose.

Time and minor surgery will help perfect the final result.

**RESHAPING THE DONOR LOWER LIP**

When the highly touted shield-shaped lip-switch flap is used, closure of its donor area tends to lengthen slightly the line of union, thus offsetting any straight-line contracture. The closure of the lower lip donor area is achieved with 4-0 chromic catgut sutures in the posterior mucosa, one deeply buried 4-0 Vicryl in the center of the muscle, 4-0 and 5-0 chromic catgut in the remaining muscle and subcutaneous tissue and 6-0 silk in the skin. During the 8- to 18-year age period, skin scars often heal here with hypertrophy and may need revision later. Resist any temptation to do a Z-plasty on this scar as the natural line is vertical and the length of the skin edges has already been increased; there is no need for further assistance.

A common but minor problem that arises in maybe one in seven Abbe flaps is a mild midline lump in the free border mucosa at the site of the closure. This is caused by the piling up of excess mucosa plus the tendency for mucosa to hypertrophy at the site of any trauma. Correction of this minor but eye-catching bump is its posterior, transverse, elliptical excision just behind the free border and out of sight. The excision includes what deep tissue and scar are necessary to thin as well as flatten the vermillion edge.
51. Composite Free Graft
Lip-Switch

Almost every author concerned with Abbe flap procedures has emphasized the value of a narrow pedicle. It has been whittled down until the procedure has become an island flap. Gillies used to say that lip vermilion is so vascular that it would probably nourish an Abbe flap even if the main coronary vessel were inadvertently divided. He never taxed his theory to the point of cutting one because of the irreplaceable value of this prime cut of lip. Pursuing the principle to the end point, of course, would mean dividing the pedicle completely and free-grafting the wedge of lower lip into the upper lip.

The modest, retiring southern surgeon Wiley S. Flanagin of Augusta, Georgia, had the ingenuity and courage to be the first. In 1956 he reported four composite free grafts from the lower to the upper lip of 1 cm. in thickness. He also ignited a chain reaction that has flared up in many plastic surgery centers: Kingston, Buenos Aires, Paris, London, Tokyo, and Livingston, New Jersey.

Late in 1962 in Kingston, Jamaica, I treated a secondary bilateral cleft lip deformity with a composite free graft, 1.25 cm. wide, taken from the relatively protuberant lower lip. As such a graft has two edges of approximation, its width can be 1.25 to possibly 1.5 cm.

The patient was a young Jamaican female in whom a primary cleft had been closed with the lip's lateral elements pulled together below the prolabium resulting in a short columella, absence of a philtrum and cupid's bow and a bulky superior

Wiley Flanagin
As I wrote at the time:

The free graft approach has several obvious advantages such as requiring only one operation, by-passing the inconvenience of a fortnight of lip-tie and allowing a slightly more accurate inset. These factors must be weighed against several disadvantages. Of course, there is always the possibility of a tragic loss of the graft. Then the amount of tissue that can be transported is limited. The temporary circulatory embarrassment during the struggle for survival and "take" may leave scarring or at least remove some of the natural portion of the upper lip with a tight lower border. A short forked flap lengthened the columella and tightened the superior portion of the lip. The tight border of the lip was released by a midline incision, and the lower lip composite graft was meticulously sutured. This action achieved relaxation of the lip with eversion of the free border and formation of a philtrum and its dimple along with the suggestion of a cupid’s bow. This Kingston Public Hospital case was published in the *British Journal of Plastic Surgery* in January 1964.
velvet-like quality seen in flaps and so often missing in grafts. Then, too, the chance of survival of hair follicles is even less likely in the composite graft . . . This prediction has been corroborated by Flanagin (1963) and serves as a contraindication for the use of the free composite graft in the male. Growth of hair, of course, in the flap is normal and allows the culturing of a moustache which can serve to camouflage the scars.

When the free-graft approach is to be used then every precaution for a perfect take must be employed including meticulous approximation of all layers and strict immobilisation of the upper lip. Suggestions outlined for small lip-switch flaps also are appropriate for free grafts. The mid-vertical position for the insertion of the graft again is advised whether in postoperative lips of bilateral or unilateral clefts. As in the lip-switch flap the full-thickness composite free graft should be taken from the mid-portion of the lower lip so as to incorporate any groove that is present. It is of interest that this dimple also persists after grafting and serves well to imitate the natural philtrum.

Another to become infatuated by the free graft Abbe was the genteel, honorable, enthusiastic Hector Marino of Buenos Aires, who whether at Alberto’s in Rome or at Jackson Memorial Hospital in Miami has epitomized what Shakespeare’s Mark Antony said of Brutus: "This was the noblest Roman of them all." In 1967, with Juan Rabinovich, he published four cases of composite lower lip free grafts in unilateral cleft cases. They emphasized the importance of young vascular tissue and complete excision of scars to ensure adequate vascularity to the graft. Description of the graft was courageous:

The base of the triangle should not exceed 2 to 2.5 cms.

Indeed, their grafts were an impressive size and revealed good results in spite of their unilateral placement! Their report of the results is candid:

Two of the cases presented no complications whatsoever. In the other two, there was central necrosis of the graft which, however, did not change the satisfactory result.

A letter to Marino requesting his latest thoughts on Abbe free grafts and a possible example in a bilateral case received this charming response on June 5, 1974:
Unfortunately I do not have such a case in my files because in these last years I had the luck of being able to solve most of my secondary double harelips using rotating flaps from the vicinity. . . . Besides, in the few cases in which I performed the classical Abbe operation I refrained from employing the free transplant of tissue perhaps because old age is making me a bit wary of taking avoidable risks.

On the other hand I have employed this procedure in a number of hopeless, scarred secondary single harelips in which, for different reasons, I could not expect that the patient would tolerate the locking of both lips together for any length of time. Of these I have color pictures . . . one of which is quite interesting as it shows the composite graft looking of an absolutely normal pink hue just 12 hours after the operation.

I seem to remember that Jack Penn told me that he has used the free transplant in all his cases in the last years attributing his unfailing success to the immediate and constant cooling of the graft.

This large free graft is quite remarkable not only in its size but in its rapid revascularization. Moreover, it has been placed in the midline of a unilateral cleft lip creating a pleasant philtrum.

Also in 1967 Claude Dufourmentel, with Mouly, Preaux and Marchac of Paris, expressed their pleasure with a simplicity of “la greffe composée libre de lièvre à lièvre.” As noted by Gola:

C'est le procédé d'Estlander-Abbé sans pédicule.

They had the courage to combine shifting a skin flap out of the center of the upper lip to lengthen the columella and filling the lip gap, which was now under some tension, with a free composite graft.
In 1969 the confident F. T. "Jerry" Moore, one of McIndoe's favorites, with P. G. Lendvay of the Queen Victoria Hospital, East Grinstead, England, wrote a colorful paper on the "Free Composite Lip-Switch Procedure." They reported that since 1965 a series of 25 patients aged 5 to 30 years had had lip free grafts with no total losses and gave their reasons for a one-stage lip-switch:

1. The danger of post-operative airway obstruction.
2. Discomfort of the patient in having upper and lower lips connected by a pedicle for a period of two weeks.
3. The necessity of lengthy hospitalization and for two separate operations.
4. The technical difficulty of matching skin and vermilion junction at the time of pedicle division when the tissues are still in a reactive and indurated phase.

They suggested that the graft be no more than 1.5 cm. wide and that it be cut on the oblique and inserted in similar fashion to capitalize on the tongue-in-groove principle advocated by Dav-enport and Bernard in 1959 for increasing contact apposition in composite free grafts. Corroborating McLaughlin's 1954 findings in composite auricular grafts, they reported:

The color of the graft, initially dead white, is noted to have a pale pink tinge 12 hours post-operatively; 24 to 48 hours after operation it shows cyanosis, but with obvious return in colour. A final healthy colour is noted at about the third day.

John Walker and Robby Meijer of St. Barnabas Medical Center in New Jersey were also tempted by the simplicity of the one-stage procedure. In 1971 they reported 14 free composite lip grafts, with an average width of 1.24 cm. and an upper limit of 1.5 cm., with no total losses and minimal graft contraction.

In 1973 in Copenhagen, Shugo Soeda of Tokyo University gave some interesting findings on composite grafts. Experiments with 22 composite grafts in rabbits involved removal of the graft from the lip or nose and replacing it in its original site. Micro-angiography revealed that some of the large vessels connected directly to the recipient vessels in three to four days while the
capillary penetration from the bed could not be demonstrated except near the margin at the same time.

Soeda also reported over 30 composite lip grafts, measuring 0.8 to 1.5 cm. in width, which he had inserted in secondary cleft lip deformities without any total losses. He used the obvious midline insertion in bilateral clefts.

In unilateral cases he was obsessed with the insertion of the graft into the off-center position of the old scar and advised taking the graft from "the contralateral side" of the lower lip to get the natural curve and thickness to match the upper lip.

Histological study of four cases revealed patent large vessels and almost normal muscle fibers in the graft after six months. At the same time electromyography showed positive activity. This is encouraging when it is recalled that Magnus in 1890 and Volkmann in 1893, in animals, and Eden in 1919, in humans, found that free autogenous muscle grafts were replaced by connective tissue.

A critical study of the cases Soeda showed at the Cleft Palate Congress in Denmark revealed composite grafts that had taken well. In the unilateral cases, however, the unilateral position was
jarring, and in both unilateral and bilateral cases the grafts were too short in vertical length, not extending the full length of the lip and giving a stuck-on effect rather than simulating a philtrum.

A HALF LOSS

It has been noted constantly that there have been no total losses of these composite free grafts, but even a partial loss can be undesirable and it does happen. I used a composite free lip graft in an impatient old lady with a cancer defect and lost the posterior mucosa, which was far from ideal, requiring revision. Yet it is not fear of graft loss that has limited my use of this procedure.

FLAP VERSUS GRAFT

The natural quality, size, amount of scarring and chance of survival are all better in the Abbe flap, and toleration of the nine-day coronary lip-tie is preferred. Of course, when microsurgery has progressed to the extent that the labial coronary vessels can be anastomosed with a very high percentage of success, the anastomosed free graft will have everything to offer that the flap has plus the abolition of the inconvenient little eight- or nine-day pedicle.

In the meantime, the only vote for a standard "Abbe" free graft is convenience. When convenience means actual feasibility of switching a lower lip segment into the upper lip at all, then, of course, the free graft is available. If used, it should be no more than 1.0 to 1.5 cm. in width and be shield-shaped like a philtrum. Unlike any free grafts published, including mine, it should be made long enough to reach the base of the columella. The length of the graft does not endanger its chances of survival and does increase its similarity to a philtrum.

There are times when the graft may come in handy, as in the case Gillies labeled his "quickest Abbe." An adult cleft lip patient who had had an Abbe flap meticulously sutured into place was sent back to the ward. The extracautious anesthetist left the
inratracheal tube in position with the metal angle-piece strapped to the chin. Back on the ward less than an hour later, the patient began to swallow, which reaction gripped and pulled the tube out of the angle-piece and down into the trachea. The house officer could just reach the tube with the tip of his fingers. Senior surgeon Basil happened by and, seeing the cyanotic patient and the struggling house officer, grabbed up a pair of bandage scissors, chopped through the pedicle and retrieved the tube.

A note by H. D. G. on this case suggested:

If such should ever happen to you, don't forget you could save the flap by slipping one finger into the mouth and ripping out the precious piece from its stitches in the upper lip.

Or, if the Abbe flap was not more than 1.5 cm. wide, it has suddenly become a free graft and should be treated as such.

Better yet, do your Abbe flaps under local anesthesia. It is easier anyway.
An Introduction to Nasal and Labial Corrections

Unlike unilateral cleft procedures, in which secondary nasal and labial corrections can and usually should be carried out separately, in the bilateral cleft, combined nasal and labial corrections are mandatory. Because of the varying degrees of shortness of the entire frontonasal component in bilateral clefts, the nose depends on the lip to fork up or otherwise defray extra nasal expenses, and the lip must pay its nasal "tax" before trying to balance its own budget. If there is still lack of lip funds, then, as the lower lip usually has a surplus, a draft can be drawn from below. The important point is to consider the entire residual bilateral cleft upper lip, nose and lower lip anatomy as the total remaining capital setup in three separate checking accounts with freedom to crisscross funds as needed by the process of deposit and withdrawal.

Depending upon the condition of the columella and the state of the lip, the secondary surgery is planned. As a result of the primary bilateral cleft lip closure, there are four typical designs that seem to present themselves most often for secondary correction. They all have a flat nasal tip and short columella in common and may show in addition a wide prolabium (A), a whistling deformity (B) or triangular (C) or quadrilateral (D) flaps joining each other below the prolabium.

In addition to the revision of scars, approximation of muscles, balance of the free border and creation of the philtrum dimple, cupid's bow and upper sulcus, there are basic adjustments. Part or the whole of the prolabium may be shifted out of the lip; it may
be reduced or just revised. An Abbe flap may be transferred from
the lower lip. In fact, every trick available should be used in an
all-out effort to create the ideal normal.

The next three chapters will demonstrate the following:

*First:* Results of the various primary portioning of funds have
been responsible for the maintenance or production of the *big
four* common basic problems.

1. Short columella
2. Short lip
3. Long lip
4. Tight lip

Then, to confuse the issue further, seldom does just one of these
appear alone. Far more likely is a combination of as many as three
of the four all in one case! In addition, there are multiple
deformities associated with each of the four main categories.

*Second:* Secondary attempts, guided by principles, have been
used to balance the total budget toward a happy norm. Remem-
ber that, although the three chapters deal with *short* lip, *long* lip
and *tight* lip, the example cases used often have a short columella
and can be either short or long but tight too. There is a reason
why each specific case appears in a certain chapter, but keep
flexible and look out for the sometimes subtle ancillary aspects.
Short Upper Lip

When the upper lip is short in vertical height, it exposes too much of the incisors and requires lengthening. Several methods have been described to increase vertical lip length. They call upon tissue from the ear, lateral lip elements and cheeks. Then, too, as will be demonstrated in specific cases, varying degrees of short lip correction can be achieved without exclusive focus on lip lengthening. Scar excisions, the forked flap, advancement of the total short prolabium into the columella followed by an Abbe flap, with minor adjustments to the lateral lip segments, can achieve not only scar improvement, columella length and philtrum construction but *lip length as an extra dividend.*

**Ear Grafts**

The simplest method of minor central lip lengthening which also ingeniously creates the semblance of a cupid’s bow was described by the interesting British team of Muir of Aberdeen and Bodenham of Bristol for Gibson’s 1966 *Modern Trends in Plastic Surgery.* They stated:

Occasionally a simple way of lengthening the short scarred lip is required. A through and through transverse incision is made along the mucocutaneous margin... and the red margin allowed to drop. The lozenge-shaped defect is then filled with a suitable shaped, double-sided, full thickness lobe graft from the ear, the width of the correction being planned to simulate the natural cupid’s bow.

Its only detractor might be the encircling scar and the stuck-on effect of a little ear in a scarred lip.
LATERAL LIP FLAPS

The introduction of lateral lip flaps across the midline can, of course, lengthen the vertical dimension of the lip. When this principle is used during the primary bilateral cleft lip surgery, it too often results in a long lip. When the surgery is carried out secondarily after five years of age, it can achieve length under more controlled accuracy. Then the main deterrent becomes the unnatural position of the scars and the lack of muscle continuity.

LOW ADVANCEMENT

G. Ginestet's stair-step method of advancing the lateral lip elements medially under the lower border of the prolabium as a secondary maneuver is mentioned only to condemn it. The cost in unnatural scarring and side-to-side tightening is too great for the vertical lengthening achieved.

![Diagram of lateral lip flaps](image)

If this is bad in primary clefts, it is just as deforming in secondary deformities!

MIDDLE Z-PLASTIES

The Z-plasty is renowned for its ability to lengthen a short segment along one axis, but remember, this is at the expense of tightening in the opposite axis. Although bilateral Z-plasties have been and will continue to be used in short bilateral cleft lips, in my opinion the scars violate natural lines and landmarks and should be used, if at all, with caution. Remember, the interdigitations will not increase the total center length of the short prolabium but only the zigzagged sides.
HIGH TRANSPOSITION

The transposition of vertical flaps to the horizontal position, as described by Trauner, Marcks and Wynn, can be called upon to lengthen a short lip even more than to lengthen a columella. There is an unnatural box-like square effect of the scars following the elevation, 90-degree turn and insertion of bilateral flaps.

HIGH ADVANCEMENT

Of all the methods using the lateral lip elements to lengthen the short lip, it seems that the high advancement is closest to achieving the normal. It tightens under the base of the nose where width is usually the most abundant and the least desirable and leaves the lip free border relatively relaxed. Bilateral medial advancement of the lateral lip elements at the top just beneath the alar bases and columella presents scars of union along the natural nasal creases and philtrum curves. Yet, to preserve the full philtrum effect, when vertical shortness is not present, these flaps are better brought just short of tip to tip.

Only when the lip is extremely short should the lateral flap tips touch or crisscross even by millimeters.

FORKED FLAP LENGTHENS LIP

Lest the forked flap be considered only a columella lengthener, it is well to point out that it also lengthens the lip vertically as it tightens it from side to side. This effect is obvious if the action during closure of the donor area is studied. After the fork with the scars is advanced out of the lip, there is some release. Then when the lateral lip flaps advance toward each other at the tip of the philtrum’s little pointed head, the lip grows longer. This is an
Important consideration if a forked flap is planned and the lip is already too long. Action to shorten the lip, such as high lateral transverse wedge excisions, should be incorporated in that specific forked flap design.

**Abbe Flap Often Followed By Upper Lip Lengthening**

Whether the prolabium is advanced out of the lip into the columella to make room for an Abbe flap or the central scar is excised and the lip divided to receive the Abbe flap, the final Abbe flap insertion not only releases the side-to-side tightness but can allow lip lengthening. The reason is that preparation of the upper lip for the Abbe flap has required the shifting of a short tight prolabium or the excision of scars, and either or both could have been acting to some degree as a shortening restraint. Thus, it is important to note whether or not the lip is of satisfactory vertical length prior to the lip-switch surgery. If the lateral elements, when freed, become too long, they can be tailored. The Abbe flap should be cut to match the correct length and not the released length, for indeed the Abbe is the enforcer which, if fashioned correctly, can keep the lip right.

**Joining Muscles Lengthens Lip**

Many of us have noted that when the lateral lip muscle fibers are joined to each other across the cleft behind the prolabium there is some increase in vertical length, often immediate but at least eventual.

**Cheek Flaps**

When the upper lip is both short and tight and the lower lip is not redundant, the surgeon must turn to the cheek for tissue. Varying amounts are available from the cheeks depending on the need.
Bilateral nasolabial cheek flaps were described by Dieffenbach in 1845 for reconstruction of the upper lip. As he published no diagrams, the scholarly J. P. Webster carefully interpreted this design from the German text.

Esser also transposed bilateral nasolabial flaps into the upper lip, bringing both body and length to the lip without sacrifice of the lower lip. The donor scars of closure hug and are hidden in the alar creases.

The charming John N. Barron, another New Zealander who became a plastic surgery leader in Britain, trained with Mowlem, served with Gillies and later developed his own super unit at Odstock on the Salisbury Plain within the “shadow” of Stonehenge. Barron, skilled in joinery whether in wood or flaps and grafts, was one of my early teachers while he was at Rooksdown House, Basingstoke. I recall vividly his generosity, resonant voice, fluent French, original design of subcutaneous pedicled flaps and this 1948 secondary bilateral cleft case of his in which he cleverly designed Esser cheek rotation flaps.
In 1946 August Lindemmann advocated cheek flaps for construction of the upper lip and columella in a severe secondary case. His design was, in principle, similar to his primary design for a severe bilateral cleft in which he shifted the prolabium into the columella.

In 1967 Pere Gabarro of Barcelona stated his preference for this bilateral cheek rotation while shifting the prolabium into the columella for his secondary correction of bilateral clefts. He is an artist and these are his own sketches.
PERSONAL CASES

Cheek flaps and Abbe flap

Here is a case in which the prolabium had been partially advanced into the columella and the lateral lip elements drawn together in the midline with retention sutures. The result was a short, tight, scarred lip with an invisible free border vermilion. The correction required a simultaneous thinning and further advancement of the prolabium into the columella, radical midline lip scar excision, bilateral advancement of cheek flaps, bilateral elliptical cupid's bow skin excisions above the mucocutaneous junction and midline lip closure of mucosa, muscle and skin with medial advancement of the alar bases.

One and a half years later the lip result was not as good as the early postoperative condition promised.
Improvement in the nose was permanent, but evidently the original lip discrepancy had been too great for local tissue shifting by advancement flaps. The presence of a midline scar, the lack of a philtrum and cupid’s bow and the relative tightness of the upper lip in relation to the lower have more or less forced a second-stage small shield-shaped Abbe flap. The pedicle was divided after 14 days, and the patient, happy with his flap and growing a mustache, returned to his island in the Bahamas and was never seen again.

**Prolabium into columella and Abbe flap**

This patient’s bilateral cleft of the lip and palate was closed with the Blair-Brown inferior triangular flaps in infancy in Tennessee. At 26 years he had a short, tight upper lip with a central bulging prolabium, short columella, flat nasal tip, asymmetrical nostrils and flaring alae more marked on the right. The nasal deformity was accentuated by the high nasal bridge and the deviated septum.
Here is a case in which there is a definite advantage to correcting the nose and lip at the same time.

The probalbium was elevated out of the lip. With the aid of a membranous septal incision diverging laterally as anterior vestibular incisions, a reduction rhinoplasty was possible. The alar cartilages were reduced, the hump was lowered, the septum was shortened and a submucous resection removed the airway obstruction. In the course of lowering the bridge, a cartilage flap was turned toward the tip to offer extra support. The probalbium was thinned and rolled on itself as a hemi-column and, after being advanced along the septum to elevate the tip, was sutured.

The inferior end of the probalbium flap was split and splayed to form a columella base to join the alar bases across the nostril sill. The upper lip was now completely divided in the midline, and a 1.7 x 1.7 cm. shield-shaped Abbe flap was transposed from the lower lip to create a philtrum. The pedicle was divided after 10 days, and 18 months later, sandpaper abrasion of scars gave the finishing touch.

Forked flap and Abbe flap
Asymmetrical bilateral complete and incomplete clefts of the lip had been closed in infancy in California. By the age of 14 years the patient revealed a short columella, snubbed nasal tip, asym-
metrical nostrils, short upper lip with prolabium forming the central segment but with everted, thickened vermilion free border riding high with a single mucocutaneous arc and no semblance of a cupid's bow. There was evidence of sparse hair in the prolabium which, at first, discouraged its use for columella lengthening.

A forked flap incorporating the bilateral scars allowed columella lengthening and release of the nasal tip. Scars and incisions evidently disheartened what hair follicles were included in the fork as they never reared their shoots thereafter. Advancement of the lip elements to close the forked flap donor area did give some vertical length to the lip, yet the inherent shortness of tissue was still reflected in the reentrant nasolabial angle. Subsequent thinning of the vermilion free border and a Gillies cupid's bow operation were only moderately successful.
Slight retraction of the columella and long sidewalls prompted bilateral alar chondromucosal flaps based superiorly to be transposed to each other into a membranous septal releasing incision.

The upper lip was split in the midline and released from above by high transverse incisions laterally to give width and length to the lip. A W-shaped Abbe flap was turned 180 degrees into the defect in the upper lip and the pedicle divided after 14 days. C.M.F.

The excess of columella above and its inferior deficiency was not treated, but a solution to this nasty little problem was later developed, is described at the end of Chapter 47 and is available for this fine gentleman should he ever return.

Prolabium into columella and Abbe flap

During and after the original operation on this bilateral cleft lip and palate, which incorporated the prolabium in the lip, there had been a 27-year tug-of-war between the nasal tip and the upper 27 years
lip. As often happens, both were losers as the lip was pulled up and the tip pulled down.

At 27 years the prolabium was advanced into the columella with exposure for alar cartilage and hump reduction, septal shortening, bilateral osteotomies, submucous resection, septal cartilage strut to the nasal tip and bilateral advancement of the lateral lip elements to each other in the midline.

In spite of the slight tightening of the upper lip, the release of the nose presented a face with contented composure which lasted three years. Finally the patient was prevailed upon to accept a small midline shield-shaped Abbe flap. It became functional and was embellished with a mustache, definitely in vogue today.
This bilateral cleft lip and palate had had several operations in Chicago and elsewhere. By age 16 years what remained of the patient’s prolabium, after Z-plasty interdigitations of lateral flaps into its sides, was of minimal value to the lip any more. The lip was so scarred, short and tight that even in repose it exposed the entire incisors and compared unfavorably with the protuberant lower lip. The nose, with its flared alae, asymmetrical nostrils and short columella, posed an unusual challenge as its “Roman” bridge rounded abruptly at the flattened tip with a forward projection little better than that of the lower lip: a classic “nose pressed against a windowpane.”

The prolabium was cut out of the lip, elevated and attached to the base of the columella. Exposure through a membranous septal incision extended bilaterally as anterior vestibular incisions made possible reduction of the alar cartilages with suturing of their medial crura at the tip, lowering of the bridge with saw and chisel and narrowing of the nasal bones by bilateral osteotomy. The prolabium was thinned, rolled on itself and advanced as columella. The alar bases and superior portions of the lateral lip elements were advanced medially and sutured with nylon to the septum at the nasal spine. An Abbe flap 1.5 cm. long (skin length) was transposed into the upper lip defect and the pedicle divided after 10 days.
Eight months later rounded tip and hanging columella were treated with alar cartilage reduction, septal shortening, bridge lowering and alar base resections.

One year later final refinements included membranous septal S.M.R. excisions of columella overhang, submucous resection with septal S.C.S.2 cartilage struts inserted into the columella to support the tip, S.C.S.4 another strut along the alar rim and denuded tips of alar base A.B.2 flaps sutured to each other at the septum with Mersilene.
Forked flap and rhinoplasty

An asymmetrical bilateral cleft of the lip had been closed in infancy in South America by approximation of the lateral lip elements to the sides of the prolabium. At four and a half years of age this boy had a short central segment of the lip with the original prolabium vermilion still present and a moderately short columella with slight drag on the nasal tip.
A forked flap, taking the bilateral lip scars and reshaping the philtrum, was shifted into the columella with release of the nasal tip. Six months later the prolabium vermilion was turned down and lateral vermilion flaps were used to overlap it, creating a more natural vermilion free border and tubercle.
At 17 years a corrective rhinoplasty included reduction of alar cartilages, lowering of the bridge, bilateral osteotomy, alar wedge resections, columella thinning with an elliptical excision, submucous resection and two septal cartilage struts in the columella to refine the tip. A Silastic sponge implant to the chin was inserted into a pocket through a stab incision in the lower labial sulcus.

Main problems at this point were short, undimpled prolabium with a transverse crease at its join with the columella base and, of course, a severely protuberant lower lip. The patient refused an Abbe flap offered to improve the upper lip while reducing the lower lip because he did not want to risk the extra lower lip scar.

Therefore, a revision of the cupid’s bow through a mucocutaneous line incision allowed elevation of the prolabium skin, dissection of a subcutaneous flap out of the center of the prolabium and tunneling of this flap under the upper lip crease into the columella. The prolabium skin was tacked with buried 4-0 Mersilene (Ethicon # R-691G) into the excavation and further molded as a philtrum dimple with a through-and-through suture tied over a cotton bolus. The lower lip was reduced by a long transverse excision of an ellipse of posterior mucosa and orbicularis oris marginalis.
Prolabium into columella and Abbe flap

A bilateral cleft of the lip and palate had been closed in Michigan in infancy with a moderate amount of scarring and a shortness of the columella and lip.

It was predicted that a composite wedge resection of the lower lip, including skin, will be necessary to tighten the lip to ideal proportions.

At 11 years the best portion of the prolabium was advanced into the columella to release the nasal tip, and its inferior end was split to receive a midline shield-shaped Abbe flap from the lower lip. The pedicle was divided after 10 days. Minor scar revisions followed.
Forked flap

This eight-year-old boy had his bilateral cleft of the lip and palate closed by approximation of lateral elements to prolabium with spread of the prolabium, snubbing of the nasal tip and flaring of the alae.

A forked flap, incorporating the bilateral scars and portions of the prolabium, was advanced along the membranous septum, tubed on itself in the upper portion and allowed to splay at the bottom to join the medial advanced alar base.
Rhinoplasty and Abbe flap

This bilateral cleft of the lip and palate was treated by many operations in New York. By age 16 years the patient revealed a high-bridged, hooked nose with large nostrils and a scarred, retracted columella overpowering a short, tight, "whisker"-scarred upper lip which, in repose, exposed both central incisors in their entirety.
A corrective rhinoplasty included reduction of alar cartilages, removal of hump, slight septal shortening, bilateral osteotomies and cartilage strut from the bridge grafted into the columella for nasal tip definition. The "whisker" stitch mark scars of the lip persisted.

One year later the scarred skin of the central lip was excised, and the mucosa and vermilion were used to cover the raw area of the upper labial sulcus. The alar bases were cut free from the lip elements so the alar bases could be advanced to the columella and the lateral lip elements sutured to each other in their upper portion. This procedure reduced the amount of skin scarring, lengthened the lip but produced a central gap. A midline shield-shaped 1.25 cm. Abbe flap was transposed into the defect and the pedicle divided in 10 days. Other minor revisions included denuding the tips of the alar base flaps and suturing them together at the nasal spine for final reduction of alar flare, V-Y advancement of vermilion of Abbe flap to create a central tubercle and methylene blue painting followed by sandpaper abrasion of remaining skin scars.
Rhinoplasty, prolabium into columella and Abbe flap

This bilateral cleft of the lip and palate had the lip closed in infancy with incorporation of the prolabium into the lip. Most of the premaxilla had been lost, and the wide cleft in the palate had never been closed, so that the patient had to use a dental plate with a palatal prosthesis and pharyngeal bulb. At age 23 years he presented a short upper lip with a whistling deformity, a hairless prolabium, short columella, depressed nasal tip and flaring alar bases. There was a relative prognathism of the mandible when compared to the lack of premaxilla and deficiency of the cleft maxillary segments. Even a mustache and beard did not help much.
The prolabium was cut out of the lip and, with the aid of membranous sepal and bilateral anterior vestibular incisions, was elevated out of the way to facilitate a reduction rhinoplasty. The alar cartilages were reduced, the hump was removed and the septum was shortened. The small bony knob of the premaxilla was smoothed down and the mucosa used to surface the area. The prolabium was thinned, shaped and rolled on itself with subcutaneous 4-0 chromic catgut sutures to form a natural columella, then advanced along the membranous septum and sutured. Its inferior base was split to receive the tail of the Abbe flap. The alar bases were freed from the lateral lip segments by circumalar incisions; then each was divided into two flaps, a subcutaneous flap and a skin flap. The subcutaneous flaps were sutured to each other at the base of the septum, and the skin flaps were advanced across the nasal floors to the columella to form the nostril sills. The lateral lip segments were advanced medially and hung to the septum creating a philtrum-sized defect.

Then a 2 cm. shield-shaped Abbe flap, measuring 1.3 cm. skin length, was transposed into the upper lip with its tail tucked into the prolabium, split to camouflage the new union of lip and nose. The pedicle was divided after 11 days. When the patient was last seen, three weeks after the operation, the possibilities of a maxillary advancement were discussed.
This bilateral cleft of the lip and palate was closed in infancy with the Blair-Brown type of lateral triangular flaps introduced above the inferior edge of the prolabium but with a small amount of original prolabium vermilion retained in the center. At 11 years of age, the upper lip was short, tight, with a trapdoor prolabium, a tiny whistling deformity and a large left buccal sulcus oronasal fistula. The short columella, flattened nasal tip and flaring alae gave the usual angry, snorting effect.

As visiting professor at the Massachusetts General Hospital, I was invited to carry out my usual one-stage nasal and labial correction. The prolabium was freed from the lip, thinned and curled on itself and advanced along the septum as columella with release of the nasal tip. The alar bases were cut as flaps, denuded of epithelium at their tips, advanced and sutured to the septum at the nasal spine. The mucosa of the prolabium was used as a flap to close the oronasal fistula.

Then a midline shield-shaped Abbe flap was transposed into the center of the upper lip to create a philtrum. The pedicle was
divided after 12 days, and the photographs were forwarded by Josh Tofield about two months after the surgery.
THE lip that is long in the vertical dimension is seen most often under three circumstances:

1. The surgeon, in a misguided effort to lengthen a prolabium he considers too short, introduces composite flaps of skin and vermilion from the lateral lip elements below the inferior edge of the prolabium.
2. Some lengthening may also occur when the lateral flaps are introduced above the prolabium.
3. In complete bilateral clefts, when the prolabium has been cut free from the nose during columella lengthening in the infant or very young child, the strong lateral lip musculature pulls on the unanchored prolabium. In many cases this persistent traction during the growth period gradually stretches the lip in the vertical dimension.

CORRECTING LIPS WITH LATERAL COMPOSITE FLAPS BELOW THE PROLABIUM

Usually the composite lateral lip flaps have been introduced below the prolabium primarily to lengthen a seemingly short central element and secondarily to avoid dragging the nasal tip quite so far down into the lip. Such disjointed allotment of upper lip tissue tightens its transverse dimension while increasing its vertical length, which, with eventual stretching, will be exagger-
ated into a tragically comical curtain. These inferior flaps can be triangular (Mirault-Rose-Blair-Brown), joining tip to tip, or quadrilateral (Maas, Hagedorn, LeMesurier, Barsky), joining square end to square end. The amount of lengthening is in direct proportion to the width of the inferiorly transposed flaps. Thus the quadrilateral flap is potentially the champion lip lengthener.

This entire fiasco has also been branded with an unbelievably unnatural position of scars that cannot ever be completely "unscrambled." To add insult to injury, the short columella and depressed nasal tip usually are still respectively short and depressed. If then a flap is taken out of the center of the prolabium for columella lengthening, not only is another vertical scar added to the previous two but the columella usually remains inadequate.

**SHORTENING THE VERTICAL LIP LENGTH**

If the columella has won out in this type of surgical proportioning with the lateral lip elements joined beneath the prolabium and is of sufficient length, then shortening the vertical lip length and correction of the unnatural position of the scars get priority. Some surgeons have been content with just shortening the lip. Various methods have been proposed, none of which end up with an artistic final result.

_Erich_

Erich, of the Mayo Clinic, reduced the vertical length of the lip by excision of the bilateral scars and reduction of the length of
the prolabium. This maneuver does shorten the lip in direct relation to the amount of inferior prolabium amputated but does nothing about the unnatural shape of the Y scar in the philtrum area.

*Vaughan*

Along a similar but more radical pattern Vaughan designed a shortening of the vertical length of the lip in 1940. With the old bilateral scars in his line of action and with extensions lateral, he resected the scars and the desired amount of tissue not only from the inferior border of the prolabium but also laterally from the nasolabial junction. With the resection shaped not unlike a Viking’s winged headpiece, the upper lip is shortened in its vertical dimension along its entire width. Here again, however, the resulting winged scar makes no pretense of imitating a philtrum.

*Ragnell*

In 1946 British-trained Alan Ragnell of Stockholm designed a similar scar excision in bilateral cleft lip which served to shorten a long lip and medially rotate flaring alar bases at the same time. This, at least, produces scar configurations that fall somewhere within the general area of natural landmarks and seems to be the best of this series of total lip-shortening procedures.

*Holdsworth*

When the central vertical length is near normal and the scars are reasonable but the lateral lip is too long vertically on each side, a variation of Holdsworth’s subalar excision will achieve shortening and place the scars in natural creases.
ADD I TION OF V ERM I L I O N F L A P

Rex Peterson, the sophisticated plastic surgery cowboy of the Arizona Crippled Children’s Hospital, Phoenix, with Ellenburg and Carroll in 1966, warned that the apparently

deficient prolabium in bilateral cleft lip should not become a surgical trap.

For those cases already caught by the introduction of lateral lip flaps beneath the prolabium, he has corralled an interesting combination of procedures. Again, the rare condition of sufficient columella length was assumed, but the upper lip was horizontally tight, vertically long and mismatched by a protuberant lower lip. Rex’s rodeo freed the prolabium, shortened the lateral lip segments by wedge excisions along the nasolabial line and ended up with a true swayback whistling deformity. His final roundup reduced the lower lip by cutting an Abbe flap out of it and, after trimming off the skin portion, turned the remaining portion of the flap to fill the defect,

incorporating only the vermilion margin, the muscularis and varying amounts of labial mucosa.

In principle, this vermilion-bordered flap is somewhat similar to one described in 1957 by Gillies and Millard.

In 1973, O’Malley of Orlando, advocated a similar “skinned Abbe” for secondary bilateral clefts presenting a whistling deformity and lack of an upper labial sulcus.

Such multiple corrective actions as designed by Peterson are not as “rough riding” as they may seem because he has repositioned his brands more compatibly with the philtrum, has shortened the vertical lip length and has reduced the relative excess of the lower lip.

If the lower lip were not redundant, it is possible, after excision of the flaps of skin beneath the prolabium, that there would be enough mucosa available to fill the whistling deformity without a form of Abbe flap.
When the lateral lip elements have been joined beneath the prolabium resulting in excess vertical lip length and the columella is still very short, a most infuriating secondary deformity is presented. Some cases have been treated by excision of the flaps beneath the prolabium in a radical cupid's bow procedure. Use of this procedure to shorten long bilateral cleft lips calls for some modification, as indicated by Gillies and Kilner:

When the "cupid's bow" operation is being used to shorten the "up-and-down" length of the lip, obviously the central point cannot remain fixed; the entire vermilion border, therefore, must advance up and the lower border of the orbicularis be trimmed shorter before it is nicked at the cupid's bow.

Thus the vertical length of the lip is reduced and the misplaced flaps are removed. Yet the columella is still lacking in length, which cannot be spared from a lip that is already too tight from side to side. This inadequacy led to another approach, as demonstrated on pages 665–667.

PERSONAL LIP SHORTENING
BY SIMPLE EXCISIONS

The most effective vertical shortening of a long lip, if all other labial and nasal aspects are satisfactory, is the transverse full-thickness excision of the required amount of superior upper lip along its entire join with the nose. Variations in the execution of this action depend on the specific case, but it is seldom that a bilateral lip is only too long and just as rare that mere shortening will complete the correction.

Discarding skin below prolabium

This patient, born with an incomplete bilateral cleft of the lip, was one of twins, and his twin had a incomplete unilateral cleft. The bilateral cleft was treated in infancy with what appears to
have been a Brown-Barsky type of closure. The introduction of lateral lip flaps below the prolabium did not pull on the almost adequate columella but did tighten the lip from side to side in its lower portion and produced unnatural scarring and vertical lengthening.

All scars bordering the prolabium were excised, and all skin except the mucocutaneous ridge was excised from between the inferior edge of the prolabium and the vermillion. The lip shortening in this central segment was balanced by bilateral full-thickness wedge resections transversely in the upper lateral lip elements at their join with the alar bases and nostril sills. This procedure placed the prolabium in a more natural philtrum position, shortened the long lip and actually improved its relationship with the lower lip.
COMBINING LIP SHORTENING WITH OTHER CORRECTIONS

As will be seen in specific long lip cases, scar excisions, the forked flap, total prolabium-into-columella followed by an Abbe flap—all can be used to improve scars, lengthen columella and construct a philtrum, but with extra effort they can be forced to shorten a long lip. Of course, this action is dependent upon simultaneous shortening of the lateral lip segments and keeping the Abbe flap short enough (average 1.3 to 1.5 cm. skin length). Remember, the model upper lip at rest should expose the inferior one-third or slightly less of the upper incisors.

PERSONAL CASES

Prolabium into columella and Abbe flap

Evidently this bilateral cleft lip and palate had been treated in infancy with lateral lip flaps sutured to each other below the prolabium. At two and a half years there must have been an attempt at columella lengthening. At six years, the columella was still short with a flattened nasal tip and flaring alae. The upper lip hung long like a curtain, marked with three vertical and one transverse scars, showed very little free border vermilion and was slightly tight in transverse dimension. The lower lip showed some protuberance.

6 years
A year later a small shield-shaped Abbe flap was transposed into the center of the lower two-thirds of the upper lip, after scar excision, and the pedicle divided in 13 days.

A center portion of the prolabium was shifted into the columella and the lip shortened in vertical length by skin excision of a portion of the inferior flaps above the mucocutaneous junction.
At age 15 years corrective rhinoplasty included reduction of alar cartilages, lowering of nasal bridge, shortening of septum, bilateral osteotomy, alar base wedge resection, alar margin sculpturing and cartilage strut from the bridge inserted into the columella to support the nasal tip.

One year later, submucous resection and diamond excision of skin reduced tip-columella thickness. After another year, alar base flaps were dissected into skin flaps and subcutaneous flaps. The subcutaneous flaps were sutured to each other with Mersilene at the septum behind the columella base with reduction of the alar flare. The alar skin flaps were slid across the nostril floor toward the columella to create the nostril sills.

Forked flap

This bilateral cleft of the lip and palate was treated with composite flaps of skin and vermilion from the lateral lip elements placed below the prolabium. Then, to add insult to injury, as has been done so often, a flap was taken out of the center of the prolabium to lengthen the columella partially. Photographs of this girl at six years of age show a projecting premaxilla, a flat nasal tip with flaring alae and a small blob-like columella. The lip is vertically long, hanging like a curtain and tight along its free border. The scar pattern of three vertical and one transverse has caused irreversible marking of the lip.
At nine years a forked flap, incorporating the bilateral scars and reducing the square prolabium to a narrower, more philtrum-like central component, lengthened the columella and released the nasal tip moderately. In addition, the ends of the fork splayed into the nasal floor to join the alar bases to form nostril sills. This procedure was followed later with a minor cupid's bow correction.

It will be necessary to remove the entire scarred prolabium, advance the lateral lip elements and fill the defect with an Abbe flap. A reason to postpone this as long as possible has been the lack of slack protuberance of the lower lip.
A switch and then a fork

Here is an interesting plan specifically designed for the case with lateral rectangular flaps joining each other below the prolabium, which also suffers a short columella and a long upper lip.

To correct vertical length and columella shortness a rather complicated but logical rerun in reverse of the first abominable operation picked up the lateral lip flaps from their stuck-on position below the prolabium and replaced them in their original position in the lip on either side of the prolabium. These flaps were composed of skin and subcutaneous tissue, leaving the vermillion mucosa to border the inferior edge of the prolabium. Thus the vertical height of the lip was shortened and tissue positioned for columella use. Later these repositioned flaps were incorporated into a regular forked flap and were shifted into the columella with nasal tip release. Even after all the finagling, the lip ended up with only two vertical scars. An example follows.

Recuperating the forked flap

A bilateral complete cleft of the lip and palate in 1966 had composite flaps including skin from the lateral lip elements transposed below the prolabium as a primary Jalaquier-Hagedorn-Barsky procedure. At age two and a half years the patient came under my care and, as would be expected, revealed a long vertical lip unnaturally scarred and a short columella.

At age four years, through-and-through incisions were made along the old scars around the prolabium. Then two skin areas F
and F were taken as flaps and transposed back where they came from along the sides of the lateral elements. The mucosa beneath them was used to deepen the upper labial sulcus, and the free border vermilion was merely elevated and sutured along the inferior border of the prolabium where it belonged in the first place.

Four months later, delay incision inscribing a forked flap and including these replaced skin flaps was made. Then, five weeks later, a forked flap was cut. It was elevated with the aid of a membranous septal incision, and the alar cartilages were exposed and sutured together. The prongs of the fork were approximated and advanced along the septum with release of the nasal tip. The lateral mucosa and muscles were sutured together behind the prolabium, which maintained its viability through its vermilion border attachment.
Because of the persistent excess protrusion of the premaxilla, the lip lost some of its shortening, but with the aid of orthodontia by Berkowitz the alignment was improved. In 1974, revision with lip shortening, muscle reapproximation and dimple formation was completed. It might almost be said that this "egg" had been unscrambled.

10 years

Prolabium into columella and Abbe flap

An incomplete bilateral cleft was closed in Chicago by the Blair-Brown triangular flap inserted below the prolabium. At five years the patient had a long lip with a Y-shaped scar, no cupid's bow, philtrum or tubercle and a short columella with a slightly restrained nasal tip.

5 years
Excision of scars included some skin to transform the triangular flaps into quadrilateral flaps in an attempt to create the LeMesurier cupid’s bow. This was only partially successful so 10 years later more radical surgery was used.

The prolabium was elevated out of the lip and the anterior septum shortened to correct the hanging columella. Then the prolabium was reduced, advanced into the columnella base, split and sutured to the alar bases. The upper lip was divided, and the lateral lip elements were advanced medially to the septum and sutured with 4-0 Mersilene to create a philtrum-sized midline defect. A shield-shaped 1.7 cm. Abbe flap was transposed into the center of the upper lip and the pedicle divided after seven days.
This 9-year-old boy with a bilateral incomplete cleft of the lip had bilateral composite flaps placed below the prolabium in Cuba. This presented a long lip with unnatural scars and a short columella. At age 10 years, the scars were excised as marked, including bilateral triangles from the upper portion of the lip bilaterally to shorten the vertical length of the lateral elements. The prolabium was advanced into the columella and the lip elements advanced medially, presenting a philtrum-sized defect. A shield-shaped Abbe flap was transposed into the philtrum position with its tail inserted into a split in the prolabium base. The pedicle was divided after one week.
Forked flap and rhinoplasty

A bilateral cleft lip and palate patient with mild hypertelorism had undergone numerous procedures. At age 14 years, the lip and nose revealed the specific fallacies of the standard principles used. The prolabium, trapped between the columella and the lip, served neither well. The short columella had snubbed the nasal tip spatula flat. Lateral lip flaps had been pulled together below the prolabium causing the lip to be long in vertical length but tight from side to side, particularly along its lower border. The situation had provoked the surgeon to insert a small Abbe flap unilaterally to relieve this specific tension.

A surgeon must have the ideal normal as his goal and set his aim and plan his surgical campaign accordingly. Otherwise, his is but a craft darting hither and thither in open seas with enough fuel but no charts, no compass and an uncertain destination. One error is followed by another, each launched to correct the last but merely compounding the problem by adding insult to injury to the point of irreversible disorder. This was a difficult deformity from the beginning, no doubt, but there was even less chance of total recovery now.

At age 15 years, a modified forked flap incorporating the bilateral scars and portions of the prolabium was used to lengthen the columella and partially release the nasal tip. A reduction rhinoplasty lowered the nasal bridge and narrowed the bony base.

Subsequent corrective procedures over the next four years were too numerous to describe in detail. They did include a cupid's
bow operation, alar base advancements, alar margin sculpturing, bilateral osteotomies, a vomer strut in the columella, a Silastic sponge chin implant, lip scar revisions and abrasion.

One time during the latter part of this period, when I thought the patient was progressing reasonably well considering her original problem, a kind woman befriended her. The new acquaintance assisted the patient in getting a room and then inquired into her financial status, saying, "Dear, I would like for you to see a good plastic surgeon." Whereupon my patient loyally explained she already had one!

At age 20 years, the patient had a baby boy with a complete unilateral cleft of the lip which was treated with a rotation-advancement closure. Since then she has had two babies with bilateral cleft of the lip and palate, one with the alveolus intact on one side and one complete with projecting premaxilla.
Abbe flap and lip-shortening procedures

This classic story of a long lip is a special favorite of mine, but you have to follow it play by play to understand why. Born with an asymmetrical bilateral cleft lip which was closed at two months and revised at 17 years, Sheldon Gloger, at 34 years, had an asymmetrical nasal distortion with the prolabium trapped above the lateral lip flaps, which joined each other below it. In the spring of 1972 a letter from this patient arrived in Miami. Here are excerpts:

Why I travel so far . . . very suspicious of doctors because of previous bad experiences. I searched cleft lip literature for problems similar to mine . . .

<table>
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<tr>
<th>lip:</th>
<th>nose:</th>
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<tr>
<td>tight</td>
<td>depression of nasal tip</td>
</tr>
<tr>
<td>stiff</td>
<td>alar cartilage protruding into right nostril</td>
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<td>scarred</td>
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When not smiling, my lip gives impression of anger and meanness. When smiling, my upper lip does not move hiding the smile. To project a smile, I must force movement of the lip with many facial muscles.

The patient was seen in Miami, and an Abbe flap was proposed.

One month later he wrote:

One item worries me. Unfortunately I was too shy to mention it during consultation. The previous operation . . . resulted in too long a vertical length in the upper lip. It hangs one centimeter below the upper teeth, hiding the teeth from view even when laughing.

Will your operation improve this?
My answer:

Your upper lip does not look long in your smiling photographs. . . . When we shorten your nose, this will increase the effective length of your lip but, if necessary, I can shorten the actual length when the Abbe flap is inserted.

On August 8, 1972, the midline scar of the lower portion of the upper lip was excised and the prolabium reduced and shifted onto the columella base. Then the lip was opened in the midline and a 1.5 cm. (skin length) Abbe flap was inserted giving release, symmetry, and a philtrum to the upper lip. The pedicle was divided after 10 days.

Ten days later he wrote:

Your Abbe flap is masterful. I now have a normal lip and corrected nose for the first time in my life. I mentioned disappointment at not having a shortened lip only as an honest reply to your questioning.

Four months later he wrote:

The sag while smiling or laughing is terrible—like an old man with his dentures out—both comical and hideous. Even with a forced grin, the sag still covers the upper teeth. This is a great handicap to my work where talking, with pleasant facial expressions, is important. My lip is still quite stiff. Is it possible the sag will improve when the stiffness disappears?

If my problem were corrected by further surgery, what would be the harm?

My response:

Give the lip another month or two and then we can shorten it.
Six months after the Abbe flap operation, the alar cartilage was reduced on the right and grafted as an onlay on the left, the septum was shortened and then a full-thickness transverse wedge, 1 cm. wide, was excised across the entire upper lip along its join with the nasal base. With smiling the upper teeth were exposed, but he wanted it shorter!

Seven months after the lip shortening the patient wrote:

During the operation your assistant said it was shortened 8–11 mm. One day after the operation I had the same overly long upper lip, the same toothless smile as I have today. What happened?

My response:

I am sorry that you are not pleased with the excellent result. We can go ahead and do a little more work if you would like.

This was his response:

Thank you for your courteous reply and offer, but no, I won’t be coming to Miami anymore. You have done what you promised. . . . It seems I did not communicate well what is extremely important to me: a shortening of my overly long lip that hangs like a wet curtain when I smile or laugh. Now I do insist. I want my upper lip shortened a full ½ inch. Nothing else will do. That or nothing. So, I must seek another specialist. . . .

I have already consulted several plastic surgeons who have offered to attempt a ¼ inch shortening, each by a different method. . . . You know my lip better than anyone, what harm might I expect if a ½ inch shortening is attempted?
One surgeon wants to operate under the nose, from nasolabial fold to nasolabial fold; another wants to excise "all the way through," another surgeon would operate just above the red line of the cupid's bow; one plastic surgeon feels that the lip has already had too much surgery, another surgeon wants to "tuck under and up" the whole visible mucosa. None of these fine gentlemen have performed such an operation, which scares me, although there is a reference to this problem showing before and after photos (Holdsworth, W. G., *Cleft Lip and Palate*, 4th Edition, 1970, pp. 160-161).

As a last service, please tell me some things to help me finally get the job done or convince me that it's a lost cause.

My response one week later:

No, it is better that I do this for you and at no charge. I want you as happy as possible. I did shorten you over a \(\frac{1}{2}\) inch before, but it will take more and my hope would be to let a small amount of your upper teeth show.

His answer:

O.K. Set me up for the operation as soon as possible—whenever. I will drop everything and fly to Miami.

He enclosed photos to show "our" lip at repose, smiling and grinning and illustrated with a couple of his own arrows.

So, 10 months after the last lip shortening, a 1 cm. wide, transverse, full-thickness ellipse of upper lip skin, muscle and mucosa was excised from alar base to alar base. During the operation the patient was encouraged, "Sheldon, at least I can say at this time your teeth are easily visible through your lip!"
The defect was closed as the lip was lifted and sutured to the nasal base with exposure of the lower one-third of incisors at rest. On the fourth postoperative day the sutures were removed.

My note in the patient’s chart after this visit stated:

Shortest lip in Miami, but swollen. Lip measures approximately 11 mm.

Eight months later, not having heard a word from the patient, I wrote asking how he was, terrified that he would write, “Only one thing, doctor, you have made my lip too short!” Instead, he
wrote four and a half single-spaced typed pages, but the message can be condensed to:

I only wish you had taken more out during your last operation.

He did give me an even clearer insight into his magnificent (lip) obsession when he wrote:

Some fine experiments were carried out by psychologists, as reported in Krech and Crutchfield. Volunteers were fitted with masks that hid all but one feature of their faces. In some, it was the mouth that showed, in others, only the eyes, etc. Then these people were subjected to various stimuli (electric shock, tickling, onions for crying, etc.). . . . Observers, unaware of the stimuli, were facing the masked volunteers and were asked to judge the emotions, their only guide being the expressions of one facial feature. Conclusion: only the mouth region communicated the person's true feelings. And this is something I knew from experience, ever since that operation at age 17, I suddenly wasn't being understood by in-person contact. My upper lip, inflexible, long, hiding the teeth, could not reflect my emotions. . . . Look at motion picture actors and actresses. It amuses me to notice that the bad guy, the heavy ugly in a film, may have a scar on the forehead, a hooked nose, an eye that half opens or a missing ear. But, in all cases, this horrible creature has a beautiful mouth, excellent set of teeth, and his use of that mouth region is what produces the intended aura. Only I notice it, but it's very true.
These are photos he had taken for this book in Mark Gorney's office. In spite of what scurrilous letters Sheldon may write me in the future, I am proud of his result as he is now quite handsome.

Resident Tony Wolfe, slightly obsessed with bony structure and teeth prior to his year with Tessier and Obwegeser, after reviewing this case suggested:

It would have been easier to lengthen his teeth!

*Lip lengthening following early division of columella and prolabium*

When the lateral lip elements have been introduced across the top of the prolabium until they meet tip to tip as in the original adaptation of the rotation-advancement principle in bilateral clefts, this action can also lead to lengthening of the lip vertically. If the complete division of the columella base from the prolabium is carried out in infancy or early childhood, the chances of the baby's pulling a long lip are enhanced. If the division is postponed until five years of age, there seems to be less vertical lip lengthening. In cases that have developed vertical lengthening there are two main methods of shortening. Again, the procedure should be postponed until school age.

**SUPERIOR.** If there is a natural mucocutaneous ridge and cupid's bow as usually created with the rotation-advancement principle, then a transverse superior full-thickness excision along the join of the lip with the alar bases, nostril sills and columella is the method of choice.

**INFERIOR.** If the mucocutaneous junction, cupid's bow and vermillion free border are unnatural and scarred, requiring radical
After early forked flap

An early forked flap in a complete bilateral cleft places tissues in their correct position during the surgery. Yet, with the complete division of the lip attachments to the columella during infancy and early childhood, when muscle pull exaggerates growth, the lip develops too long in its vertical dimension. The lack of septal support in the nasal tip also allows the forked flap to slip partially back down into the lip. By re-advancing the forked flap up into the columella, supporting it with a temporary homologous septal cartilage strut (if under 16 years) or autogenous septal cartilage (if over 16 years) and lifting the lip will achieve and maintain nasal tip elevation and lip shortening.

adjustments, then Gillies’ cupid’s bow operation can be used to revise the bow and also shorten the vertical length of the lip. Leave the mucocutaneous junction “white roll” with the vermillion if it is still present.

Or, even better, use my modification, which creates not only a bow but philtrum columns and a dimple and at the same time shortens the vertical lip length but retains the white roll.
SHORTENING LIP WHILE AIDING COLUMELLA

When the lip is long but the columella short or retracted, it is well to use in the columella what must be taken from the lip. The lip shortening can be accomplished by transverse excision of wedges of skin, subcutaneous tissue and whatever sparse muscle is present from very high in the lip along its join with the alar base and nostril sill. If this tissue is not amputated but is based medially on the sides of the columella base, it can be advanced on each side medially and upward, like the forked flap, along the incised membranous septum to increase the columella length and at the same time elevate and shorten the long lip.

If there is columella retraction, these flaps can be based medially inside the vestibule and transposed out of the lip and into a columella releasing membranous septal incision as described in Chapter 47.

This is the same general principle as described in 1919 by John Staige Davis of Baltimore for reconstruction of the columella. He advocated bilateral transverse skin and subcutaneous tissue flaps raised from the upper lip and with the raw surface turned inward toward the midline, sutured together, skin surface outward. The free end of the approximated flaps was sutured to the tip of the nose. As Davis explained:

This type of operation for reconstruction of the columna is suitable only for those cases in which the upper lip is very long. It accomplishes the double purpose of shortening the lip and forming the columna.

Of course, the modern modification has refined the procedure appreciably.
54. Tight Upper Lip

TIGHT UPPER LIP WITH PROLABIUM

In certain cases the prolabium has been incorporated into the full vertical length of the lip with depression of the nasal tip, but either because of the smallness of the original prolabium or because of the union of the lateral lip elements at the inferior border of the prolabium, this prolabium has not stretched. The general effect is of a relatively tight upper lip exaggerated by a slack, protuberant lower lip. Such a case for some surgeons will cause the thought “Abbe flap” to flash on automatically; then, as no other information is flashed with it, the prolabium is released by being split up the middle, and the lower lip flap is switched into it. This is an unacceptable solution because it immediately increases the vertical scars to four and leaves the depressed nasal tip unrelieved.

Believe it or not, there are other surgeons who jump the track completely and actually place the Abbe flap unilaterally in bilateral cases. The reasoning is difficult to understand, but the correction is even more bewildering.

Actually, the best method of handling the relatively tight upper lip with the small prolabium incorporated in it is to shift the entire prolabium up into the columella, and there is seldom a columella that will not welcome the additional tissue. Then an Abbe flap can be transposed into the defect left in the upper lip.

Shifting the entire prolabium is preferred in order to reproduce the philtrum as a single lip-switch flap unit. Prolabium advancement into the columella will call for the standard membranous
septal incision carried up over the bridge of the septum. The prolabium will require thinning and shaping and may have to be rolled on itself with subcutaneous sutures particularly at the nasal tip to simulate a columella. In the male there may be hairs, which can be discouraged by follicle excision. Hairs in this area usually are sparse and any that survive surgery can be kept clean during the morning shave. The end of the prolabium can be split and splayed at the base of the new columella.

With the prolabium slid up into the nose, the upper lip presents a yawning gap which has frightened many a surgeon to cut an Abbe flap too wide, too long, and unimaginatively straight. It plugs the upper lip with an inartistic square segment which in no way can be mistaken for a philtrum.

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**MY FIRST BILATERAL SECONDARY**

Anyone who cuts the lower lip flap the exact size dictated by the upper-lower lip relation before the switch, without accounting for the simultaneous reduction in the lower lip at the time of the switch, is in for a shock. This kind of calculating has a double backfire, producing very big upper lips ballooning over their lower lips, now drawn irreversibly too tight. This is the course I took in 1949 in my first Abbe flap case, and Gillies, who used quite large Abbes himself, ticked me off for it.

The case was a 27-year-old British army veteran with the typical secondary tight upper lip, flat nasal tip and flaring alae of a complete bilateral cleft lip and palate. He had been the welterweight boxing champion in both the Egyptian and Italian theaters of war, and the absence of an impressive muscle on his body caused me to suspect that he had terrorized opponents with his
frightening flat face. Such a thing could happen in the service even though a smart boxer seldom fears a pounded face as the bearer obviously has repeatedly been an easy target. Having given up boxing, the veteran was anxious for any improvement in appearance. His prolabium was advanced into his columella and a corrective rhinoplasty carried out. This left a gaping upper lip defect, into which was transposed a huge W-shaped flap planned to fill the hole exactly. It turned out to be too long, too wide and totally unnatural, requiring several reduction procedures. Persistence and a cartilage graft to the nasal bridge finally achieved a happy transformation—yet not without my learning the impor-
tant lesson that these flaps need not be large and, in fact, are best shaped the size of a normal philtrum.

If the defect is just too big in the upper lip to be satisfied with a philtrum-shaped or -sized Abbe flap, then, again, J. P. Webster’s perialar crescent excisions will allow the cheeks to aid in the upper lip construction by reducing the size of its defect.

Although some surgeons, more concerned about the position of the pedicle, prefer shifting the Abbe flap donor area off the midline as shown here, it is suggested that a flap taken from the midline of the lower lip not only may carry a dimple but can be maneuvered into the upper lip defect just as easily. Remember to keep the circumalar incisions high and in the shadow of the nasolabial join.
OTHER PERSONAL CASES WITH PROLABIUM STILL IN TIGHT LIP

Forked flap and rhinoplasty

This 27-year-old woman, whose complete bilateral cleft of the lip and palate had been treated in Cuba, presented a short columella, flat nasal tip with several external nasal skin scars, asymmetrical nostrils, flaring alae and short, tight upper lip with unnatural scars.

A forked flap with nostril extensions was elevated, and lateral lip muscle elements were freed and joined. A Z-plasty lengthened the short posterior lip mucosa. Septal cartilage grafts were made
to the nasal bridge and columella. A diamond excision of nasal tip skin and suturing of the forked flap allowed columella lengthening, the lateral wing extensions being folded into the vestibular releasing incisions to elevate the nasal tip.

Later cleft lip rhinoplasty included reduction of alar cartilages, bilateral osteotomies, septal cartilage strut into the columella and lateral mucosal flaps transposed between columella and membranous septum. The tips of the alar base flaps were denuded of epithelium and sutured to each other with Mersilene behind the columella to reduce the flare.

The final labial and nasal revisions included abrasion of skin scars.
When he was first seen in Miami, orthodontic manipulation to spread the maxilla was started by Michael Krop. At 12 years, a forked flap revised the lip scars and reduced the prolabium. Exposure allowed removal of the nasal hump. The forked flap was advanced along the membranous septum with release of the tip, and the ends of the fork were splayed to join the advancing alar bases to form the nostril sills.

The young lady has blossomed, has learned to use makeup and does the very most with what surgery has been able to give her. In the next case, complete bilateral cleft of the lip and incomplete cleft of the palate were initially treated in New York. The 1955 operative notes from the Maxillo-Facial Service of New York Presbyterian Hospital described a left-side LeMesurier lip closure and, three months later, the same on the right with mucoperiosteal flap closure of the anterior palate. At three years a partial vomer resection and Kirschner wire fixation achieved premaxillary pushback. Some time thereafter, Dupertuis in Pittsburgh applied one of his auricular lobule free grafts to lengthen the columella.

By age 10 years the patient showed a moderately depressed, rounded nasal tip, short scarred columella, tight upper lip with scars and stitch marks, a hypoplastic maxilla and a protuberant lower lip.
A bilateral cleft lip and palate was closed in Boston using a Tennison-type Z-plasty, one side at a time, for the lip. At six years the patient had a short columella, flared alae, a tight upper lip, unnatural zigzagging of lip scars without muscle continuity or natural philtrum landmarks, a vermilion whistling deformity, some lack of maxillary development and a protruding lower lip.

Two months later, alar margin excisions and reduction of the columella ear lobe graft sculptured the nasal entrance. A Silastic sponge chin implant was inserted through a lower labial sulcus incision. At age 16 years mandibular osteotomy was carried out by oral surgeon Arnold Weiner.
At seven years a forked flap was taken out of the lip to lengthen the short columella and to shape the prolabium more like a philtrum. The lateral muscles were freed in the upper portions and sutured together in the midline and the flaring alar bases cut free and advanced medially between the forks and the membranous septum. It was necessary to maintain a blood supply to the prolabium through the free border vermilion.

Some improvement was achieved, but the tight upper lip exaggerated by the lax lower lip demanded more radical surgery. At nine years of age the remaining prolabium was cut out of the lip, rolled into a tube and advanced along the membranous septum. The closure was exact enough to allow insertion of a banked homologous septal cartilage strut for temporary nasal tip support. The lateral lip elements were advanced medially and supported by upper muscle flaps sutured to the septal base. Thus the defect was reduced to philtrum proportions so that a 1.5 cm. shield-shaped Abbe flap could be transposed into the defect.
Time and minor revisions will smooth out the final result. If necessary, at 16 years an autogenous septal strut can be inserted. Further reduction of the lower lip may be required.

**TIGHT UPPER LIP WITH HALFWAY PROLABIUM**

Bilateral cleft cases closed by the Blair-Brown, Hagedorn-LeMesurier, Barsky and other methods which introduce lateral lip flaps to each other below the prolabium often result in a long lip. There are some lips, however, that are not too long vertically but suffer transverse tightness in the lower portion. With the prolabium in halfway limbo, the nasal tip is still flat and the columella still short. Here the prolabium must go the whole way into the columella, and then an Abbe flap can construct a philtrum.

**PERSONAL CASES WITH TIGHT LIP AND HALFWAY PROLABIUM**

*Prolabium into columella and Abbe flap*

Bilateral cleft lip and palate closure brought composite flaps of skin and vermilion from the lateral elements below the prolabium. At 11 years, this operation had resulted in a snubbed nasal tip, short columella, tight, unnaturally scarred upper lip and relatively protuberant lower lip.
At 13 years the scarred prolabium was elevated out of the lip, thinned, rolled on itself into a hemi-column and advanced along the membranous septum to release the tip and elongate the columella. The remaining upper lip was divided in the midline and tailored. Then a $1.5 \times 1.25$ cm. Abbe flap was transposed into the upper lip defect and the pedicle divided after 10 days. A year later, tips of alar base flaps were denuded of epithelium and advanced to each other at the septum behind the columella. Double-breasted-vest revision of the upper lip scars was used.

Prolabium into columella and Abbe flap after 50

This bilateral cleft lip and palate was closed in infancy by approximating the lateral lip elements beneath the prolabium. The palate was never closed but fitted with a plate. At age 53 years, the patient presented for surgery. Release of the lip and slight
advancement of the prolabium made room for a midline Abbe flap. The pedicle was divided in two weeks. The more advanced age of the patient possibly reduced the flap’s ability to blend as a philtrum, but additional years and the Florida sun did bring wrinkles to the face and Abbe alike.

Prolabium into columella and Abbe flap

This bilateral cleft lip and palate was treated by the Blair-Brown method in St. Louis. The photographs at 23 years show the lateral triangular lip flaps joined to each other below the prolabium with a single arc elevation of the vermillion, a tight upper lip, short columella, rounded nasal tip and protuberant lower lip.

The prolabium was cut out of the lip, thinned and split into a forked flap. The alar cartilages were reduced, the septum was shortened and the columella was lengthened, the ends of the fork joining the alar bases as nostril sills. A midline shield-shaped Abbe flap, $1.5 \times 1.25$ cm., was transposed into the defect. When the pedicle was divided after 11 days, a Silastic sponge implant was inserted into the chin through a lower labial sulcus stab incision.
In the next case, what seems to have been an asymmetrical bilateral cleft of the lip had been closed in Ecuador in infancy by bringing the lateral lip elements together below the prolabium. At 17 years the upper lip was tight and scarred, revealed almost no free border vermilion and compared unfavorably with the protuberant lower lip. The diminutive prolabium bulged at the base of the short columella, which pulled a slight hook in the nasal tip.
The lip scar was excised, opening a midline full-thickness defect. The prolabium was reduced, split and advanced into the columella. Then a shield-shaped 2 cm. Abbe flap was transposed and the pedicle divided after 10 days.

At 19 years a corrective rhinoplasty included alar cartilage reduction, hump lowering, septal shortening, bilateral osteotomies, alar base wedge resections, alar web excisions, submucous resection and septal cartilage strut in the columella for nasal tip support.

In this case, lateral lip elements were joined to each other below the prolabium in infancy resulting at 10 years in a slightly snubbed nasal tip, short columella, asymmetrically flaring alae, tight upper lip with unnatural scars and no philtrum landmarks.

At 13 years the prolabium with lateral flaps was elevated from the lip, rolled on itself and advanced along the septum to release the tip and elongate the columella. A submucous dissection of the deviated septal cartilage allowed it to be freed from its off-center position on the nasal spine, to have its concavity scored and to be placed in the midline. The upper lip was split in the middle, the alar bases were freed from the lip and advanced to the septum and the muscles of the lip elements were attached to the septum to reduce the central defect. Then a midline shield-shaped
1.5 cm. Abbe flap was transposed into the upper lip and the pedicle divided in nine days.

This 13-year-old boy had had a Blair-Brown type of lip closure in infancy in northern Florida. He showed a flat nasal tip, short columella, bulging prolabium without natural landmarks of cupid’s bow or philtrum, tight upper lip and relatively protuberant lower lip.

At age 13, under local anesthesia, his prolabium was elevated T.P. out of the lip, thinned, rolled on itself and split at its distal end. With the aid of a membranous septal incision extending well
over the tip, the prolabium was advanced into the columella and the lip defect filled with a 1 cm. wide, 1.5 cm. long Abbe flap from the lower lip. The pedicle was divided after 11 days.

At age 16 a cleft lip rhinoplasty included reduction of the alar cartilages, straightening of the bridge and septal shortening. The alar bases were cut as flaps, thinned by cutting subcutaneous flaps out of their center, and then advanced medially by suturing their subcutaneous flap extensions to each other at the septal base. A submucous resection of septal cartilage produced a strut for support of the columella and the elevated nasal tip. Another smaller strut was used along the right alar rim.
As an infant, this boy had a Blair-Brown type of lip closure in the Navy. At 18 years, he revealed a short, tight upper lip with a humped prolabium trapped by triangular flaps joining tip to tip below it. He had a whistling deformity and a protuberance of the lower lip. The nose was high-bridged and hooked, the nasal tip dragged down by the relatively short columella. The total prolabium was elevated out of the lip and freed for advancement by a membranous septal incision which was extended bilaterally into the vestibules for extra tip release. The alar cartilages were reduced and the hump was lowered. The septal cartilage removed during a submucous resection was sutured as a strut along the end of the septum. After upper lateral flaps were cut from the prolabium as wings to fill the vestibular defects, the remaining prolabium was thinned, rolled and advanced along the septum for columella lengthening. The base of the prolabium was split to receive the tip of the shield-shaped 1.5 cm. Abbe flap. The pedicle was divided after eight days.
Rhinoplasty and Abbe flap

Born with an incomplete bilateral cleft of the lip, this patient was treated first in Cuba in infancy and later in Florida. When seen at age 21 years, she had a prolabium seated halfway up the lip with lateral lip flaps joined beneath it. This condition produced an unnatural columella, one convex curve of the mucocutaneous line without a cupid’s bow, a whistling deformity and a tight upper lip with transverse scars too wide for complete excision. As the nose had a bulbous tip and a slight hump, the usual combined correction of both lip and nose in bilateral secondary deformities was planned.

The prolabium was elevated out of the lip and as much scar as possible excised from the center of the lip. With the aid of membranous septal and bilateral anterior vestibular incisions, the alar cartilages were reduced, the tip was defatted and the hump was lowered. The prolabium was thinned, rolled on itself and advanced into the columella. A V wedge from its base not only sculptured the excess cuff but opened a split for the Abbe tail. The lateral lip elements were advanced medially by suturing their subcutaneous edges together at the tip, thus producing a natural-sized defect in the upper lip. A midline 1.5 cm. shield-shaped Abbe flap was transposed into the gap and the pedicle divided.
after seven days. Note the ideal length of the upper lip, exposing the lower one-third of the upper incisors.

**Prolabium into columella and Abbe flap**

This bilateral cleft lip and palate was closed with lateral triangular flaps brought together below the prolabium. By seven years of age, the premaxilla was gone, the upper lip was tight from side to side particularly along its free border and the prolabium bulged like a trapdoor in the upper central portion of the lip, accentuated by the horseshoe-shaped scar and its "quotation mark" stitch marks. The columella was short, the alae were flared and the nasal tip was so flat that its projection was successfully challenged by the protuberant lower lip!
In 1959 the prolabium was elevated out of the lip, thinned, rolled and advanced into the columella. As I had not yet become infatuated with the shield-shaped Abbe flap, an oblong lip-switch flap with a forked tail 1.5 cm. long by 1.25 cm. wide was transposed the usual 180 degrees with the tips of the split tail straddling the columella base.

Two years later a minor modified cupid's bow operation improved the blending of the Abbe flap along the mucocutaneous border. As the patient grew, so did her nose, especially with the tip free, and this incited me to reduction surgery a little earlier than usual.
By 13 years she was five feet, five inches tall. Thus, at age 15 years her columella was reelevated as a trapdoor, thinned, split for shortening and replaced after standard corrective rhinoplasty procedures of alar cartilage and bridge reduction, septal shortening and bilateral osteotomies. At age 16 years alar base-nasal floor flaps denuded at the tips were advanced and sutured to each other behind the columella base. At 17 years the lip scars were abraded. A subcutaneous pedicle cut out of the center of the Abbe flap was tunneled up into the columella, and a small Z-plasty of the scar join between the Abbe flap and the columella rounded the acuteness of the nasolabial angle.

**Prolabium into columella and delayed Abbe flap**

In this bilateral cleft lip and palate the projecting premaxilla and diminutive prolabium caused a dilemma for the primary surgery. The lateral lip flaps had been brought together below the prolabium. By age eight years the tug-of-war had caused the prolabium to be suspended between the nasal tip and the lip without benefit to either.
The prolabium was freed from the lip, thinned and advanced along the septum to lengthen the columella and release the tip. The lip was simply approximated in the midline.

A year later the scar was excised from the midline of the lip and a shield-shaped Abbe flap inserted with division of its pedicle in 14 days. Two years later the columella bulge was reduced by a vertical elliptical excision and two years after that the tips of the alar base flaps were denuded of epithelium and advanced to each other behind the columella.
The tissues were now well distributed. Only the refining remained. Upon recall for final revisions at age 18, it was discovered that the patient had died in an automobile accident. This is a terribly sad event to record, as such a part of his life had been shadowed by either facial deformity or a stage of healing between the many surgical procedures. He was a fine boy and had been a good patient, and just as he was obtaining a happy result at the prime of his life, suddenly it all ended for him.

**TIGHT UPPER LIP**

**WITHOUT PROLABIUM**

If the prolabium was shifted bodily into the columella, the upper lip probably will be tight from side to side, may be long in vertical dimension and certainly will have no central element to suggest a philtrum.

The nose should be satisfied so that most of the surgeon's attention can be directed toward the tight upper lip. Vertical scar excision will release the lip, and it will spring apart in happy relief! If there is excessive vertical length, it can be reduced by bilateral full-thickness transverse wedge excisions along the lip join with the nose. Now there is a gaping full-thickness defect in
the center of the upper lip, and Abbe found the answer in a full-thickness flap from the lower lip as a natural replacement of the missing tissue.

PERSONAL CASES OF TIGHT LIP WITHOUT PROLABIUM

Abbe flap
This bilateral cleft lip and palate had been treated by shoving the prolabium almost into the columella and bringing the lateral lip flaps together below it. At 15 years of age, short bulging prolabium columella, flat nasal tip with kinked alae, flaring alar bases, tight upper lip and protuberant lower lip and receding chin added to the general problem of cerebral palsy.

The prolabium was freed, thinned, rolled on itself and advanced into the columella with relief to the nasal tip. The upper lip was divided in the midline and an Abbe flap transposed into the defect. The pedicle was divided after 14 days.

Six months later, corrective rhinoplasty included reduction of alar cartilages, lowering of the bridge, septal shortening, bilateral osteotomies, alar base wedge resections, submucous resection and septal cartilage strut in the columella to elevate the tip.
This bilateral cleft lip and palate was treated in infancy with lateral lip flaps joining beneath the prolabium. A central flap was taken out of the prolabium to lengthen the columella. At age 22 years the upper lip had no philtrum or cupid's bow and was flat and unnatural. The slightly short columella ended abruptly in the lip, as did the alar bases, with no natural flow of contour along the nostril sill.

The prolabium was elevated out of the lip, split and advanced into the columella with the tails joining the alar bases across the nasal floors as nostril sills. A midline shield-shaped Abbe flap released the lip, producing at least the semblance of a philtrum. The pedicle was divided after 10 days.
Lip scar into columella and Abbe flap

This 20-year-old Cuban elevator operator, who had had four operations on his bilateral cleft lip and palate, was seen in consultation in Miami in 1963. He revealed a flat, almost bifid nasal tip with flaring, crinkled alae and a short, retracted columella. His upper lip was tight and retroposed. It had a mass of scar in its center and no vestige of the prolabium. The lower lip was protuberant. A plan for surgical rehabilitation was outlined.

In 1964 this letter arrived:

Dear Doctor,

I am writing to you this letter to remind you about my operation. Please, doctor, I hope you don’t forget about it, because this is one of my best wishes and hopes in the world.

The other day I saw a girl and I asked her if she wants to be my girlfriend, and she told me “no,” you know how I feel after that, because I think because of my defect she didn’t want to have anything to do with me.

Thank you doctor for everything that you can do for my lip and I will appreciate it forever.

The scarred central portion of the lip was advanced and rolled on itself to lengthen the columella. The alar cartilages were reduced. The lip was divided in the midline and freed from the maxilla. Into this gap was transposed a 2 cm. (skin length) Abbe flap. The pedicle was divided after 13 days.
Four years later, the alar bases were reduced and alar margins sculptured. As there had never been any cartilage left in the septum, a small Silastic implant was inserted into a pocket in the columella but only as a dormant contour builder and not a working tip lifter!

The patient has flourished, mustached and married!

The following year the patient had a final island flap pushback of his palate and a minor nasal revision resulting in good facial form and function.

The patient has flourished, mustached and married!
Prolabium into columella and Abbe flap

This 31-year-old medical student had been born with a bilateral incomplete cleft of the lip and a white forelock. His bilateral lip cleft was treated in Minneapolis with a Blair-Brown-type closure with lateral lip triangles touching under the prolabium. This left the lip tight in its lower border with inversion exaggerating the redundance of the lower lip. The columella was slightly short with the nasal tip mildly depressed.

The prolabium was elevated out of the lip, thinned, rolled on itself and advanced along the septum to raise the tip and lengthen the columella. It was split at its inferior end. Subcutaneous pedicles developed under the alar bases were advanced and sutured to each other on the septum at the nasal spine. Then the alar bases were sutured to the split ends of the columella to reduce the alar flare and create nostril sills. The result was a 1.4 cm. philtrum-shaped defect in the upper lip, which, including osteotomies, alar base wedge resections, submucous resection and Abbe flap. The inferior lip flap based on the coronary vessel was rotated 180 degrees and inset, and after eight days the vessel pedicle was divided. Although this action balanced his face and improved his nasal and labial relationship, he proudly proceeded to grow a luxurious mustache.
It is of special interest that this patient's daughter was born with an incomplete unilateral cleft of the lip, a bilateral cleft of the palate, normal hearing (at three months) and the white forelock. She had a lip adhesion, soft palate closure and myringotomy with tube insertions at three months, and a rotation-advancement lip and nose correction at seven months and is progressing well.

Nasal Tip Depressed with Prolabium Already in Columella

When there is no prolabium in the lip because it has been shifted into the columella (but not sufficiently to raise the nasal tip), the
columella has to be rereleased, and the alar cartilages must be sutured together to support the tip. The vertical midline scar in the tight upper lip can be excised and an Abbe flap fashioned long enough to extend into the columella to make up the deficit. Depending on the columella defect, the tail of the Abbe flap may be maintained as a point or trimmed as a blunt fork. In 1971 Onizuka of Tokyo specifically designed a longer Abbe flap to be used both for release of the tight upper lip and to fill in the lower portion of the columella after the short columella had been shifted farther into the nasal tip.

It is interesting that in 1968 Vilar-Sancho Altet and I independently designed similar columella construction with an extended Abbe flap in median clefts. Do not forget the value of a couple of autogenous septal struts inserted in the new columella to help maintain nasal tip lift.
There are certain cases in which several procedures have made subtle improvement in the total effect. The deformity is not always glaring, the solution not necessarily exciting, but the little change makes everyday existence a little easier as it helps the patient blend into his surroundings without being constantly picked out as odd or just different.

A Round Tip and a Reentrant Angle

This bilateral cleft of the lip and palate had been operated on in three excellent medical centers. A wide Abbe flap had already been transposed and a Silastic implant to the nasal tip had been and gone! The patient was a pleasant 18-year-old girl with a suggestion of a parrot's beak of the nose and inequality of scarring of the lips.
Through the Potter-type marginal “flying bird” incision, the columnella skin was elevated, presenting exposure for bridge lowering and alar cartilage reduction. Subcutaneous tissue and a cartilage strut in the columnella were turned up for nasal tip support and columnella reduction. A V-Y advancement lengthened the upper lip slightly.

The roundness of the columnella in profile was exaggerated by the reentrant nasolabial angle. Six months later, despite previous incisions, a midline vertical ellipse of excess columnella skin, based on a subcutaneous pedicle directed inferiorly, was incised and advanced down into a releasing incision across the retracted nasolabial angle where the columnella joined the lip.

Final improvements included minor scar excisions and sandpaper abrasion. The abrasion was aided by a common trick of

21 years
painting methylene blue over the irregularities to mark the pits and to ensure complete de-epithelialization.

After the last surgery the patient faced her greatest test when she started teaching. She wrote a happy note that the students had accepted her—but she says it best:

I am so excited and pleased with my surgery. The redness and roughness were gone within a very few days. I have gotten so many compliments on your work. I started my teaching field experience and I passed the greatest test of all. Usually the first question I am asked by the children is what happened to your face. They have been all over me to see what they have done. It is all over my braces. That makes me feel good.

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AN OVERTREATED COLUMELLA

Here the columella of a bilateral cleft lip and palate had been lengthened, probably then became retracted and was overtreated with a Silastic implant. At 14 years, the nasal tip was flat, the alae were flared, the nostrils were without sills, the columella was thick and prominent and the central vermilion of the lip showed a whistling deformity.
R.R. The alar bases were advanced across the nasal floor to reduce the flare and create nostril sills. Midline longitudinal elliptical excision of the columella and removal of the Silastic implant reduced the mid-column. Reduction of the alar cartilages and the hump and bilateral osteotomies and alar cartilage folded as free grafts to the membranous septum improved the nose. A V-Y advancement posterior mucosa created a tubercle in the whistling deformity of the lip.

THE SHARP-ANGL ED NOSTRIL AND COLUMELLA RETRACTION

This bilateral cleft lip and palate patient, after an untold number of surgical procedures, presented retroposition of the maxillae, most noticeable in the alar base areas, a columella with retraction, a peculiar asymmetry of the nostrils, a protuberant lower lip and a receding chin.
Cancellous iliac bone grafts were placed between the maxillae and the prexmaxilla and under the alar bases. A Silastic sponge was inserted through a labial sulcus incision to improve the chin projection, and a wedge resection of the lower lip reduced its protuberance. Then a reduction rhinoplasty was carried out, and cartilage from the hump and septal submucous resection was inserted into the columella through a midline vertical skin-splitting incision. Finally, a left alar marginal "excision" was retained as a flap based superiorly and medially and transposed back into the vestibule at the top of the arch to round out the sharpness of the ala-columella angle and to symmetrize the nostrils at the same time.

**FLAT NOSE**

This 26-year-old man had a bilateral cleft lip closed in infancy with the prolabium in the center of the lip. The columella
The patient would now benefit by an Abbe flap and eventually may accept it.

GRIDIRON LIP SCARRING

A 17-year-old girl, born with a complete bilateral cleft of the lip and palate and a pair of mucous pits of the lower lip, was treated at various U.S. naval hospitals and provides a case against the armed services' shifting of patients from doctor to doctor. Evidently the lateral segments were attached to the prolabium primarily, resulting in the usual stretching and flattening of the prolabium, which bulged against the projecting premaxilla.
At one stage, as shown, circumalar cheek incisions were used, probably in a frantic attempt to mobilize the cheeks to aid the lip. A Gensoul-type flap was shifted into the columella, with reasonable nasal tip release, but the price of this maneuver totaled three vertical scars in the upper lip, which also tightened the lip to even more noticeable flatness.

This situation stimulated another surgeon at another naval hospital to call upon an Abbe flap. It had to be taken from an unsatisfactory lower lip that had previously had a pair of mucous pits excised and reexcised. The cost of this action was the addition of two more scars or a total of four vertical upper lip scars, not unlike a gridiron.

When first seen as a secondary problem, the patient was 17 years old with a retracted columella, cheek scars, a flat lip with four vertical scars and one scar of the lower lip. Her maxillary and
mandibular relationship and occlusion were considered within normal limits by orthodontist Berkowitz. Even more impressive was her cheerful, optimistic and appreciative personality.

Bilateral upper labial sulcus incisions with back-cuts allowed freeing of the labial mucosa and its medial advancement. After the orbicularis oris muscles had been sutured together behind the prolabium, the posterior mucosal flaps were rotated and sutured, giving more fullness to the free border. A submucous resection of septal cartilage supplied two struts, which were introduced into the columella to relieve its retraction and give improved definition to the nasal tip.

The flatness of the lip and the absence of the cupid's bow inspired the use of my modification of the cupid's bow operation. As the lip was not long vertically, it was necessary to keep this a
"mini" procedure, further bolstered by the grafting of subcutaneous tissue in the mid-tubercle area. Sanding abrasion of alar base, cheek and all four vertical lip scars gave some improvement. The final result has been touched up with routine makeup.

**ASYMMETRIES, ANGLES AND BORDER SCARRING**

This bilateral cleft patient was born one of twin girls. Over her first 10 years she had 14 operations, which included a forked flap, a Cupid's bow procedure and bilateral commissurotomies. At 11 years of age she revealed a nasolabial angle snubbed abnormally wide open, asymmetrical nostrils, scarring of the normal mucocutaneous junction ridges and destruction of the natural commissure angles with widespread irreversible scarring. The upper lip was slightly tight in relation to the lower, but its vertical height was within normal proportions. This result represents inartistic use of accepted standard procedures, which while improving the original deformity also creates some extremely perplexing secondary problems.

I first saw the patient at 11 years and stalled secondary surgery for six years, during which time more thought and worry were spent on her than on any other cleft case in my experience. In the first place, the problem was extremely difficult because a Cupid's bow operation had scarred the natural mucocutaneous ridge and a forked flap had lengthened the columella with asymmetry and an unnatural nasolabial angle. As the little patient and I shared...
Finally, at 17 years, a cleft lip rhinoplasty included alar cartilage reduction, bridge lowering, and septal shortening at the nasal spine. A V-Y lateral advancement of the alar bases opened the nostrils and lowered the strangely elevated nostril sills. Upper labial sulcus incisions with bilateral mucosal advancement gave the lip more freedom and body.

One year later, further alar cartilage reduction and more radical bridge straightening followed by bilateral osteotomy improved the general shape. A submucous resection improved the airway and provided septal cartilage struts which were used to improve
the columella. One strut was inserted in the upper columella to give nasal tip thrust; a second strut was used to increase the columella convexity in profile.

Free border vermilion trimming and a soft tissue free graft to the tubercle improved the lip shape.

21 years

She is in college and having a happy time.
LOOKING BACKWARD
AND FORWARD, BILATERALLY

As we glance back, it is almost painful to recall how the evolution of a sound, staged solution to the primary bilateral cleft lip deformity has demanded such a prolonged, rugged climb interrupted by side-tracks, dead-ends, drop-offs, detours, lay-bys and back-tracks. True to the motto of striving for the beautiful normal, guided by basic principles and influenced by critical evaluation of results, I am continually trying to formulate and put into action a design that can both promise and produce happy results with minimal secondary deformities requiring fewer corrections and offering greater potential for perfection.

Yet possibly almost as encouraging is the hope that can be offered to those cases in which many basic principles already have been severely violated, producing results that are truly frightening. If the same old principles are conjured up again, they can be used to correct seemingly irretrievable secondary deformities and actually achieve end results that are near normal and sometimes even attractive.

Semper investigans, nunquam perficiens.
Always seeking, never quite achieving perfection.
This world is very odd we see,
We do not comprehend it.
But in one fact most all agree,
It’s worth a try to mend it.
An Interdisciplinary Workshop Conference on the Evaluation of Recent Advances in Cranio-Facial Surgery was held at the University of Illinois Medical Center, November 1974. Resident David Slepyan in attendance at the conference returned enthusiastic about Paul Tessier’s classification of craniofacial clefts based on his lifetime collection of cases. Craniofacial and orbitomaxillary clefts are rare malformations, compared to cleft lip and cleft palate, and extend through constant lines or axes through the eyelids or eyebrows, nostrils, lips or maxillae. Bone and soft tissue are seldom involved to the same extent. Soft tissue defects are more common from the midline to the infraorbital foramen while bony defects are more severe lateral to the infraorbital foramen.

It is Tessier’s theory that facial clefts have their origin on the cranial base and thus can be traced from the cranium through the orbit to the face regardless of main blood vessels or growth centers. Cleft O represents midline clefts from face to base of
A PRACTICAL APPLICATION

An adult Vietnamese male with a wide unilateral cleft of the lip involving the alveolus but with the columella intact and a unilateral cleft of the alar rim, was discussed by Jean Maes in *Plastic and Reconstructive Surgery*, September 1974. The patient had caused Maes much trouble for not only had he failed to return for scheduled surgery but he refused to fit into a standard classification. Richard Stark, after ruling out noma, interpreted the anomaly as a median cleft of the primary palate and cleft nose with imperfect naris formation. Actually, the case seems to fit quite simply into Tessier's classification of facial clefts as cleft 1, a standard unilateral cleft of the lip traversing the nose at the alar dome.
Median clefts of the upper lip are considered the result of the failure of mesoderm migration or merging of the nasomedial prominences themselves.
INCIDENCE

Median clefts of the upper lip may be normal in such animals as the hare, the llama and the camel, but in the human they are rare. Belgian Debrisieux in 1904 reported a case and stated:

Median harelip is one of the rarest occurrences in the list of congenital anomalies.

By 1923 Truman Brophy of Chicago had acknowledged 23 cases on record. Sir Arthur Keith had shown him 12 specimens in the museum of the Royal College of Surgeons, London, and to these he added the Belgian case, one reported by Burke, one by Dun, seven in his own practice and one in the clinic of his friend T. L. Gilmer. Von Bruntz reported no median in 555 clefts of the lip. In 1935 Warren B. Davis of Philadelphia found five median clefts in 688 cleft cases. In 1965 Fogh-Andersen of Denmark reported 15 in a total of 3,988 facial clefts, and in 1968 Vilar-Sancho Altet of Spain added six to the world literature and estimated the incidence at one in a million births.

It is difficult to evaluate these numbers and percentages because of the "true and false" controversy.

CLASSIFICATION

Two varieties of median clefts were first delineated clearly in the latter part of the nineteenth century by the German surgeon Friedrich Trendelenburg, even more famous for his head-down position. He grouped midline clefts on this sound basis:

1. Double cleft of the upper lip with failure of development of the intermaxilla.
2. True median cleft of the upper lip with development of the intermaxilla.

J. W. Ballantyne in 1904, E. J. Herbst and Apfelstaedt in 1930 and F. Braithwaite and J. Watson in 1949 grouped median clefts into "true" and "false" varieties. Thus, some recordings may be including both groups while others are confined to the so-called true median clefts. The only median cleft described in Brophy’s series revealed absence of the lower portion of the nasal bones,
columella, prolabium and premaxilla and, in fact, must have been a "false" or pseudomedian type. Davis' series did not even record whether the cleft was complete or a notch. Out of Fogh-Andersen's series of 15, 7 were complete median (pseudomedian or "false") clefts, and in Vilar-Sancho's cases two were "true" and four were varieties of the "false" type. In addition, accurate recording of the "false" group is virtually impossible as the life expectancy is so short.

In 1938 Veau favored three median groupings: a notch, a median cleft extending to the columella and a median defect caused by atrophy of the whole median element. In 1963 Brucker, Hoyt and Trusler of Indianapolis, with three additional cases of agenesis of the frontonasal process associated with cerebral anomalies and with more focus on the facial anomalies, suggested a general descriptive term, "median cerebrofacial dysgenesis." In 1968, with Sidney Williams, I proposed

that any congenital, vertical cleft through the center of the upper lip, no matter to what extent, be classified as a median cleft of the lip. If any vestige of prolabium is present, then it becomes bilateral.

We further divided median upper lip clefts into two groups: (1) agenesis of the medial element and (2) clefts of the medial element.

In 1971 Pinto and Goleria of Bombay divided median clefts into two groups also and refer to group I as agenesis with gross deficiency of the tissues that would have developed from the median nasal process. They refer to group II as failure of fusion, which may vary from diastema to median lip muscle gaps to median clefts associated with broadening and duplication of philtrum, columella, nose tip and nasal septum. They suggested that faulty fusion accounts for midline sinuses, dermoid cysts and fistulae. They noted that the developing face presents a very broad, flat configuration with widely separated eyes and nasal pits. Reduction of this wide interorbital and interolfactory distance is accomplished by what Mehta Lopa and Kothari have termed medialization—the rapid growth of lateral mesoderm pushing the eyes and nose toward the midline. This process can vary from
extreme hypertelorism to actual cyclopia. Medialization also brings about invagination of the median nasal process to form septum, columella, philtrum, frenulum and premaxilla. Hypo-medialization will be responsible for hypertelorism, thick septum, broad or double philtrum, broad or double columella and double frenulum.

SYMBOLIC RECORDING OF MEDIAN CLEFTS

To facilitate the recording of the two main types of median clefts, Desmond Kernahan of the Chicago Children’s Memorial Hospital in the May 1973 Plastic and Reconstructive Surgery added symbols in the center of the fork of his striped Y. A small midline block was used to represent a central cleft lip while a total filling of the fork signified a median cleft lip with absence of the primary palate.

R L R L

A SUBDIVISION

In 1973 Ingolf Koblin of the University of Düsseldorf proposed the classification of median and pseudomedian clefts of the primary palate. He acknowledged the true median clefts (deficient development and penetration of the central mesoderm) and his special type of pseudomedian clefts (absence of the central mesoderm causing a defect of the related structures) as seen in unilateral and bilateral clefts associated with hemiplasia and aplasia of the premaxilla.

This case, with no family history of anomalies, might be
considered a case of pseudo-pseudomedian cleft. There was a unilateral cleft lip with absence of the anterior septum and premaxilla but a severe median cleft of the secondary palate. There were also several associated anomalies: cryptorchidism, hypospadias, heart defect, webbed neck, aplastic anemia and cephalic abnormalities possibly including mongolism. The patient died in infancy.

Here is what I would interpret as a Koblin pseudomedian cleft with a unilateral cleft of the lip, absence of the septum and hemiplasia of the premaxilla.

The temptation was to treat this anomaly like a median cleft, but the presence of two-thirds of a Cupid's bow on the left stimulated use of the rotation-advancement principle, which at least achieved lip balance with normal landmarks. The alar bases were placed in symmetry, and the skin bridge, which was all that was present of a columella, was centralized.
If the patient reappears at about 15 years of age, a Gillies hinge graft will raise the nasal tip and create a bridge at the same time.

DeMYER

The present undisputed champion of median cleft lip, its classification, diagnosis and medical management, is William DeMyer, Professor of Neurology, Indiana University School of Medicine. He sees three or four cases a year. In previous articles with W. Zeman and C. G. Palmer in 1963 and 1964 and unaided in 1967, DeMyer set the stage for Grabb to invite him to write an excellent section in 1971 on median cleft lip. He noted the distinct and separate syndromes of facial anomalies associated with complete median cleft lip:

1. The syndrome of median cleft lip with orbital hypertelorism.
2. The median cleft face syndrome with hypertelorism.
Diagnostic Facies of Holoprosencephaly and Parallelism with the Brain

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<td>Cyclopia</td>
<td>Ethmocephaly</td>
<td>Cephalopha</td>
<td>Median cleft lip</td>
<td>Philtrum premaxilla anlage</td>
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DeMyer’s group I is characterized by a median cleft of the lip and absence of the premaxillary bone, nasal septum, nasal bones and crista galli. The ethmoid bone, which sets the interorbital distance, is hypoplastic, resulting in orbital hypotelorism. The eyebrows join each other across the midline. Occasionally, the forehead reveals a median keel-like protrusion known as trigonocephaly. The secondary palate may or may not have a median cleft. This group has an unmistakable facies, and it is pathognomonic of a severe congenital brain defect with amentia.

This Face Predicts The Lack of Brain

DeMyer has a simplified delineation of the central nervous system as a tube sealed off at each end. Normally, the rostral end bulges out like an expanding balloon which undergoes diverticulization into paired cerebral hemispheres, into paired optic bulbs and into olfactory bulbs.
II. Ethmocephaly

III. Ceboccephaly

In this anomaly there is serious curtailment of diverticularization. Instead of dividing into hemispheres, the cerebrum remains holospheric like the original simple balloon, so the generic term for this process is holoprosencephaly.

The olfactory diverticula are almost always absent in such a brain, a condition which earns the term arhinencephaly. The arrest in diverticularization can occur at any stage. When there has been no hemispherization of the brain, the interhemispheric fissure is absent and there are no lobes, then the malformation is alobar holoprosencephaly. If the arrest occurs at a later stage and the face and brain are better developed—the interhemispheric fissure extending to the frontal poles, which still keep their continuity across the midline—the malformation is lobar holoprosencephaly.

Although median cleft lip with orbital hypotelorism is the commonest facies with holoprosencephaly, it is merely one stage in a spectrum of malformations. In 1967 C. J. Kurlander, W. DeMyer and J. A. Campbell diagramed a fascinating group of facies of holoprosencephaly.

Facies I is the severest degree of orbital hypotelorism, revealing cyclopia with a single median eye in a single median orbit. A subgroup showed a single globe in a single orbit but with two corneas.

Facies II is ethmocephaly, with the orbits completely separated and the tubed proboscis having migrated from the forehead to between the eyes.

In facies III or ceboccephaly, the proboscis lies on its side but is still a fleshy tube lacking skeletal support. DeMyer calls the nasal shift from I to III the “march of the proboscis.”

In facies IV, the proboscis has been replaced by nares, but the nasal bones and septum are absent. In facies I through III, although the lip is not cleft, it has no true philtrum and the premaxillary bone is missing. Facies I through IV, according to DeMyer, are almost invariably associated with alobar holoprosencephaly, although one of his cases in IV had lobar holoprosencephaly.

In facies V there appears the intermaxillary segment consisting of rudimentary prolabium and premaxilla which removes it from
the median cleft grouping. Facies V has a variable expression of holoprosencephaly, sometimes arhinencephaly or even a brain that is generally normal but usually small and deficient in developmental potential. DeMyer states that the median cleft lip facies IV is pathognomonic of holoprosencephaly, for among 30 autopsied cases in the literature and 14 of his own there have been no exceptions. Occasionally, holoprosencephaly occurs without a warning facies so that DeMyer editorialized:

The face invariably predicts the brain, but the brain does not invariably predict the face.

**DIAGNOSTIC CONFIRMATION**

Confirmation of orbital hypotelorism is obtained by measurement of interorbital distance on posteroanterior x-ray films of the skull. Electroencephalography will show abnormal patterns. Transillumination is also possible.

**TREATMENT**

Treatment of median cleft lip with holoprosencephaly is usually not in the realm of plastic surgery. As pointed out by DeMyer, patients in facies I through III invariably die in the neonatal period, and those in facies IV usually die in the first year. Patients in facies V may survive to adulthood, but death in the early years of childhood is likely. Infants with alobar holoprosencephaly, facies I through IV, are amedited, whereas infants with lobar holoprosencephaly, facies V, may show slight developmental progress but will be hopelessly retarded.

Patients with median cleft lip and holoprosencephaly have difficulty with feeding, temperature control and convulsions. DeMyer notes that a regular infant diet can be administered through a bottle or Asepto syringe, that oscillations in temperature need not be treated with antibiotics unless a specific infection is diagnosed and that phenobarbitol or Dilantin need be given only after the onset of clinical seizures.
GENETIC COUNSELING

From reports in the literature there is evidence that, once a child with median cleft lip and holoprosencephaly has been born in a family, the risk of another affected child is high. For this reason, DeMyer advises that the parents be warned of this reproductive risk so they can make a rational decision whether to procreate or adopt.

UTILITARIAN SURGERY

As I noted in 1968, all of these patients are without mentality, do not survive beyond infancy and thus do not require corrective surgery. Once the diagnosis of alobar holoprosencephaly has been made, the prognosis is sealed and the parents should know that only one in a hundred survives the first year. It is far better that the infant be placed in an institution. If the parents insist on keeping the child, and if it survives more than the usual period, closure of the median lip cleft is possible. Extensive facial reconstruction, of course, is not warranted, but any large median gap in the upper lip is ideal for a lower lip-switch flap. When the columella is missing, it can be partially constructed by extending the distal portion of the flap. The lack of nasal support will certainly prevent an aesthetic result, but closure of the cleft does facilitate feeding and improves appearance for the family's relief during the indefinite existence of the patient.
This semilobar holoprosencephaly patient with small brain, hypertelorism, flat nose with absence of septum and columella and median cleft of the lip and alveolus had a primary Abbe flap with a columella extension to facilitate feeding. The patient lived to the age of 18 months and the case was published in Plastic and Reconstructive Surgery, July 1968.

C. R. Dehaan, for Stark in 1968, reported on a median cleft of the lip associated with microcephaly, arhinencephaly, orbital hypotelorism, bilateral exophthalmos, absence of the entire central portion of the lip (including the premaxilla but with a normal palate posterior to the incisive foramen) and a single central ostium leading into a nasal cavity devoid of vomer, septum and ethmoid plate. He had treated four "true" median clefts which were actually of the pseudomedian or "false" type. He described the surgical treatment:

The clefts were repaired by a simplified straight-line technique during the first week of life to facilitate feeding. The infants tolerated the surgery well, but none survived longer than 5 weeks.

C. J. T. Pinto and K. S. Goleria of Bombay, India, in 1971 at the Congress in Melbourne added three agenesis cases with median cleft lip and holoprosencephaly to the world records, stating that for these no surgical treatment had been indicated or administered.

**FOUR EXCEPTIONS**

The cases of B. Vilar-Sancho Altet, Jacob Longacre, Jack Fisher, and James Wells constitute four exceptions. B. Vilar-Sancho Altet of Madrid, Spain, reported a case in Revista Española Cirugía Plastica in 1968 that certainly confuses the issue and breaks DeMyer's rule that the face invariably predicts the brain. A nine-year-old male had agenesis of the right eye and hypotelorism, elongation of the middle third of the face with absence of the dorsum of the nose as well as absence of the premaxilla and prolabium. The patient also had tetralogy of Fallot but other-
wise was normal, even in intelligence. Vilar-Sancho Altet admitted that had he first seen the patient as a newborn he would have diagnosed his condition as arhinencephal and postponed surgery.

Treatment: The median cleft of the lip was closed with an Abbe flap, the distal portion being used to construct the columella. Both Vilar-Sancho Altet and I reported the same approach on median clefts in the same year, 1968.

The generous Jacob J. Longacre of the University of Cincinnati collected rare books and rare cases over the years until he accumulated the third largest private plastic surgery library in the world. He treated some very fascinating patients. Cognizant of his treasure chest of cases, I requested a median cleft and was rewarded with this rarity treated with split-rib grafts and this comment:

In review of the literature I have failed to pick up another case which following survival was so treated.

As crowned champion of the split-rib graft, Longacre first used the principle in 1952 and applied it to a variety of deformities, publishing about 20 papers on the subject. In December of 1974 he kindly forwarded this unpublished case report.
This child was born with a complete midline defect with absence of premaxilla, prolabium and columella with associated cleft lip and cleft palate deformity. The findings of midline cleft, hypotelorism, and microcephaly are most compatible with a diagnosis of arhinencephaly. The lip was repaired at five months and revision of the lip repair by Dr. O’Malley in Orlando at age one year. Motor and sensory development was slow; the patient was still crawling when first seen at age two. Frontal and lateral x-rays revealed the microcephalic skull with the grossly deformed and hypoplastic maxillae and malars with associated midline cleft and absence of the premaxilla. The interorbital distance measured 15 mm. due to hypoplasia of the ethmoids.

Following expansion and cleft palate repair by Dr. Longacre at age four, he developed a vocabulary of 250 words within six months and two of the words he used constantly were “no nose, no nose.” A columella was reconstructed with local tissues and the defect of the middle third of the facial skeleton reconstructed in two stages with split-rib grafts to malar, maxillary and nasal regions improving patient’s appearance at age four and one-half, and six.

Bilateral ptosis of eyelids still gave the patient a very stupid appearance. This was corrected with fascial slings tied into the frontalis muscle during the operation for insertion of the third set of onlay split-rib grafts. Following this, the patient showed a tremendous spurt of improvement in vocational, academic, and social adjustment. He is now ten years of age and attending regular school. Frontal and lateral x-rays reveal the autogenous bone support provided to the extensive midline defect of the facial skeleton by the staged split-rib grafts.
An odd coincidence

During the 1974 American Board of Plastic Surgery examinations in Portland, Oregon, one of my questions directed at Jack D. Fisher was on the subject of holoprosencephaly. Five months later, he repaid me by reporting that he now had a case of a related nature. Subsequently, photographs and the accompanying history and physical findings were forwarded from the University of Virginia Medical Center, Charlottesville, by resident James H. Wells, who with Jack Fisher will be publishing this case report.

This three-month-old female, born of unrelated parents but with a paternal aunt having unilateral cleft lip and palate, was the product of a pregnancy complicated with polyhydramnios and a question of aspirin overdosage at two to three months' gestation. Her birth weight was 5 pounds 5 ounces, her Apgar score 8 at one minute and 9 at five minutes.
Her deformities include a hypotelorism, cleft lip and palate, clinodactyly, and a microcephaly; head circumference was 32 cm. at two months. She had a neuroencephalogram performed, and this is a summary of the radiologist’s report.

Impression: This examination shows evidence of severe focal superficial atrophy with an almost porencephalic area in the right parietal region. An absence of the septum pellucidum, slightly fuller ventricles than one would expect in this age, and midline cerebellar agenesis or atrophy.

It was reported by Wells:

To date, she appears to have a normal growth and development pattern. She is eating well, gaining weight, utilizing a Lamb’s nipple.

Discussion with Fisher indicated his plan of bilateral rotation of the lateral lip elements with closure of the muscles in the midline. This seems a logical first step, and if the patient shows reasonable progress, then an Abbe flap with an extension could create a philtrum and columella. Craniofacial surgery in a reverse Tessier and split-rib grafts might be indicated in this case and possibly in that of Vilar-Sancho Altet.

**SURGICAL TREATMENT OF HYPOTELORISM**

Although most cases of orbital hypotelorism will not deserve surgical correction, as noted there are exceptions. In 1975 in *Plastic and Reconstructive Surgery*, Converse, McCarthy and Wood-Smith reported the first correction of an orbital hypotelorism. Although no cleft was involved, the case and the treatment are of interest.

The patient was a Caucasian girl born with orbital hypotelorism and hypoplasia of the nasomaxillary region. The nose was flattened, the columella shortened and the septum absent. She received grafts of autogenous cartilage, composite earlobe and preserved cartilage to her nose between the ages of two and nine years. At 14 years she revealed an intercanthal distance of 19 mm. and radiographic interorbital distance of 14 mm. (24 mm. expected for this age). A diagnosis of nasomaxillary dysostosis (Binder) was made.
In 1972 surgical correction was undertaken through a combined craniofacial route, similar to that for correction of orbital hypertelorism. The bony orbits were mobilized by superior horizontal osteotomies, vertical, inferior horizontal and paramedian osteotomies and a transverse cut of the orbital roof. Segments of bone were removed from the lateral aspect of each roof.

The orbits were then translocated laterally for a total distance of 8 mm. The resulting defects in the roof and in the nasofrontal areas were filled with iliac bone grafts [BG].

The patient subsequently had an inlay nasomaxillary skin graft, and the total surgery resulted in a definite improvement in her appearance.
58. Median Cleft Lip with Hypertelorism

In DeMyer's group II, the median cleft face syndrome, there is a median cleft lip, bifid nose, orbital hypertelorism and cranium bifidum occultum. The premaxilla is present except in the severest cases, but it may be cleft, with incisors erupting along the premaxillary cleft. The brain is usually normal or may show hypoplasia or absence of the corpus callosum. Intelligence is normal or only mildly impaired, and life expectancy is normal.

Embryologically, the median cleft face syndrome can be regarded as an arrest in facial development. The eyes begin on the sides of the face and, normally, migrate medially for stereoscopic vision. The nose begins relatively broad and flat, the nares being separated by a cleft formed by the medionasal processes. Somehow, the eyes stop their migration too far apart and the nose remains bifid, but whatever the process, it rarely interferes with forebrain morphogenesis and the brain develops normally.

TREATMENT

As patients with the median cleft face syndrome usually have normal mentality and longevity, they are candidates for corrective surgery.

In 1968 I attempted a total listing of all cases of this type recorded in the literature and added four that we had treated. This listing of 25 did not include any of Brophy's 23 as no
description of the type of cleft had been made, nor did it include Davis’ series, for the same reason. To my list must be added two cases reported in 1934 by Ritchie and one of Vaughan’s as well as a case published by DeMyer in 1967 with a median cleft of the lip, bifid nose, orbital hypertelorism and cranium bifidum occultum. Also in 1968, Vilar-Sancho Altet described two more of this type of median cleft.

Then in 1971 Pinto and Goleria added another eight cases and described their treatment. Others have been discovered to a total of 74, as will be noted.

In 1972 L. A. Krikun reported 64 median clefts of the nose, noting the typical deformities such as the groove, hypoplasia of the septal cartilage, cleft of its anterior margin, alar cartilage atrophy and deformity, abnormal position of the triangular cartilage and nasal bones and hypotrophy of the terminal part of the nose and columella. The most frequent abnormalities of the face were found to be hypertelorism, divergent strabismus, a wedge of hair on the forehead, deformation of the frontal bone, wide separation of the eyebrows, median cleft of the upper lip vermilion and abnormal development of the dentomaxillary system.

Then there are the great cases of Tessier and, undoubtedly, there are others. It is of interest that John Converse of New York University Medical Center, as of November 1973, had a series of 26 patients with ocular hypertelorism (Crouzon-Apert). Of these, two had bilateral cleft lip and palate and one a cleft of the hard and soft palate, but none had a midline upper lip cleft.

1. Median cleft of the lip musculature without cleft of skin or vermilion was reported by Pinto and Goleria of India. Treatment: Through midline vertical skin incision, muscles mobilized and approximated across the cleft with chromic catgut. Skin closed with nylon.

2. A vermilion notch was cited in a case of H. S. Vaughan of New York.

3. In a case reported by Braithwaite of England, a median
notch of the upper lip vermilion extended upward to the level of the mucocutaneous junction, which continued upward as far as the columellar base as a flattened shallow depression. The columns of the philtrum were more separated than is normal, but the nose was normal, except for a broad columella. A double frenulum extended from the lip to the alveolus. Although Braithwaite considered his "notch" case a separate entity, subsequent cases show it to be the least of varying degrees of the same median cleft process involving the lip and nose.

4, 5. Similar vermilion notches were seen in two brothers reported by Fogh-Andersen of Copenhagen.

6. A 25-year-old white female had a minimal midline notch of the vermilion and a tiny dimple at its center with its tract extending through the orbicularis oris muscle to a fibrous band attached to the nasal spine. There was also hypertelorism (43 mm. between medial canthi) in this case reported by Bartels and Howard of Orlando, Florida. Treatment was confined to excision of the total tract and closure.

7. A 19-year-old female with a minimal vermilion notch, lack of muscle union, diastema and an ovoid swelling of the left part of the lip was operated on once before being seen by Pinto and Goleria. Treatment: Through midline incision, muscles approximated, fibrofatty mass excised and vermilion notch corrected.

8. Median notch of the vermilion and cleft of the soft palate were reported by Vilar-Sancho Altet of Madrid. Treatment: Z-plasty of the vermilion and Wardill-Veau-Kilner pushback of the palate.

9. Midline cleft of lower quarter of the upper lip with an apparently normal nose was noted by Gabka of Berlin.

10. Median cleft of the vermilion and lower quarter of the lip with groove to the columella and no nasal deformity was reported by Vilar-Sancho Altet. Treatment: Inverted V excision by paring the edges and closure in V-Y fashion.

11. A one-year-old child with partial cleft lip associated with notch of alveolus and bifid frenulum was reported by Pinto and Goleria. Treatment: Excision of central vertical diastasis and use of a double Z-plasty.
12. An 11-year-old male with a partial median lip cleft, a diastema, a vestige of a prolabium and a protuberant polypoid mass from the right nostril attached to the lower part of the septum was reported by Pinto and Goleria. Treatment: Excision of the polypoid mass and simple paring of the cleft edges in an inverted V with approximation in layers of the deeper tissues.

13. A five-year-old boy had a median cleft of the inferior quarter of the upper lip with a vertical submucous cleft extending to the columella associated with two pedunculated club-shaped skin masses, one projecting from the septum out of the left nostril and the other from the alveolus margin between the central incisors. There was also a double frenulum, crescent defect of the left ala, bony depression over the frontal bone and hypertelorism in this case reported by Laxman Sharma of Nagpur. Treatment: V excision of cleft margins closed lip defect. Septal mass used in reduced form to reconstruct alar margin.

14. A median cleft of the lip from vermilion to columella with a normal nose was reported by H. P. Ritchie of St. Paul.

15. A six-month-old boy with median cleft of half of upper lip, short broad columella with median groove, alar cartilages separated in the broad nasal tip and double frenulum was noted in India by Laxman Sharma. Treatment: Three-layer closure of lip cleft after paring of edges and dissection of muscles.

16. A 30-year-old male with a partial cleft of the vermilion, a double philtrum, irregularity of the teeth with a supernumerary incisor just below the cleft and cleft of the left nostril was reported by Pinto and Goleria. Treatment: V excision of middle of lip with approximation in layers and local rotation correction of notched nostril.

17. A midline vermilion cleft with shortened nasal alar cartilages, atypical cleft palate, malformed lobulated tongue and normal chromosome findings (oral-facial-digital syndrome) was reported by Brucker and others.

18. An oral-facial-digital syndrome with a slight median cleft lip, atypical cleft palate and 13–15 trisomy was reported by Fogh-Andersen.

19. An oral-facial-digital syndrome with a slight median cleft lip, atypical cleft palate and normal chromosome findings was also reported by Fogh-Andersen.
20. Oral-facial-digital syndrome was associated with cleft in the mid-portion of the tongue with long pedunculated mass of tissue, pseudocleft of mid-upper lip border, total absence of premaxilla, hypertelorism, atypical cleft of secondary palate and encephalocele in palate fissure. Treatment: Encephalocele operated on at six months and lip and tongue at one year. Tongue mass revealed flat epidermal-like epithelium without keratinization covered with nests of striated muscles in richly vascularized connective tissue stroma as reported by Poradowska and Jaworska.

21. Oral-facial-digital syndrome was associated with pseudocleft of the mid-upper lip extending to the alveolar process, short columella, gross mandibular hypoplasia, complete cleft of secondary palate with fibrous band running from buccal mucosa, trilobulated tongue attached to the floor of the mouth and microphthalmus. No treatment because of early death. Case reported by Poradowska and Jaworska of Warsaw.

22. A pseudo-median cleft of the upper lip was found in one patient with Treacher Collins syndrome by Poradowska and Jaworska.

23. A seven-year-old Haitian girl (operated on at Albert Schweitzer Hospital, Des Chapelles, Haiti, 1964) had a median upper lip cleft extending vertically through the vermilion and skin about 1 cm. and continuing as a flattened shallow depression to the base of a broad columella. The philtrum columns were widely separated, the columella was wide and it had a vertical elevated ridge running up its center. The left nostril was larger
than the right. There was no alveolar notch or palate cleft. This is just a more advanced degree of notching, with the same but more exaggerated ancillary deformities. The case was published in *Plastic and Reconstructive Surgery*, July 1968. Treatment: Elliptical excision of the midline columellar prominence narrowed the column. Excision of a narrow inverted shield from the flattened central lip moved the philtrum column into better position, created a suggestion of a philtral concavity and produced the skin lengthening and the vermilion fullness of a cupid's bow and tubercle.

24. A nine-month-old male child with a wide median cleft of the lip, cleft of the alveolus and broadening and flattening of the nose, lip and columella with a fatty mass protruding from the base of the columella was reported by Pinto and Goleria. Treatment: The lip was closed by a vertical excision and a double Z-plasty. A vertical excision of the skin of the polypoid mass allowed use of the fatty tissue to round off the flat nasal tip.

25. A median fissure through the nasal tip, columella and lip was reported by H. P. Ritchie.

26. A case of bifid nose with minimal median cleft of the upper lip extending into the alveolus was reported by Francesconi of Italy for Mustardé.

27. A 19-year-old female presented a partial median cleft of the lip, bifid frenulum, bifurcation of the nose, which was short but broad, and a diastema, as reported by Pinto and Goleria. Treatment: First step in treatment was a forked flap to elongate the columella and a V excision of the middle of the lip with closure in layers.

28. A one-year-old child with a median cleft of the lip and alveolus, a bifid nose with a projection of fibrofatty tissue from both nostrils and a coloboma of the right upper eyelid was presented by Pinto and Goleria. Parents refused surgical correction.

29. An incomplete median lip cleft, cleft palate and meningocele of the septum was reported by Baibak and Bromberg of New York.
30. A six-month-old Jamaican boy (operated on at the Kingston Public Hospital, 1963) had a median cleft of the vermilion and skin about one-half the vertical length of the upper lip. The philtrum columns were widely separated, with a groove extending to the columellar base. The columella was quite broad, contained a raised vertical ridge and was extremely short. There was a slight midline notch in the alveolus. This case was published in *Plastic and Reconstructive Surgery*, July 1968.

Treatment: A forked flap was marked on the medial flattened edges of the lip cleft. The midline ridge was excised from the columella; it was then narrowed and lengthened by advancement of the forked flap. The freshened lip was brought together effectively in the midline. Sutures were removed on the fourth postoperative day, and wounds were healing well. Patient never returned to the clinic for follow-up.
31, 32, 33. Median clefts, referred to as "true" and associated with malformations of the hands, were in Fogh-Andersen’s series.

34. Stephanie in 1939 reported a median cleft of the upper lip with reduplication of the columella and nasal tip.

35, 36, 37, 38, 39. Esser in 1939, from Sanvenero-Rosselli’s clinic in Milan, reported five such cases of median cleft lip and reduplication of the columella and nasal tip. These five were all in the same family!

40. Peet and Patterson of Oxford presented a bifid nose with a partial median cleft lip but no defect of the alveolus and palate. Treatment: After simple approximation of the lip elements, an inverted V to Y advancement of the excess skin from the wide upper nasal bridge moved tissue into the bifid tip. The alar cartilages were later approximated for an excellent result.

41. An adult with median cleft of the lower one-third of the upper lip and a true bifid nose with flattening and separation of the nasal bones and a cleft between the alar cartilages was reported by Francesconi of Italy in Mustardé’s 1971 book, Plastic Surgery in Infancy and Childhood. Treatment: His management of this case is of interest. A midline vertical excision of the skin and subcuteaneous tissue of the nose and lip was followed by approximation of the separated nasal structures and a modification of the Hagedorn-LeMesurier quadrilateral flap for the construction of the upper lip.
Of equal interest are his thoughts on the causes of the deformity and the timing of the surgery. Giuseppe Francesconi of the Universities of Pisa and Milan developed his early interest in median malformations while in training with Sanvenero-Rosselli. During that time he had followed 12 cases, and since then he has added another unpublished four, one of which with rhinencephalon has been studied in anatomical detail. He tends to accept Sanvenero-Rosselli’s suggestion that bifid nose and median clefts of the lip are anomalies produced by disturbance in the fusion of the median raphe or median dysraphia of the face.

In his ancient villa in the Tuscan country near his Hospital of Lucca, Francesconi can escape these depressing malformations long enough to think and write about them. He expressed his leaning toward wise old Kazanjian’s “late reconstruction,” stating that extensive surgical procedures performed in childhood on delicate structures such as the nose may be dangerous. Although perhaps producing a satisfying result initially, the late result may be disastrous due to interference with normal tissue growth as the result of the trauma of the operation. Nevertheless, small operations . . . can be performed in childhood to improve nasal respiration and get rid of some of the deformity but a full plastic repair of the nose, which will involve cartilage and bone, must be deferred until late childhood or early adult life when the nasal structures are more developed.

42. A case was reported by Weaver and Bellinger of a median cleft of the lip extending to the base of the columella, with a split in the nasal septum, divarication of the alar cartilages and a bifid nose without skin division. Hypertelorism was present. Treat-
ment: This median cleft of the lip was closed by freshening the edges at two weeks of age. At two months the divided septum and alar cartilages were approximated, but no attempt was made to narrow the widely separated frontal processes of the maxilla. At three years the child still had a wide nasal bridge and tip.

43. A similar case (to 42) was reported by Lagos Garcia with a median lip cleft, bifid nose and hypertelorism.

44, 45. Similar cases to 43, and similar to each other except that one was Negro and the other Caucasian, were reported by G. C. Scrimshaw of Oakland. Both had median clefts of the lip and alveolus, bifid noses and hypertelorism.

46. DeMyer published a case with a median cleft of the lip, orbital hypertelorism, low V-shaped hairline, cranium bifidum occultum, bifid nose, median cleft palate, cleft premaxillary bone and normal life expectancy. No treatment was mentioned.

47. A three-month-old Jamaican girl was seen by us with an incomplete median cleft of the lip and bifid frenulum, but without cleft of the alveolus or palate. There was an asymmetrical bifurcation of the nose with a short wide columella and cleft of the right alar arch, and the right ala was high. Hypertelorism was present, as was a frontal bone defect with an encephalocele and convolutions of excess forehead skin.
This case was published in *Plastic and Reconstructive Surgery*, July 1968. Treatment: Still incomplete. A modified forked flap and midline closure of the lip cleft was carried out, along with alar rotation and transposition flaps by Sydney Williams. A neurosurgeon advised postponing any split-rib grafting to the frontal defect until the patient was older.

48. A 10-year-old boy from the island of Antigua with a median cleft of the lip vermilion was seen by us. He had a developmental confusion of the upper philtrum with divergence of the columns and a columella that was either absent or extremely wide. The nasal tip was wide and flat, the alae were notched bilaterally, the nasal bridge was wide and flat, and there was associated hypertelorism. A bifid frenulum was noted. His intelligence was within normal limits. This case was presented in *Plastic and Reconstructive Surgery*, July 1968. Treatment: A forked flap of the diverging philtrum columns was used to construct a columella. An L-shaped Silastic implant gave support to the tip and bridge. The alar notches were corrected by rotation into normal position. The patient’s return to Antigua postponed further nasal work.

49. A case was reported by Kazanjian in 1959 of a wide median cleft of the upper lip with absence of the prolabium and apparent absence of the premaxilla. Yet, at age three to six years...
the patient presented upper incisors which had to be extracted, as their roots were not surrounded by solid bone. The palate appeared to be normal but x-ray films revealed separation of the two maxillae. There was a severely bifid nose with a split columella and small symmetrical functioning nostrils one inch apart. Hypertelorism was also present. Treatment: At four months of age the median cleft lip defect was approximated, and the nasal bifurcation was brought together. Subsequent multiple procedures included surgery of the cartilage and bone; later, bone and cartilage transplants were done, followed by a forehead flap rhinoplasty. At the age of 26 years, the patient had developed well mentally. In retrospect, the surgeon regretted having operated on the bony section of the nose before the age of 15 years.

50. A similar case to 49, with median lip cleft and severe bifid nose, was reported by Baibak and Bromberg.

51. A case of median cleft lip and bifid nose was reported by Patten of Oakland.

52. A case of epignathus associated with a median lip cleft, palate cleft, bifid nose and severe hypertelorism was reported by Hirshowitz, Mahler and Heifetz of Haifa. Treatment: Surgical excision of tumor with postponement of surgical correction of the median lip cleft and bifid nose. Soft palate cleft was to have standard closure.

53. A 14-year-old Filipino boy had a bifid nose, encephalocele, microphthalmus, hypertelorism, median cleft of the lip, cleft of the primary palate and partial cleft of the secondary palate. Tomographic studies revealed an intact hard palate. Case reported by Converse, Horowitz and Becker of New York.

54. A case of marked bifid nose with a median furrow associated with a median cleft of the upper lip and hypertelorism was reported for Converse by Wang and Macomber of Albany.

55. Midline partial cleft of upper lip associated with broad nasal root in an infant girl with orofaciiodigital syndrome was reported by Fuhrmann, Stahl and Schroeder.

56, 57, 58. Three siblings, a sister and two brothers, each with a median cleft of the upper lip and associated polydactyly in the girl and one boy, were reported to me in 1974 by Joya Chowdhury of Calcutta.
59. A median cleft of the lip with a normal nose but hypertelorism which was closed "simply" and was progressing well at two years of age was reported by R. Mladick, C. Horton, J. Adamson and J. Carraway of Norfolk, Virginia.

60. A median cleft of one-third of the upper lip with a groove extending to the columella and aptly entitled "The True Hare Lip" was reported in 1974 by James A. Lehman, Jr., and Subbarraydu Cuddapah of Akron, Ohio. There was an associated double frenulum and tubercle and a flattened nasal tip and wide columella vaguely suggestive of a subliminal bifid nose. Treatment: Cleft marginal incisions, muscle approximation in the midline, and a "white roll" interdigitation at the mucocutaneous junction, which at one year revealed an excellent result.

61. Median cleft of the upper lip vermilion with hypodontia and occurrence of Ellis-van Crevel syndrome reported by Norbert Schwenzer of the University of Tübingen, West Germany. Treatment: Correction in one operation at age six years.

62. Unusual median cleft extending from the white portion of the lip to the lower third of the philtrum without complete fissure of the tissue. Treatment: Full thickness V excision correction at age two years by N. Schwenzer of West Germany.

63. A case with bilateral paramedial facial clefting, severe orbital hypertelorism, absence of nasal air passages and deformities of upper and lower extremities was reported in 1974 by Edgerton, Jane, Berry, and Fisher of the University of Virginia Medical Center, Charlottesville. Treatment: Glabella ostectomy, forehead flap for nasal lining and steel wiring at four months in an attempt at early shifting of the canthi. At eight months an abdominal flap on wrist vector was transported to create an adult-size nose. Further correction of orbital hypertelorism was planned prior to school age.

64-68. J. Chowdhury of Calcutta reported five siblings, three males and two females, with V- or quadrilateral-shaped median clefts of the vermilion of the upper lip. They each had postaxial polydactyly. No mention was made of the treatment as the surgery would be simple. It was found that these patients, their normal siblings and their parents all revealed no abnormalities in the chromosome studies.
69. A 57-year-old adult male with a median cleft of half the upper lip, a severely bifid nose and orbital hypertelorism was presented by David Frost on TV on January 18, 1975, from Gibsonton on the Gulf coast of Florida, where the freaks winter. This carnival performer, billing himself as the two-faced man, has been a popular attraction for years in the sideshow. He revealed remarkable adaptation to his untreated condition with not only a successful career in show business but a happy marriage to the lady two tents down exhibiting a peculiar skin condition.

Recently, Riccardo F. Mazzola of Milan University made a remarkable report of frontonasal malformations including five additional midline clefts belonging to this general category and one most unusual dyprosopia.

70, 71. Vermilion lip notch and bifid nose. No treatment reported.

72, 73. Midline cleft of the lip, bifid nose and hypertelorism. No treatment reported.

74. Median notch of lip, bifid nose and hypertelorism. No treatment reported.

Here is a very rare duplication of the face (dyprosopia) with a wide central cleft of the lip, alveolus and palate separating two well-formed, independent noses. Hypertelorism is present with an extra midline orbit, together with its eyebrow.

In the median cleft face syndrome, there are several general areas of surgery, which will be discussed in the sections that follow.

**MEDIAN CLEFT OF THE LIP**

If the cleft of the lip is minimal to moderate, the paring of the edges in an inverted V excision will allow a three-layer closure. A 90-degree angle in the excision is made 2 mm. above the mucocutaneous white roll on each side of the cleft. Approximation of these angles will give the lengthening of the skin in the specific area of the center of the cupid’s bow. This will provide not only the skin "spear point" but the heaping of the vermilion of a midline tubercle to create the semblance of a natural cupid’s bow.
In cases in which the columella is wide, the V excision should be extended to narrow the column.

If the lip cleft is minimal with a wide columella, then the columella reduction should be carried out separately.

When the cleft is extremely wide, a midline primary composite lip flap switched from the lower lip is available and can be used if direct closure of the cleft would tighten the upper lip relatively more than the lower.

**SHORT COLUMNELLA**

If the columella is short, the sides of the lip cleft can be taken as a forked flap. This procedure, in turn, will freshen the edges of the cleft and allow closure in an inverted V fashion in layers. Again, if the edges of the cleft are incised 2 mm. from the mucocutaneous junction with 2 mm. transverse cuts, the skin point of the center of the cupid’s bow can be created along with the vermilion tubercle.
BIFID NOSE

This deformity varies greatly in depth of the clefting, extent of spread and amount of asymmetrical distortion. Surgical correction includes bisection with removal of the excess mid-portion of skin, subcutaneous tissue and bone combined with the shifting of the distorted elements into balance. Closure should bring alar cartilages side to side. Alar notches are usually corrected by local rotations.

BIFID NOSE AND HYPTERTELORISM

Jerome P. Webster, New York plastic surgery tycoon of Presbyterian Hospital and College of Physicians and Surgeons, Columbia University, in his 1950 classic treatise with Deming in Plastic and Reconstructive Surgery on treatment of the bifid nose, pointed out the association with hypertelorism, either true or suggested, in 8 of his 10 cases. Yet true hypertelorism, or actual increase of the interpupillary distance, was present in only 4 of the 10. He pointed out with symbols that the illusion of hypertelorism was produced by wide spacing of component parts of the face adjacent to the eyes, such as increased intercanthal distance, flatness of a broad nasal bridge, presence of epicanthal folds and widely spaced eyebrows.

In that pre-Tessierian era Webster focused his surgical action on soft tissue and nasal bone reduction and shifting to reduce the illusion. He excised a wide vertical ellipse of forehead, glabella,
nasal bridge and tip skin from the columella all the way up into the hairline. He also resected the excess of the widened nasal bones, shifted them after in-fracture and fixed them with wiring. In addition he removed the subcutaneous fat at the sides of the nose and achieved medial shifting of the inner ends of the eyebrows by excision of the skin between or by V-Y advancement.

If, in addition, the nostrils were notched or retracted with the nasal tip flattened and the nose short, he advanced the entire skin of the nasal dorsum and glabella downward in a large V-Y, which not only narrowed the nasal bridge and corrected the tip but moved the eyebrows closer together.

As elevation of the nasal bridge is also effective in camouflaging the effect of wide eyes and improving epicanthal folds, onlay bone and cartilage grafts were advocated as a secondary procedure. In order to allow growth through infancy and early child-
hood, this aspect of surgery was postponed, but no longer than late childhood to reduce the inevitable psychic trauma.

Even these less extensive procedures can be time-consuming. J. P. Webster—"Webby" to his friends—was one of the founders of the American Board of Plastic Surgery and a great teacher, as is attested by the products of his renowned students. His meticulous and absolute attention to detail with no concern for time started a rumor that he operated at Presbyterian Hospital by the calendar rather than the clock. This is an appropriate time to repeat a Gillies principle: "Speed in surgery is never having to do the same thing twice." Get it right the first time without concern for the little extra time and beware jubilation over rapidity of action. Have your result rather than your speed of execution breathtaking!

**ORBITAL HYPERTelorISM**

As noted previously, median clefts of the lip are occasionally associated with orbital hypertelorism and can be treated simultaneously. The orbital hypertelorism with increased distance between the orbits, of course, is the major problem, involving surgical resection of the excess portions of bone and the shifting of the orbits together.

**THE TESSIERIAN ERA**

The imposing and dedicated Paul Tessier of Foch Hospital, Paris, a man of quiet poise, subtle charm and natural magnetism, has fathered this specialty, and others are following his inspiration and teaching. In the 1972 *Scandinavian Journal of Plastic and Reconstructive Surgery*, Tessier suggested the term orbital hypertelorism (OR.H.) and described it as a congenitally abnormally wide distance between the orbits and hence the eyes . . . [and] . . . is always a secondary syndrome, generally due to a facial or cranial cleft and sometimes to craniostenosis. Inter-orbital distance (I.O.D.) has to be measured on the skull [as the distance between the two "dacryons" (lacrimal crests) on a teleradiograph] or less accurately by measuring the distance between the medial canthi (I.C.D.). . . . Average normal I.O.D. is 25 mm.
in females, 28 mm. in males. Classification is based on the degree of inter-orbital widening. . . . 1st degree, I.O.D. 30 to 34 mm., is euryopia or telecanthus. 2nd degree, I.O.D. more than 34 mm., orientation and shape of orbits still are nearly normal. 3rd degree, I.O.D. usually 40 mm., orbits appear lateralized, the cribriform plate is often prolapsed, and the distance between the lateral canthus and auditory meatus is shortened.

Tessier concluded his opening abstract with this encouraging note:

We now have the proof that we can safely displace the whole of the "useful orbit" (i.e. within 8 to 10 mm. from its apex) in the three directions: transversely, as in OR.H.; sagitally, as in retrusion of the face or frontal bone . . . ; vertically, as in orbital malpositions secondary to trauma or to some complete orbitofacial clefts, generally unilateral.

Post-surgical review of efforts by Converse and Smith in 1959 and 1962, Schmid in 1966 and his own work with Guiot and Rougdrin in 1963 and 1965 showed that they were doomed to failure for, as Tessier noted:

They only moved a small portion of the orbital rim and practically nothing either of the orbital walls or periorbitum, and therefore had little effect in moving the globe itself.

This and other aspects pointed to the necessity for correction by the intracranial route, which was considered as early as 1960 but, as Tessier later wrote:

Nevertheless, it could not be carried out as long as there was a danger of meningeal infection; therefore, we decided to perform a preliminary operation to explore the anterior cranial fossa and to reinforce the dura by means of a dermal graft.

**Infrabasal or cranial routes**

If the medial orbital wall is vertical and if the olfactory grooves do not prolapse, an infrabasal osteotomy under the cribriform plate will be located above the eyeball equator and will promise success.

If the supraorbital rims diverge a good deal, if the nasal wall of the orbit is oblique and if the ethmoidal prolapse is noticeable, infrabasal osteotomy would be ineffective and the cranial approach is indicated.
Translocation of the orbits, including thin medial walls and hence the frontal process of the maxilla, which is the only strong structure, produces an atresia of the nasal airways, precipitating the necessity for full-thickness septal resection. Hypercorrection is suggested to counteract further growth in the child and to prevent possible intercranial hypertensive.

Tessier's general surgical indications

For 1st degree cases with minimal hypertelorism, treatment consists of palliative operations. 2nd degree cases involve partial ethmoidectomy via infrabasal route when ethmoidal prolapse is not noticeable. 3rd degree cases involve orbital ethmoidectomy via the intracranial route.

It has been said of the results of this craniofacial surgery: "This is herculean effort to transform the hideous into the ugly."

Tessier responds to that vague retort:

It appears that OR.H. has to be taken in consideration much more from an aesthetic point of view than from a functional one [in these mentally normal patients]. The abnormally wide I.O.D. is ungraceful. However, ugliness arises from the primitive malformations which produce OR.H. Here is the stumbling block. We can easily move the orbits and eyes closer together and grossly correct OR.H. but that does not mean that binocular vision is now possible in every case nor that ugly facial deformities and defects are avoided.

In 1972 I asked my friend Tessier how many cases he had had of median cleft lip associated with hypertelorism and whether he would send examples with the outline of their surgery. He responded in June:

Many cases of ocular hypertelorism have a median cleft lip, but this cleft is more or less complete, sometimes rudimentary. Most of them also have a frontal encephalocele.

Some cases have been previously operated on probably because their cleft was complete, but I cannot assess.

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<td>Partial</td>
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Enclosed, please find two operated cases: complete and partial.

Further details were forwarded in 1973:

The same basic procedure has been used for these two patients.
—cranial and facial routes
—fronto-naso-ethmoidal resection
—“square like” osteotomies all around and inside the orbits
—bringing the orbits closer together
—bone grafts of the four orbital walls and of the malar bone
—bone graft of the nose.

The partial cleft case
The patient with encephalocele also had rib-grafts of the frontal defect, as figured on the drawing.

The complete cleft case

The case without encephalocele had a "crown-like" frontal bandeau used for locking the orbital frames in a backward position in order to prevent enophthalmia, as figured on preoperative pictures.

Paul Tessier, it seems, gravitates toward the "big ones" in both work and play. As a break from his 12-hour-a-day "skull cracking" surgery he chose to hunt bull elephants in French Equatorial Africa. In khaki jacket and bush helmet, accompanied by 40 black porters in white loincloths, he set off from Bangui into the
jungle on foot. Days later he reappeared with his line of black porters heavily laden with giant tusks of ivory.

There is a charming story of Tessier and Dingman in Paris after one of Tessier’s operations for hypertelorism. Reed Dingman, not only an expert hard tissue surgeon himself but also a well-known big game hunter, in typical generous sincerity, congratulated Tessier on his great operation. Whereupon the quiet Tessier, somewhat out of character, said:

Reed, if you think that was good, come let me show you something even better!

He led Dingman to his locker and brought out a giant elephant tusk exclaiming,

What do you think of that one? I have looked up your tusk record, Reed, and this is larger than any of yours!

and they all had a good laugh.

John Marquis Converse of the New York University Medical Center was asked what he considered to be his contribution to the operation for hypertelorism and he responded by recalling that Tessier, in his first stage, opened the cranial fossa and cut through the olfactory nerves placing a dermal graft over the frontal lobe and, in the second stage, proceeded with the necessary orbital osteotomies. He summarized his 1970 work with J. Ransohoff, E. S. Mathews, B. Smith and A. Molenar with:

In checking over the x-rays of all of our cases, I noticed that the cribriform was not enlarged and conceived the idea of preserving it, thus also preserving the sense of olfaction [and of taste]. We were able to develop the one-stage procedure which is now generally employed.

CRANIUM BIFIDUM OCCULTUM

Median cleft lip may be associated with midline clefts of the cranium often involving the scalp. According to J. J. Longacre in 1964:

In the newborn, the management is conservative, and the patient is placed under continuous observation. The necessity for operation on the larger
lesions overlying the superior sagittal sinus has been stressed by Peer and Van Duyn (1948) and Kahn and Olmedo (1950). These authors point out that if the lesion is more than 1 to 2 cm. in width it may become necrotic. Reconstruction with a scalp flap is recommended. In the larger lesions, the skull defect does not close spontaneously and grafting with bone (split-rib grafts) . . . is necessary at a later stage to provide an adequate protection to the brain.

WAARDENBURG SYNDROME, OR MENDE'S SYNDROME

In 1948 P. J. Waardenburg precisely described the syndrome of (1) congenital deafness, (2) lateral displacement of the medial canthi and lacrimal puncta with broad nasal root or telecanthus (pseudohypertelorism), (3) white forelock, or poliosis, (4) heterochromic irides and (5) hyperplasia of the medial portion of the eyebrows. In 1926 I. Mende also described the syndrome, as did Van der Hoeve in 1916 at least in part. The condition is inherited as an autosomal dominant characteristic and is seen in an estimated 2 percent of all congenitally deaf persons. R. J. Gorlin and J. J. Pindborg in 1964 noted that neither Mende nor Waardenburg had included lip clefts in the syndrome and mentioned that lack of clefts was also their experience. In 1961 A. Pirodda reported that cleft lip-palate and other palatal alterations were not uncommon in this syndrome. Then in 1965, independently, Feinberg, Hansen et al. and Puxeddu and in 1967 Reed et al. reported cases with cleft lip and/or palate.

According to Gorlin, Cervenka and Pruzansky, the syndrome described by Klein in 1950 was different from the Waardenburg syndrome. As they said,

Deafness, partial albinism, blepharophimosis and bony and muscle deformities of the shoulder girdle, in our opinion, represent another Syndrome.
59. Lateral Facial Clefts

**HORIZONTAL** or transverse clefts are considered the result of failure of mesoderm migration or merging to obliterate the embryonic grooves between the maxillary and mandibular prominences.

**TRANSVERSE CLEFTS**

As these clefts are rare and almost everybody having one has reported it, it is possible to review most of the reported cases and
when described note the treatment. After specific case recordings in what may seem a helter-skelter arrangement, generalizations may be of value.

In 1891 Rose noted:

For long the very existence of this macrostomatous deformity was doubted, but cases have been recognized more or less since 1715, when Muralt pictured it for the first time.

One of the first cases reported was by Vrolik, who, in his 1849 work, gave several illustrations of commissural clefts as well as other deformities of the face. Other cases were reported by Reissmann in 1869 and Morgan in 1882.

Macrostomia or commissural harelip, according to Rose, is evidenced by an increased diameter of the mouth which may vary from a slight increase to a considerable distance; in a case reported by Rynd in 1862 the mouth opening extended as far as the first molar on the right side and to the last molar on the left. In 1887 Sutton published the drawing of a child with a very large cleft, the angles of which gradually passed into a red cicatrix. This scar ended in a gaping wound over the temporal region, extending to the dura mater.

Rose also pointed out:

Macrostoma is not only attended by great disfigurement, but is also troublesome from the impossibility of the child retaining its saliva and the food escaping during mastication. Suckling can be performed if the nurse's nipple be long, but is difficult otherwise. This deformity is, perhaps, more frequently associated with defective cerebral power than any other of the facial clefts, a large proportion of the subjects having been idiots.

In 1862 M. Debout first noted the association of macrostomia with abnormal conditions of the external ear—either defective development or the production of accessory auricles. In 1875 Ahfield reported a transverse cleft of the mouth which included the ear. In 1886 Roulland published an account of a double macrostomia with accessory auricular appendages, absence of middle ear and eustachian tube and absence of the temporomaxillary joint on the left side. Macrostomia with auricular appendages, shown as a sketch, was presented by one of Fergus-
son's patients. Then, in 1895 Ballantyne enumerated 16 cases of macrostomia with preauricular appendages. In 1909 Edington reported a transverse oral cleft that stopped in front of the tragus but with a fissure extending to the external auditory meatus. Sir Arthur Keith in 1920 recorded a case of transverse facial cleft extending to the tragus and external auditory canal, which he reported in 1940. As did many plastic surgery textbooks, Padgett and Stephensen in 1948 reported a transverse facial cleft associated with anomalous pretragal tags. Then in 1937 McEnery and Brennemann presented a case of macrostomia which coexisted with a nasomaxillary cleft. This is a real mix-up, with disturbance of the first branchial cleft and arch and persistence of the naso-optic groove, and enough to give any embryologist a "splitting" headache.

In 1950 Blackfield and Wilde of the University of California reported five cases. One was a three-month-old male with bilateral clefts extending from the corners of the mouth backward and above the ears. Absence of the terminal phalanges of the left hand, syndactyly of the left foot and absence of the right great toe were additional deformities. In the other four transverse facial clefts, one had a sinus of the dorsum of the nose, and two were associated with ear deformities. Treatment: Clefts closed and grooves excised and subsequently correction of syndactyly and excision of sinus or appendages.

Others reporting transverse facial clefts were Sanvenero-Rosselli in 1958, Phoner in 1958 and Piotti in 1958. In 1964 Gorlin and Pindborg surmised that transverse facial clefts seem to appear more commonly in males and when unilateral were most often on the left. In 1965 Fogh-Andersen of Copenhagen reported 13 transverse facial clefts out of his 3,988 clefts.

In 1968 Powell and Jenkins of Chicago reported three cases. A white male had a transverse facial cleft, preauricular skin tags, dermoid cyst of the conjunctiva and thoracic hemivertebrae, a condition they diagnosed as oculoauriculo-vertebral dysplasia or Goldenhar's syndrome. The other two patients were white females, one with bilateral transverse clefts and the other with unilateral clefts associated with preauricular skin tag and retroauricular dermoid.
Treatment: Early closure was carried out on the transverse clefts. The bilateral clefts were closed with reconstruction of the oral angles with small flaps of vermilion in a modified Estlander technique. Subsequently the cysts, dermoid and skin tags were excised.

In 1970 Eiseman, Walden, Platzer and Hoppe reported a 13-year-old Negro female with bilateral transverse facial clefts associated with maxillary protrusion. Treatment: Closure of the clefts with Z-plasties followed by extraction of strategic teeth for aid in the osteotomy and setback of the maxilla.

Blackfield and Wilde admitted in 1950 that the etiology of these clefts is unestablished and then devoted pages to the possible causes. The most generally accepted explanation was the failure of fusion between mandibular and maxillary processes. Powell and Jenkins noted:

One theory on the genesis of lateral clefts is failure of the mesoderm to penetrate completely the regions of the epithelial fusion at the oral commissures, or they may be the result of absolute deficiencies in quantities of mesoderm.

According to Streeter:

There is no evidence of ectodermal resorption between the meeting surfaces, but rather the surface is simply flattened out by the proliferation of the growth centers beneath.

Blackfield and Wilde also leveled a truly wild “shotgun blast” at all possible etiological factors involved in cleft formation. Such causes were mentioned as Finley and Keith’s ideas of placental infarction, Von Winckel’s amniotic bands, Streeter’s amniotic adhesions, faulty implantation with poor nutrition, diabetic mothers, vitamin deficiencies (vitamin E), rubella infection during pregnancy and radiation. They concluded that the etiology of transverse facial clefts is probably a combination of several of the above-mentioned factors:

It would be well to stop thinking of heredity as a cause of disease and to consider it merely the pattern of incidence of a condition brought about by one or more factors.
In addition to transverse facial clefts and ear deformities, there is often an associated mandibular malformation. This grouping was first reported by Kirmisson in 1902. In 1938 British oral surgeon Martin Rushton reported a transverse facial cleft associated with maldevelopment of the mandible. T. P. Kilner suggested for this case closure of the cleft and at the same time a bone graft onlay to the mandible.

In 1939 Kazanjian of Boston reported five cases of congenital absence of the mandible and noted that two of them had macrostomia and four had microtia. He observed that, although this anomaly seemed to be the expression of improper development of the first branchial arch and cleft, as other facial and cranial bone anomalies appeared, they may have been secondary to the absence of the mandibular segment, which deprived the surrounding tissue of normal growth.

Treatment: He advised closure of the oral fissure and reconstruction of the ear only. Surgery of the mandibular defect, however, he postponed until the permanent teeth were available to allow fixation during tibial bone grafting.

In 1950 Michael Lewin reported a case of mandibular malformation associated with an anomaly of the ear and an associated groove-like thinning of the cheek extending from the corner of the mouth to an auricular appendage. In 1955 Hunt and Smith also reported a case of oral-mandibular and auricular deformities.

Lateral facial clefts can be associated with what Gorlin and Pindborg referred to as hemifacial microstomia (microtia, macrostomia and failure of formation of the mandibular ramus and condyle). They suggested that oculoauriculo-vertebral dysplasia or the Goldenhar syndrome is a variant of this complex characterized by vertebral anomalies, most often hemivertebrae and epibulbar dermoids of the eye.

In April 1961 Ken McNeill of Kingston, Jamaica, and I set off on a West Indian plastic peregrination, having cabled ahead for the local doctors to collect all of their worst faces. Among our "touchdowns" was the island of Barbados, "a little England"
with more sunshine, more British color and charm and more people and sugar cane per square mile (21 X 14 mi.) than any other isle of the Antilles. Here, Jack Leacock was waiting for us with a rare macrostomia extending across the cheek with a groove passing above the slightly deformed ear. There were an associated seventh nerve paralysis and a gelatinous cyst in the cleft between the maxilla and the hypoplastic mandible. First the cyst was excised. Then the edges of the cleft were freed to facilitate a two-layer closure interrupted by a Z-plasty of the skin and a vermilion flap from the cleft to turn the corner of the new commissure, as published in the *British Journal of Plastic Surgery* in 1962. Because of the happy atmosphere on this sunny island, both the main wing of the Z flap and the mucosal commissure flap were turned upward in an attempt to suggest a smile in the presence of facial paralysis.

In 1961 J. J. Longacre of Cincinnati, with DeStefano and Holmstrand, also reported a case of oral, mandibular and auricular deformities. They advised Z-plasty of the cleft closure, and Longacre emphasized the importance of early split-rib autografts to the mandible to minimize the psychological trauma.

In 1962 Hans May of Philadelphia reported three cases of transverse facial clefts associated with ear and mandibular anomalies along with other defects. His treatment was of interest. One case of transverse facial cleft was accompanied by a rudimentary left ear in the middle of the cheek, coloboma of the left upper eyelid, dermoid cyst of the conjunctiva, coloboma of the iris, absence of the malar arch and maldevelopment of the mandible. This is getting close to a description of the so-called Treacher Collins syndrome, which, not having clefts, will be bypassed. May closed the transverse cleft directly, and when the scar developed hypertrophy he excised it and used a Z-plasty with what he reported was a success.

Another of his patients was a male with a transverse facial cleft with underdeveloped mandible and forward displacement of the tragus. He closed the cleft and shifted the tragus posteriorly. His third patient was a female with a transverse facial cleft and underdevelopment of the mandible and ear. In addition to ear
revision and mandibular lengthening, May closed the cleft and reconstructed the commissure.

His summary was important:

Transverse facial clefts seldom constitute an isolated deformity. As a rule, they are accompanied by deformities of the mandible, the ear, and perhaps various other facial deformities, all centering around the first (mandibular) branchial arch. . . . These clefts require closure since the orbicularis oris muscle is divided. Closure by simple fusion of the separated structures overcomes only part of the deformity. The key point in the repair must center upon the reconstruction of a muscular commissure, the closure of the orbicularis ring at the cleft side. This can be done effectively by rotation of a full-thickness vermilion-lined flap from the lower into the upper lip after Estlander.

In 1963 Nagai and Weinstein also advocated the use of a modified Estlander-type flap for reconstruction of the oral commissure in transverse clefts.

Side by side with Hans May in the March 1962 Plastic and Reconstructive Surgery was a paper by Richard Stark and David Saunders officially grouping the combined oral-mandibular-auricular anomalies into the first branchial syndrome. They reported five cases of this combination and stated:

Macrostomia, hemignathia and auricular deformities are intimately related congenital anomalies. All are rare but they may coexist, representing a syndrome.

They explained the association:

Embryologically, the mandible develops from the mesoderm of the first branchial (mandibular) arch. A portion of the auricle (tragus and helical crus) also is derived from this mesoderm. Normal development of the mouth depends upon the amount of mesoderm of this arch and the extent of its migration.

Treatment: Their cheiloplasty included paring of the cleft edges and closure in layers. Insurance toward preservation of the corner of the mouth was achieved by mucosal flaps: either a triangular one that fits directly into the commissure or a mucosal flap taken from the upper or lower vermilion and used as a "wraparound" at the corner which shifts the scar out of the
commissure itself. Excision of preauricular tags, ear reconstruction and mandibular bone grafting were mentioned briefly.

**LANDMARKS FOR THE COMMISSURE**

In the *British Journal of Plastic Surgery* in 1968 Khoo Boo-Chai of Singapore reported four cases of transverse facial cleft in which the cleft was the presenting complaint in a constellation of other deformities seen in the first and second branchial arch syndrome. William Grabb in 1965 published a classical review of the clinical aspects of this syndrome. For the treatment of his four cases Boo-Chai gave an excellent outline of the essential points in the surgical correction (one case is shown). He wisely noted:

The rim of the cleft is lined by vermilion which is of a slightly lighter shade than that of the normal vermilion. The line of demarcation which we were able to detect in all our four cases marks the beginning of the cleft. Pressure with the examining finger in this region will help to bring out a muscular ridge which corresponds with the line of demarcation in the vermilion. We place importance on this landmark because we believe it to be the correct position of the new commissure . . . Once this is accurately identified and marked, the vermilion of the rim is excised together with the triangular piece of skin on the buccal surface of the cheek. Beginning intra-orally at the apex of the triangular raw area, the edges of the mucosa are closed with 4-0 plain interrupted catgut working outward toward the new commissure . . . the cut through the vermilion at the site of the new commissure is not vertical but it is made slightly oblique from within out . . . The oral musculature is then apposed on the outside . . . It is important to get the muscle together as close to the commissure as possible. Otherwise, we will get a "goldfish mouth" appearance. A "Z" plasty for the skin completes the operation.

**DOUBLE Z**

O. T. Mansfield and D. C. Herbert of England noted in 1972 that unilateral transverse facial clefts are associated with facial hypoplasia and proposed introduction of additional tissue into the plane of the cleft to make up the deficiency. For two cases they designed a double Z-plasty along the line of the cleft from the
commissure to the tragus: a small Z at the commissure and a large Z with thick flaps in the cheek area which they claim not only increased the length of the scar but improved the contour.

According to Tord Skoog of Sweden in his 1974 book *Plastic Surgery*:

Macrostomia should be recognized as a malformation involving several tissue layers. The external defect is always combined with a more extensive separation of the deep tissues of mesodermal origin, i.e., the oral and buccal musculature.

He presented an example of a minimal lateral facial cleft possessing preauricular tabs characteristic of congenital malformations involving the first and second branchial arches. William Grabb noted in 1965 that a distinctive tag just anterior to the junction of the tragus and antitragus was almost always associated with macrostomia.

Skoog's reconstructive design was basic, using mucocutaneous incisions around the commissure defect for exposure, dissecting both ends of the orbicularis oris muscle, freeing the buccinator and then closing in three layers. The oral mucosa was sutured in a straight line and the orbicularis oris muscle stumps were approximated with 4-0 Dexon sutures to construct the sling around the commissure.

The buccinator was sutured with 5-0 catgut and the skin closed in a transverse lateral line except for a small skin interdigitation near the commissure. This technique indeed seems to be a sound and effective approach to this type of cleft.
TRANSVERSE CLEFTS IN BILATERAL FACIAL MACROSTOMIA

In October 1974 John M. Converse, Donald Wood-Smith, J. G. McCarthy, P. J. Coccaro and M. H. Becker of New York University Medical Center presented their 15-case experience with bilateral facial macrostomia. They divided this congenital syndrome into four groups, the fourth being macrostomia, transverse facial clefts, absent parotid ducts and abnormalities of the auricles and facial skeleton.

They elaborated in *Plastic and Reconstructive Surgery*:

This group included 4 patients, whose auricles were small and low-set bilaterally. A full complement of auricular elements was present in each. . . . One patient had preauricular pits and appendages, another showed atresia of both external auditory canals on temporal bone tomography. The remaining 3 patients had no hearing abnormalities.

Varying degrees of macrostomia and transverse facial clefting were the hallmark of this group. In two patients, subcutaneous cleft-like mesodermal deficiencies extended across the buccal region in a transverse direction toward the external auditory meatus. In two other patients, the cleft involved full thickness of the cheek—in one patient extending approximately two cm. from the oral commissure—in another patient involving the full width of the cheeks as far as the tragus. . . . The patient with the most pronounced transverse facial clefts also had a wide cleft of the hard and soft palate. Two patients, studied radiographically, also showed extramaxillary foci of bone and ectopic dentition in the region of the pterygoid processes and maxillary tuberosities. In both of these patients the mandibular excursions were restricted, but they improved after intraoral excision of the extra-alveolar segment of ectopic dentition. All 4 patients had pronounced micrognathia and some degree of apertognathia (open bite), with class II dental occlusal relationships.

Tomographic studies showed abnormalities of the mandibular condyles, ranging from absence to surface irregularities. Each ramus tended to be shortened, the ramus and mandibular body assuming a straight-line relationship. Two patients in this group had cervical spine abnormalities.

Their plan of treatment for this group involved

(1) restoration of mandibular size and form and (2) correction of soft tissue deficiency.
In the worse of the two cases shown, there had been multiple Z-plasties of the transverse facial clefts in infancy. Further surgery included the following:

(1) An increase in the anteroposterior dimensions of the right mandibular ramus was obtained by vertical section and iliac bone grafting; a sagittal osteotomy was done on the left ramus. (2) An intraoral skin graft was inlaid to remedy the soft tissue deficiency and distend the premental region. (3) A step osteotomy and iliac bone grafting was used to elongate the body of the mandible [as diagramed].

In spite of the zigzagging cheek scars, the result shown was excellent.

**SUMMARY ON CLEFT CLOSURE**

Transverse facial clefts are associated with multiple anomalies, and the actual cleft is often the least of the problems encountered. Early closure of the cleft in layers is important to the patient's ability to feed. As the cleft transgresses the natural lines of the face, the scar of its closures must also. For this reason and for the added precaution against straight-line contracture by interruption, some form of a Z-plasty can be valuable. It is always happier to turn the main flap upward when possible, as seen on the Barbadian baby.

The other important aspect of transverse clefts, of course, is the reconstruction of the commissure. Various mucosal flap interruptions of the scar at the commissure are useful, but May's use of a small Estlander flap to reconstitute the muscle at the corner of the mouth and, even better, Skoog's reconstruction of the orbicularis oris musculature at the commissure seem sound.
60. Oblique Facial Clefts

The first report of an oblique facial cleft was made in 1732 by Von Kulmus, and it is not surprising that he recorded it in Latin. Then in 1828 Delpech presented such a case in French, and in 1832 Walter Dick of Glasgow reported one in English.

William Rose of London in 1891 acknowledged his teacher, Sir William Fergusson, as the only English surgeon, as far as he knew, who had observed the rare facial clefts, the majority of recorded cases hailing from Germany and France.

Rose noted that several cases occurred with red cicatrices rather than actual clefts and cited this case (Tillmanns after Kraske) of an oblique cicatricial deformity of the face along the line usually transversed by such a cleft.

He also cited a facial cleft in a child, involving the lower lid and eye and with a development of accessory teeth along the cleft margin (Tillmanns after Haselmann).

Rose wrote of these cicatrices and clefts:

The defect begins at the free margin of the upper lip, and usually at the spot whence starts the ordinary harelip cleft; but occasionally from the angle of the mouth. It then trends upwards and outwards, leaving the nose entire, and skirts round the ala nasi to reach its upper limit at the middle of the lower eyelid which is cleft, or at the inner canthus. The eye itself may show a coloboma iridis, usually downwards and inwards. The facial skeleton may be divided or not; sometimes a large opening into the antrum exists.

Rose noted that the deformity could be bilateral and cited the case of Guersant. He also acknowledged:
Albrecht recorded a most interesting case in a newly born pup of double cleft extending from the lip margin upwards not only into the nostril but also towards the eye on either side, i.e. a double associated harelip and facial cleft. The specimen is taken from the Royal Veterinary College of Brussels.

M. Guersant, in the middle of the nineteenth century, reported a case of bilateral oro-ocular clefts of the face and illustrated the condition. Although the sketch portrays the cleft involving the entire lower eyelid, this probably was a medial type of oro-ocular cleft.

In 1887 Morian collected 34 cases in the literature, 77 percent of which were stillborn. In 1970 Khoo Boo-Chai, reviewing the literature since Morian, collected 43 cases of live-born oblique facial clefts including two of his own. Tessier in 1969 reported three; Bartels, O’Malley, Baker and Douglas in 1971, two; and Wilson, Musgrave, Garrett and Conklin in 1972, seven. According to Wilson’s calculations, this rare anomaly represents approximately 0.25 percent of all facial clefts. Then in 1973 Dey of Sydney reported another five oblique facial clefts, and Miller, Wood and Hag reported one case from Nairobi. Also added is a case of Tom Zaydon’s, who was my patient for a short time but is now in Bethesda. And, of course, there are an unknown number of patients around the world, like this Jamaican, who are operated on by the local surgeon and never get included in any published statistics.

According to the Nomenclature Committee of the American Association for Cleft Palate Rehabilitation, there are two main forms of oblique facial clefts: the naso-ocular and the oro-ocular. The oro-ocular type is subdivided into medial and lateral, depending on the relationship of the cleft to the infraorbital foramen. Adding to the complexity is the mixed occurrence of these various clefts in the same patient.

Numerous fascinating combinations can occur. Burian had a case with a naso-ocular cleft on one side and an oro-ocular on the other. Dey of Australia also had one case of a boy with both a
naso-ocular and an oro-ocular cleft. Greer-Walker and Skoog each had cases with both subgroups (medial and lateral) of the oro-ocular cleft. The oblique facial cleft has been associated with a transverse facial cleft in three reported cases—two on the contralateral side, one recorded by Lexer and one by Burian, and one on the ipsilateral side, recorded by McEnery and Brennemann.

Persistence of ectodermal grooves due to retardation in normal mesodermal migration could explain all oblique clefts except that, as Karfik pointed out, the lateral oro-ocular cleft corresponds to no embryonic facial groove. These clefts do not seem to be familial. Wilson, Musgrave, Garrett and Conklin put the blame vaguely on "some environmental insult to the developing embryo," backing this proposal with:

It is not surprising therefore to find multiple anomalies in many of these patients and a high incidence of still birth.

David Dey favors Ida Mann's thesis that the nasolacrimal ducts and apparatus are derived from ectoderm cut off from the surface by a forward growth of the maxillary process, which reaches the inner and outer nasal folds. The naso-ocular group of clefts follows the line of this epithelial inclusion, which at all times maintains connections with the nasal pits, extending any cleft of the lip that occurs in the usual position. The oro-ocular cleft, however, has no connections with the nasal pit, has no correspondence with the site of the ordinary cleft of the lip and may pass medial to the inferior punctum. Dey suggests that Sir Arthur Keith's theory of linear intrauterine necrosis along the watershed between developing vascular areas seems apt. Sanvenero-Rosselli in 1953 blamed the arterial system for congenital anomalies and quoted Kundrat in ancient writings as having found arhinencephaly to be due to a disturbance of the whole region supplied by the anterior cerebral artery.
Naso-ocular clefts are considered the result of failure of mesoderm migration or merging to obliterate the embryonic grooves between the nasomedial, nasolateral and maxillary prominences each with the other.

The naso-ocular cleft extends from the pyriform aperture to the medial canthal area along the approximate course of the nasolacrimal duct. As the nasolacrimal duct is intact only in the mild cases, it is usually absent or opened.

Daniel Marchac of Paris forwarded photographs of a naso-ocular cleft from an 1828 book by Professor Delpech of Montpellier. A short excerpt translated from the original French text is of interest.

In the month of April, 1820, we met in the streets of Montpellier, a young boy 12 years old with a singularly severe congenital deformity.

With what is considered to be the first frontal flap used in France, a hemirhinoplasty was accomplished. It was impressive, to say the
least, that an early nineteenth-century surgeon had the sophisti-
cation to call upon the Indian forehead rhinoplasty to correct
both nasal and ocular defects of an oblique facial cleft.

In 1962 C. S. Harkins, with A. Berlin, R. L. Harding, J. J.
Longacre and R. M. Snodgrass, defined a naso-ocular cleft as

a fissure extending from the narial region toward the medial angle of the
palpebral fissure,

differentiating it, as Bartels noted, from the oro-ocular cleft,
which extends from the mouth to the orbit without involving
the nose.

In 1966 Sakurai, Mitchell and Holmes noted that the fissure
need not involve the entire line from the lip through the nose to
the eyelid orbit with extension to the temporal region. Boo-Chai
distinguished between complete and incomplete forms, noting
that complete clefts are rare, usually seen in stillborn monsters,
often associated with cleft lip and palate. When the bone is
involved, there is hypoplasia of the body of the maxilla and only
very seldom a complete cleft. When there is a split in the bone, it
occurs between the medial and lateral incisors with disruption of
the pyriform aperture and extension of the cleft into the orbit, as
described by Burian in 1963 and Ergin in 1966.

In 1963 G. S. Gunter of the Royal Children’s Hospital,
Melbourne, referred to this anomaly as the nasomaxillary cleft
and attributed it to the persistence of the naso-optic groove
between the maxillary and frontonasal processes. He made several
observations:
When the cleft appears to occupy the same portion of the primary palate as does the usual cleft lip, it then involves the nostril floor and passes on both sides of the displaced alar base. At the upper end there is involvement of the inner canthus with an upward extension across the brow and forehead.

Gunter was the first to note the various strange disruptions and extensions of the hairline and the hairs of the eyebrows.

Treatment is difficult and calls upon every facet of reconstructive surgery. Gunter did make some specific suggestions. In his experience, blocked nasolacrimal duct and repeated infection of the sac occurred in all cases, prompting him to advocate total extirpation of the sac and duct. He also noted that the normal eye must have early and adequate lid reconstruction. When additional tissue is required in the cleft of the lip and face, forehead and Abbe flaps can be used. The nose on the cleft side is always short between the alar base and the inner canthus; if the discrepancy is great enough, new soft tissue should be introduced. Gunter acknowledged the difficulty of reconstruction in asymmetries of the skull and face. He stressed the importance of having the afflicted children accepted within their family circle and not allowing them to become lost socially and educationally in the multiplicity of surgical procedures.

Gunter, who has added to his interests the breeding of Aberdeen Angus cows and Holsteiner horses, was asked for his current thoughts on naso-ocular clefts. He answered in December 1973:

I used to call this cleft “naso-maxillary” because it appears to lie between those structures. . . . However this is not always strictly true . . . nor does the cleft always lie in the naso-optic (naso-ocular) groove, to use the other terminology, and I wonder if the much older concept of some mechanical band, possibly amniotic, being responsible might not still be worthy of consideration. I've had personal dealings with one more case since my paper appeared in 1963. . . . This child also had anomalies of the hands of the "congenital ring stricture" type. . . .
This child has had three operations to date. 1. Repair of lip and anterior palate. 2. Z-plasty to left side of nose and inner canthus to lengthen nose on that side and bring the canthus up to a correct level, and 3. Repair of the cleft palate proper.

The complexity of these deformities seems to require many operations, as reported by all involved surgeons.

In April 1971 Roger Bartels, Joseph O’Malley, James Baker and William Douglas, in a paper “Naso-Ocular Clefts” in *Plastic and Reconstructive Surgery*, presented two interesting cases. In 1974 Bartels was questioned about these cases and he kindly sent recent details of their follow-up.

Case 1 was a six-pound Caucasian female with no history of clefts in the family but a record of maternal virus cold in the first trimester. Patient had left naso-ocular cleft, coloboma of the lower eyelid, left anophthalmia and bilateral complete cleft lip and palate. Treatment by O’Malley had included the following staged procedures: (1) right cheilorrhaphy, (2) closure of the naso-ocular cleft with left cheilorrhaphy and a vomer resection, (3) staphylorrhaphy with vomer flaps, (4) Wardill pushback palatoplasty, (5) left alarplasty, (6) left orbitoplasty, (7) composite graft from the right ear to the columella.
At 10 years of age she was reported of normal intelligence, doing well in school, a happy well-adjusted child.

Bartels' recent communication noted:

Since the article, Dr. O'Malley performed two additional surgical procedures on this patient using a midline forehead flap to construct a lower lid for this unfortunate girl. As you can see from her photographs, the left eye prosthesis was displaced downward to a considerable degree and this lower lid reconstructive procedure was done in an attempt to give her a more normal appearance. I have not seen her since her last photograph but obviously she needs additional work.

Case 2 was a seven-pound Caucasian female with no history of clefts in the family but a record of maternal viral infection during the first trimester of pregnancy. The patient had a right incomplete naso-ocular cleft with a coloboma of the right lower eyelid, coloboma of the right iris, left anophthalmia, slightly enlarged cranial vault with separation of the suture lines and tense frontanelles, hemangioma of the forehead, bilateral cleft lip and palate, diastasis of the rectus abdominis, abnormal hand lines and hypertelorism. Other congenital anomalies included an extra cervical vertebra and a grossly abnormal brain as revealed by encephalography. A ventricular-peritoneal shunt had to be performed to decrease intracranial pressure.

Bartels carried out two surgical procedures, in the first closing the naso-ocular cleft and the bilateral lip clefts and in the second closing the coloboma of the right lower eyelid and releasing the short ala on the right with a large auricular composite graft.
Bartels' recent report follows:

The child's postoperative care was provided by the physicians at Sunland Hospital here in Orlando and when I returned at a later date for postoperative photographs, I was informed that the child had died of meningitis, apparently related to her ventriculo-peritoneal shunt.

In 1971 Bartels had noted 11 cases of congenital naso-ocular clefts in the world literature, to which he added two. In 1974 he stated:

I personally feel that a naso-ocular cleft is a result of failure of fusion between the lateral nasal process and the maxillary process. To the best of my recollection every case of naso-ocular cleft reported also had a cleft of the primary palate, the only exception being the case report by Julio Ortega, appearing in Volume 43 of *Plastic and Reconstructive Surgery*.

In June 1969 in *Plastic and Reconstructive Surgery* Julio Ortega and Enzo Flor of Luis Vernaza Hospital, Guayaquil, Ecuador, reported a rare case of a 16-year-old country girl with an incomplete naso-ocular cleft with no history of clefts in the family and no incidents during the first trimester of her mother's pregnancy. Ortega considered the deformity an underdevelopment rather than an absence of elements, which was consistent with the absence or abnormal development of a specific portion of the mesodermal mass in the naso-optic groove. The deformity included the following conditions: moderate hypoplasia of the orbital and maxillary region, inner canthus of the left eye 15 mm. lower than the right, lacrimal apparatus present but
underdeveloped and abnormally located, lacrimal sac on the floor of the orbit, epiphora present, incomplete bony nasal process of the maxilla consisting mostly of cartilage with a 2 mm. cleft between it and the nasal bone, partial lack of left nasal ala, underdeveloped lateral crura and especially the superior lateral cartilage and hypoplasia of the chin with defective dental occlusion. This was the sequence of surgical procedures:

1. Rhinoplasty to reduce the size of the nose and the size of the alar defect.
2. Silicone implant to chin.
3. Reconstruction of alar defect (two stages).
4. Z-plasty to the left canthus.
5. Dental prosthesis.

The alar correction by logical local flaps in two stages was well executed.

The complex surgical problem offered by these clefts is exemplified again in the four cases reported in 1972 by Wilson, Musgrave, Garrett and Conklin, who stated:

Tissue defects present may be so extensive as to preclude truly satisfying aesthetic results . . . and can be expected to include multiple staged operations. . . . The only generalization possible is that an exposed eye requires immediate treatment.

One of their cases had had nine operations elsewhere and received another nine operations. Their other three cases averaged nine
operations each, including the usual cleft lip and palate procedures and eyelid, cheek and nasal reconstruction. In spite of all this surgery, the cases were considered still unfinished, indicating the severity of the problem.

**DEY ADDS FOUR MORE TO THE LITERATURE**

Dey reported four naso-ocular cleft cases. One was a bilateral naso-ocular cleft, far worse on the left side, where a small skin tube connected the nostril margin to the eyebrow region. There were associated anomalies such as cleft palate, absence of great toes, syndactyly of the second and third toes on the left side, constricting ring on the left ring finger and left little finger and congenital amputations of the right index and middle fingers. The intelligence was good and social adjustment satisfactory.

The second was a boy with almost complete right-sided oro-ocular cleft and complete left-sided naso-ocular cleft, left cleft alveolus but intact palate. There was also a bilateral posterior choanal atresia. The patient developed normally and has done well in school with a pleasant personality.

The third case had complete naso-ocular clefts on both sides with hypertelorism and blindness (right anophthalmia, left microphthalmia).

The fourth patient was a baby boy with bilateral cleft lip, plus cleft palate. On the left side the cleft was naso-ocular, and on both sides well-marked grooves extended the cleft high onto the forehead with the hair showing associated "cowlick" on the left side.

The first three of these had been treated prior to their coming to Dey, and the last is a patient of George Gunter.

**ORO-Ocular CLEFTS**

In oro-ocular clefts the fissure extends from the mouth to either the medial or the lateral canthus leaving the pyriform aperture intact. The subgroup, medial or lateral, of the oro-ocular cleft is
Medial oro-ocular clefts are considered the result of failure of mesoderm migration or merging to obliterate the embryonic grooves between the nasolateral or nasomedial prominences and the maxillary prominences, the nasomedial and nasolateral prominences having merged with each other successfully.

determined by the cleft's position in relation to the infraorbital foramen. These clefts can occur in complete and incomplete forms. Mild incomplete oro-ocular clefts can be confused with mild incomplete lip clefts and can be distinguished from them by two main characteristics:

1. The cleft lies lateral to the peak of the cupid's bow rather than through it, as in the standard cleft.
2. Because of shortening of the soft tissue element on the affected side there is an upward tilt of the alar base instead of the usual downward flare.

THE MEDIAL ORO-OCULAR CLEFT

Medial oro-ocular clefts are considered the result of failure of mesoderm migration or merging to obliterate the embryonic grooves between the nasolateral or nasomedial prominences and the maxillary prominences, the nasomedial and nasolateral prominences having merged with each other successfully.
The cleft lies medial to the infraorbital foramen and, instead of involving the nose, bypasses it, running upward in the region of the nasolabial (cheek) groove to terminate in the inner canthus of the lower eyelid. This fissure may extend up into the forehead, usually in the temporal region, and when the bone is cleft, the split lies between the lateral incisor and the canine.

Although the nose is well formed, in unilateral cases it is usually rotated around its long axis; in bilateral cases the bony and cartilaginous nose is detached from its lateral bony segments, drawn upward with forward protrusion. The orbit is sometimes shifted downward and is capacious because of the irregular and deficient growth of its walls. According to Rogalski, the eyeball may be deformed.

In 1935 Warren B. Davis found, out of a series of 1,000 clefts, four oblique clefts with absent nasolacrimal duct and five with coloboma extending into the facial cleft. He published a bilateral example of the medial group of the oro-ocular cleft and described the deformity:

The clefts involve the lips, cheeks, lower eyelids, alveolar processes, anteromedial portions of the maxillae and the orbital floors. Posterior to the premaxilla, the palate is intact. Atresia of the posterior one-third of the nasal passages was from a thick mass of tissue, partly osseous. Note the rotation of premaxilla, and the elevation of all anterior nasal structures, which, in association with the prolapse of the eyeballs, placed the anterior nares and the pupils of the eyes on the same horizontal plane.

Harry P. Ritchie spied this strange cleft of Davis' and included it in his surgical interpretation of embryology in 1934:

This case is particularly important for my purpose, as it shows the nose, prolabium and premaxilla normally formed in the frontonasal process. This process is shown to be an embryonal entity, separate from the lateral maxillary processes.

In 1950 John Potter of Newcastle reported a bilateral oblique facial cleft extending from the medial end of the lower eyelid to the lateral side of the premaxilla. There was also a complete cleft of the lip and alveolar margin, but this passed lateral to the nose. The central part of the face protruded at a level much higher than
normal with the nasal tip on a line with the eye. The nasal airways were normal and remained so. The nose was shorter than normal. There was a complete bilateral cleft of the palate. The lacrimal system was grossly abnormal, the inner canthus being unformed and caruncle and puncta absent, with notching of the upper lid. There was no lacrimal sac, and the nasolacrimal duct was represented by an open cleft covered by pink epithelium. The eyes were normal and moved normally.

Potter noted:

On each side the cleft involved superficial parts of the soft tissues only at its upper end, deepening as it descends so as to involve the full thickness of the lip, and being complete in the alveolus and palate.

This case seems to illustrate a view expressed by Frazer in 1939:

It must be understood that the cleft is only present where the maxillary process applies itself, in its growth to the surfaces of the nasal folds. Further back it is never present, the maxillary mesoderm being applied directly to the paraxial mesoderm without any intervention of ectoderm.

Treatment: W. E. M. Wardill closed the left cleft at six weeks of age. He used Veau's palate procedure, suturing the mobilized hard palate flap to the vomerine mucosa flap. He pared the edges of the lip cleft and closed with sutures after wide undermining.

Six weeks later John Potter closed the right palate cleft in the same manner but used a modified Blair-Brown-Mirault procedure for the lip. Six weeks later he revised Wardill's lip on the left with the Blair-Brown method. The palate was closed at age 12 months by Potter, using Wardill's V-Y pushback and pharyngoplasty. Then, at age two years, Potter freed the depressed inner end of each lower eyelid and transposed a flap from each upper lid into the defect to correct the inner droop.

This interesting case was published in the British Journal of Plastic Surgery in October 1950 with records of the patient up to two years of age.

Recently I wrote my friend Potter for more up-to-date records and he obtained photographs from Newcastle of the patient in 1967 at the age of about 20 years. Although further surgery has been carried out since, these photographs are revealing.
eyelid construction had been quite satisfactory. Potter, true to his old chief Wardill’s dictum “Follow up a few cases well and carefully and keep trying,” wrote almost in anguish:

You can see the problem—the premaxilla has grown again in his teens.

It seems that the frontonasal component, being more or less detached from the lateral segments in relation to mesoderm and consequently muscle and bone, has failed in its vertical descent and has continued in its forward growth. Thus this final result has occurred without the benefit of the downward pull of normal maxillary attachments or the constricting restraints of the intact orbicularis oris muscle. At least here is an honest and true follow-up on this rare type of cleft that shows what will happen under certain conditions; it should give some direction toward treatment of the future.

Postponement of early closure of the alveolar and hard palate clefts should prevent any reduction in growth that is caused by surgery but certainly will avoid locking in the short frontonasal component at its undescended position, which evidently is destined to be exaggerated by future growth. Possibly a controlled device as described by Georgiade and Latham could exert the necessary prolonged downward traction to encourage growth of this stunted segment and at the same time position better what-
ever is already present. Then, of course, joining the orbicularis oris muscles across the cleft will give further molding benefits.

Few clinics in the world ever see a bilateral medial oro-ocular cleft patient. For instance, Joachim Gabka with his great volume of cases in Berlin borrowed for his book one of these bilateral oblique clefts from the even larger collection of Rosenthal.

In 1964 Gabka, in his book *Hasenschärtchen und Wolfsschächer*, diagramed his plan for treating a unilateral medial oro-ocular cleft. His design was simple inturning of the edges of the cleft for lining and rotation of a cheek flap for cover while aligning the lateral and medial vermilion of the lip.

Fogh-Andersen in 1965 reported three oblique facial clefts out of 3,988 clefts. One was a severe oblique cleft combined with bilateral cleft lip and palate, nasal defect and preauricular appendages. He also published an account of a less severe incomplete oblique cleft of the lip involving the medial portion of the lower eyelid. His surgery corrected the lip and cheek with a Z-plasty.

Paul Tessier of Paris, who seems to gravitate to facial bone pathology, especially in the orbital area, in 1969 reported on 16 coloboma patients with 22 facial clefts. He differentiated between two types of medial oro-ocular clefts, *vertical* and *oblique*.

He noted differential features. In the eyelids, localization of the cleft seems to be outside the punctum lacrimale in vertical clefts and inside in the oblique cleft. The medial canthal ligament is almost normal in direction and insertion in vertical clefts but atrophic, obliquely directed and associated with ectopia in oblique clefts.
The lacrimal sac and canal are absent in the oblique clefts—but in only three vertical clefts were they salvageable. There is an osseous cleft involving the floor of the orbit and the maxilla with deeper skeletal upheaval in the oblique clefts. The lower edge and the floor of the orbit are always separated by a gap which may vary in both depth and width but is situated inside the infraorbital foramen. The contents of the orbit sink into this fissure and at times reach the palate, causing prolapse of the eyeball. Vertical clefts pass into the maxilla via the sinus. In oblique clefts the internal wall of the maxillary sinus is absent. Skeletal clefts are usually located between the canine and the lateral incisor, although Tessier has also observed an accessory cleft between the central incisors.

In the nose the ala is normal but tilted up in vertical clefts with the distance between the internal canthus and the foot of the ala short. The same distance is extremely short in oblique clefts since the cleft itself occupies this general site. Then, too, the ala is unsupported with the bone cleft behind it, and the internal wall and the frontal process of the sinus are absent. In the vertical cleft the labial cleft lies outside the ala, not extending to form the usual cleft lip. The vertical-type cleft extends onto the lip as a standard cleft lip and may be accompanied by alar and labial fissures.

Treatment by Tessier is a combined operation consistent with his grand style. The design has a similar format for incomplete and complete oblique cleft correction but is carefully planned for the specific need of the case:

A multi-stage operation is replaced by simultaneous management of the eyelid, inner canthus, floor of orbit, cheek, lip and ala nasi. The point of novelty is this and one which I consider to be of the maximum importance. The treatment of coloboma must be carried out in a single stage because it is much easier to combine the different skin flaps, extensive cleavages, external cantholysis, inner canthopexy and multiple bone grafts.

Palpebral elongation demands total disinsertion of the lower septum and external cantholysis. As correct placement of the eyelid is opposed by the connection of the septum with the periosteum, this must be broken. Ectopia of the inner canthus,
more marked in oblique clefts, deserves transnasal inner canthopexy in most cases. The maxillary cleft through the floor of the orbit allows the contents of the orbit to sink out of position, requiring correction and maintenance with bone grafts to establish continuity of the floor and edge of the orbit, plug the gap and improve the contour of the aplasia. As noted by Tessier, in oblique clefts the orbit, nose, sinus and mouth are in communication, not facilitating the success of bone grafts. He explains:

The grafts must be made to rest on the palatine plate and the outer edge of the alveolar arch (externally) and on the inner face of the orbit and the remains of the frontal apophysis (internally). Overhang is important and must be sustained above and externally by floor grafts. In spite of this, however, resorption may take place and secondary bone grafts may be required.

The ala nasi is always atrophied, and for the more severe hypoplasia a composite graft may be of value later. For the cleft lip Tessier suggests rotation and advancement:

We have obtained good results from Millard’s mark-out for harelip in external labial cleft accompanying vertical cleft.

The striking shortness of the vertical distance between the canthus and the lip requires at least two interdigitations of skin flaps to reposition the eyelid and drop the ala nasi. Then, with the rotation-advancement, the cleft lip is corrected.

Six of Tessier’s 16 cases had a bilateral coloboma in which there was considerable protrusion of the “central massif” exaggerated by gross hypoplasia of the malar bones and the cheeks. He accused this deformity of being a “devourer of bone,” and the greater the malformation, the more pressing the need for bone grafts to reconstruct the normal contours of the face.

David Dey of Sydney reported a case of bilateral medial oro-ocular clefting, complete on the left, somewhat less than complete on the right. The eyes were exposed by proptosis and downward displacement of eyelids. Medial to the point of entry of the cleft no real lid margin was evident. As usual, the central upper lip, nose and nostrils appeared basically normal except shortened and displaced upward. A groove in the maxilla on both
sides extended from the alveolus at the canine tooth to the orbital margin. Bilateral choanal atresia was also present.

Dey’s outline of treatment for this case included penetration of the atresia and establishment of airways by otolaryngologist B. Benjamin, rotation of the lower lids as flaps upward and medially to the inner canthi and inrolling of the edges of the complete cleft to form an artificial lacrimal duct. He described his lip closure:

Three months later, the cleft was repaired bilaterally—using a lateral cheek flap (somewhat reminiscent of the Millard advancement-rotation operation) combined with a triangular lip flap used Z-fashion. The flaps of excess vermillion tissue on the lateral margins of the clefts were used in the central lower border, where the vermillion was very narrow.

In 1973 Miller, Wood and Hag reported a case of bilateral medial oro-ocular clefting seen in Nairobi. The patient had a left complete medial oro-ocular cleft with coloboma and patent nasolacrimal duct. The left globe, covered by an epithelial membrane with "inadequate visual structures present for future sight," had complete range of motion. On the right there was a medial incomplete oro-ocular cleft with skin grooving up to the lower eyelid, anophthalmia with no nasolacrimal system, oblique cleft of the secondary palate and hypoplasia of the left malar eminence and maxillary sinus.

Treatment: Bilateral straight-line closure of each oro-ocular cleft was performed along with attempted closure of the coloboma, which had to be repeated.

In 1973 Poradowska, Jaworska, Dudkiewicz and Reszke of Warsaw, Poland, reported a case of complete medial oro-ocular cleft.

Treatment: The blind hypoplastic eyeball was retained to carry a prosthesis. The surgical construction was carried out in multiple stages rather than in the one grand slam of Tessier. First, the cleft was closed superficially by skin advancement. Then, both lacrimal sac and fistula were excised, and a lower lid was partially constructed. Maxillary mucosa was turned for lining so that the lower orbital rim could be grafted with split rib. Elongation of the vertical shortness of the cheek was treated with multiple
In this case, a superiorly based muscle flap turned off the rotation edge of the medial element and was inserted into the upper lateral advancement flap to fill out its deficiency. The result still left much to be desired since insufficient new tissue had been moved into the area of this horrendous defect.

PERSONAL CASES

In 1957 Max Grob noted the various paths of oblique facial clefts as those associated with cleft lip and involving the nostril and those lateral to the philtrum that skirt the nostril. This case shows nasal ala notches that correspond to Tessier's cleft 1 and 2 and lateral to the alar base in his cleft 3.

It has not been my fortune to treat many oblique clefts. I have had several incomplete clefts, however, that seemed to show an obliqueness of direction, slanting not into the nasal floor but toward the alar base or lateral to it. These clefts are well corrected by the rotation-advancement principle. The direction of the cleft tends to shear off the point of the advancement flap, but extension of the lateral incision around the alar base releases enough lateral lip element to fill the rotation gap and complete the lip construction.

In this case, a superiorly based muscle flap turned off the rotation edge of the medial element and was inserted into the upper lateral advancement flap to fill out its deficiency. The
denuded end of the freed alar base flap was sutured to the septum for permanent fixation of the alar base and nostril sill.

Here is another oblique incomplete cleft threatening to skirt the ala.

And another!

This little boy had an interesting family history in that his mother's cousin had a cleft of the palate and his father had a microform including a unilateral congenital ridge and groove of the lip with slight elevation of the vermilion of the bow peak and notching of the free border along with a first-degree cleft lip nose. There was no difficulty with rotation in the child's lip as it required only a 5 mm. drop. A small amount of the nostril bridge was used in the advancement flap.
BILATERAL ASYMMETRICAL OBLIQUE CLEFTS

Here is a case not previously published as it is still unfinished. This patient (born February 4, 1963) of Thomas J. Zaydon of Miami had a bilateral medial oro-ocular cleft, complete on the left and incomplete on the right, with extension through the hard and soft palate.

As soon as the patient was one month of age, Zaydon operated on the left facial cleft with emphasis on achieving coverage of the left eye. He turned local mucosal and conjunctival flaps for lower lid lining and then, after extensive undermining, advanced a large facial-cheek flap medially for cover. Two months later a similar procedure was carried out on the right side using local conjunctival flaps and advancement of the cheek.

During the next two years five more operations were aimed at creating more conjunctival lining and skin in the area of the eyelids. An upper buccal sulcus was partially constructed, and on December 14, 1965, a Langenbeck-type procedure effectively closed the palate cleft. An operation in 1966 and another in 1967 continued to try for more eyeball coverage and the construction of a philtrum. After four years of Zaydon's heroic effort to correct this horrendous deformity, the patient revealed good progress in function and appearance. On his retirement from the Florida Crippled Children's Commission, Zaydon referred this patient to me.
At age eight, on September 1, 1971, bilateral fistulae were closed through the upper buccal sulcus, and during the process the antrum was opened on the left, allowing the escape of thin, dark, non-odorous fluid. This was suctioned, the antrum irrigated with neomycin-bacitracin solution and the opening closed with muscle. Split-rib grafts and chips were used to fill the bony gap on the left and to overlay the hypoplastic maxilla on the right. The skin of the prolabium was undermined and the unnatural corded subcutaneous vertical ridge split as two flaps based inferiorly. These flaps were shifted laterally into philtrum column positions, and a central dimple stitch was placed in an attempt to create a philtrum concavity out of an abnormal convexity. The straight-line oblique skin scars of the cheeks were interrupted by small interdigitations. Then the transverse ridge of the inferior vermillion of the prolabium was reduced and the adjacent horizontal groove filled with a dermal graft to improve the contour fullness of the vermillion border, particularly in the area of the tubercle.

Obviously, the next surgical procedure planned was the transport of distant tissue to make up the bilateral lower lid deficiency. During this period a change of homes was evidently in progress, and eventually the patient was taken by a remarkable and talented new parent who adopts only handicapped children. This course of events necessitated a move to Maryland, and her rehabilitation is being continued expertly by Alfred J. Suraci of Washington, D.C. This is part of his 1975 report.

When I first saw her in the latter part of 1972, it was quite evident that the sclera of the eyes bilaterally were becoming damaged due to her inability to close her eyelids. Hence, the first operative procedure on March 27, 1973, concentrated on this pathology and the severe ectropion was corrected on both sides by utilization of a full thickness right clavicular skin graft. In addition, adhesions of the lower eyelids to the sclera bilaterally were removed surgically and the upper and lower eyelids then sutured to each other for support. Fortunately, there was a 100% take of the skin graft and her eyes took on a much improved appearance, the severe hemorrhagic conjunctivitis disappearing with the ability to close her eyelids and protect the sclera.

The next surgical procedure was performed on July 13, 1973, at which time the severe scarring of the cheeks bilaterally, infraorbital regions bilat-
erally and particularly on the left side was excised in their superficial portion, utilizing the underlying dermal scars to build up the cheeks. A "V-Y" advancement of the vermilion border on each side was accomplished.

On January 29, 1974, a pharyngeal flap based superiorly with attachment to the nasal surface of the severely scarred soft palate was accomplished and this operative procedure has turned out quite well, her speech having improved remarkably.

In retrospect, techniques to "pull" growth and encourage downward positioning of the frontonasal component, as with the most modern Georgiade-Latham Mark III apparatus, and early side-to-side union of the orbicularis oris muscle might have been beneficial. This would be an effort to avoid a final result with a short central segment only moderately apparent at present but probably destined to increase proportionately in the late teens, as observed by Potter in 1974.
Lateral oro-ocular clefts do not correspond to any embryonic grooving.

The lateral oro-ocular cleft extends from the angle of the mouth upward to the orbit terminating in the lateral canthus or in a coloboma in the mid-portion of the lower lid lateral to the infraorbital foramen. More often than in the naso-ocular type, incomplete forms occur in which the central portion of the cleft in the region of the cheek is replaced by a scar-like groove. In mild cases the nasolacrimal duct is intact but in severe cases it is defective or absent. This is a mysterious cleft. It has the same origin as a transverse cleft, but its direction turns oblique, not corresponding to any of the known embryonic facial grooves. Karfik in 1969 called it the "true oblique cleft."

This is the rarest of all clefts; six such clefts are reported in the world literature. Three examples have occurred on one side in cases of the mixed group reported by Skoog and also by Greer-Walker. One unilateral incomplete cleft reported by Boo-Chai in
1970 was treated by paring and approximation of the edges of the coloboma. The tissue of the cheek along the line of the cleft and scar from the level of the alar base to the eyelid was lengthened vertically by a double Z-plasty, which also interrupted any tendency toward contraction of the oblique line.

Always a little more grandiose than the rest of us, Ivo Pitanguy of Rio, with Franco, reported a bilateral lateral oro-ocular cleft. In fact, he bragged that Brazil’s 83 million people produced a higher percentage of rare clefts than reported by Fogh-Andersen in Denmark or Burian in Czechoslovakia. In 1967 he presented this table:

<table>
<thead>
<tr>
<th>Source</th>
<th>Total Clefts</th>
<th>Rare Clefts</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fogh-Andersen</td>
<td>3,988</td>
<td>48</td>
<td>1.20 ± 0.77</td>
</tr>
<tr>
<td>Burian</td>
<td>4,000</td>
<td>97</td>
<td>2.42 ± 2.44</td>
</tr>
<tr>
<td>Pitanguy</td>
<td>736</td>
<td>25</td>
<td>3.39 ± 0.66</td>
</tr>
</tbody>
</table>

Pitanguy’s bilateral lateral oro-ocular cleft is the only one ever recorded in the world. In his patient the clefts ran obliquely in the lip from just medial to the commissure through the cheeks and into the lateral aspect of the lower eyelids. There was no cleft in the palate.
Treatment: Pitanguy approximated the soft tissue of the cheeks to the central component on each side with simultaneous positioning of the lower eyelids and construction of the oral commissures aided with Z-plasties.

This case with its early postoperative photographs was published in *Plastic and Reconstructive Surgery* in 1967. Here is a later follow-up record.
**61. Median Clefts of the Lower Lip and Mandible**

**Midline** clefts of the lower lip and mandible are considered the result of failure of mesoderm migration or merging of the paired mandibular processes.

Midline clefts of the lower lip are exceedingly rare and can vary from a vermilion notch to a cleft involving the total lower lip, tongue and mandible extending to the root of the neck.
Couronné in 1819 was the first to mention this anomaly. Bouisson in 1840 mentioned some three or four earlier cases and recorded one that he had seen post mortem himself. According to Rose:

The cleft extends in different cases to a variable extent. Thus Nicati, Couronné, F. Petit and Ammon saw clefts implicating the lower lip. Rikell operated [in 1870] on a cleft extending to the chin, through which the saliva was continuously dribbling. Faucon (1868) and Lannelongue (1879) recorded clefts of the lip and mandible conjoined, and in both cystic swellings (presumably of the dermoid type) were found between the segments. Parise's (1862) and Wölfier's [1890] cases were also associated with cleft of the tongue, through its whole thickness in the former, and only at its tip in the latter.

Wölfier's case is shown as a sketch. It is interesting that Parise's 14-day-old case had a median complete lower lip cleft with the free edges rounded as in "harelip" extending as a cicatricial band in the midline of the neck to the suprasternal notch. The median cleft of the mandible was separated several millimeters but bridged by connective tissue. The tongue was entirely divided, the cleft extending back to the glossoepiglottic ligament and downward between the geniohyoglossus muscles.

Sir Arthur Keith of the Royal College of Surgeons, London, noted:

Among the 250 specimens of malformations examined, only 4 showed this condition; a full-term child in the museum at St. George's Hospital and 3 specimens in the museum of this college; one from an ass, another from a cockatoo and a third from a sparrow.

In 1926 Brophy published this cast of a four-month-old girl with a midline complete cleft of the lower lip and mandible extending into the neck which had been presented to him by Keith from the Museum of the Royal College of Surgeons. He also reported an incomplete median cleft of the lower lip in an East Indian treated with a V excision and closure. In addition, he published an eagle with a cleft of the lower beak. When added to a cleft sparrow and cockatoo, the data does suggest that this anomaly is "for the birds"!
<table>
<thead>
<tr>
<th>Author and Year</th>
<th>Subject</th>
<th>Lower Lip</th>
<th>Mandible</th>
<th>Tongue</th>
<th>Ankyloglossia</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Couronné, 1819</td>
<td>Adult F.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>Neck contracture</td>
</tr>
<tr>
<td>Moeckel</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>Neck contracture, bulging of neck</td>
</tr>
<tr>
<td>Petit, 1826</td>
<td>15 d.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>Dermoid of nose, neck contracture</td>
</tr>
<tr>
<td>Bouisson, 1840</td>
<td>1½ yr.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>Polyp</td>
</tr>
<tr>
<td>Parise, 1862</td>
<td>2½ yr. M.</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
<td>Thyroid gland absent, neck contracture</td>
</tr>
<tr>
<td>Faucon, 1874</td>
<td>Child</td>
<td>+</td>
<td></td>
<td>-</td>
<td></td>
<td>Congenital heart lesion, neck contracture</td>
</tr>
<tr>
<td>Lannelongue, 1879</td>
<td>21 d. M.</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td></td>
<td>Cleft upper lip and palate, anencephaly, clubfoot</td>
</tr>
<tr>
<td>Hamilton, 1881</td>
<td>8 mo. M.</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td>Tumor of tongue, neck contracture</td>
</tr>
<tr>
<td>Wöller, 1890</td>
<td>3 mo.</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td>Accessory tongue</td>
</tr>
<tr>
<td>Redard et al., 1891</td>
<td>3 mo.</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salzer, 1902</td>
<td>3 yr. F.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debraisieux, 1904</td>
<td>19 yr. M.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keith, 1909</td>
<td>Child?</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Brophy, 1923</td>
<td>Baby F.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miyata, 1926</td>
<td>13 d. F.</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morton et al., 1935</td>
<td>13 d. F.</td>
<td>+       +</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stewart, 1935</td>
<td>3 yr. F.</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wassmund, 1935</td>
<td>44 yr. M.</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ashley et al., 1943</td>
<td>4 yr. F.</td>
<td>+       +</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Braithwaite et al., 1949</td>
<td>4 yr. F.</td>
<td>+       +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davis, 1950</td>
<td>Newborn</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Abramson, 1952</td>
<td>Newborn F.</td>
<td>+    +</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haym, 1952</td>
<td>1½ yr. M.</td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weyers, 1955</td>
<td>2 yr. M.</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vigil-Lorenzo, 1955</td>
<td>2 yr. M.</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kawai, 1955</td>
<td>2 yr. M.</td>
<td>+</td>
<td></td>
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<tr>
<td>Torres et al., 1956</td>
<td>2 yr. M.</td>
<td>+</td>
<td></td>
<td></td>
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<tr>
<td>Recamier et al., 1957</td>
<td>2 yr. M.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Russell et al., 1961</td>
<td>2 yr. M.</td>
<td>+</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Oota et al., 1963</td>
<td>2 yr. M.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nolens, 1964</td>
<td>6 yr. F.</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watanabe et al., 1964</td>
<td>6 yr. F.</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tange, 1965</td>
<td>Newborn</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Monroe et al., 1966</td>
<td>6 yr. M.</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fujino et al. (present study), 1967</td>
<td>6 yr. M.</td>
<td>+</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Chouard, 1967</td>
<td>17 d. F.</td>
<td>+</td>
<td></td>
<td></td>
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<tr>
<td>Rea, 1967</td>
<td>1969</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Knowles et al., 1969</td>
<td>1969</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Lauro and Verga, 1969</td>
<td>1969</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fitzgibbon (unpublished)</td>
<td>+</td>
<td></td>
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</tr>
<tr>
<td>Millard et al., 1971</td>
<td>Newborn F.</td>
<td>+       +</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Reviews of the world literature by Monroe of the United States in 1966 and Fujino, Yasuko and Takeshi of Japan in 1970 list a total of 35 cases. This did not include Brophy’s case in 1923, five others reported by Nolens in 1964, and one each by Chouard in 1967, Rea in 1967, Knowles, Littlewood and Bush in 1969 and Lauro and Verga in 1969. To this have been added other known human cases to a total of 47. It is certain that there have been many unreported cases, like the incomplete median cleft of the lower lip associated with mucous pits seen in Fitzgibbon’s clinic in Bristol.

**EMBRYOLOGICAL ASPECTS**

Fundamentally, the anomaly seems to be the result of failure of mesodermal penetration into the midline structures of the mandibular portions of the first branchial arch. There is a broad variation in the severity of this failure, which ranges from minor clefts to complete clefts with loss of the supporting structures of the neck and sternum noted by Davis in 1950. Morton and Jordon in 1935 proposed that failure of the mandibular processes to fuse probably prevents the ventral ends of the succeeding arches from uniting inasmuch as fusion proceeds from above. Possibly this explains the absence of the hyoid bone, thyroid cartilage, strap muscles and manubrium in some of the more severe cases.

**TREATMENT**

Treatment of this anomaly has not varied greatly. Some of the early cases were museum specimens and some died before surgery could be accomplished. The cases of Braithwaite and Watson and Fujino, Yasuko and Takeshi were published prior to surgery. Later, Fujino with Yasuko and Katsuki reported their plan of treatment of the patient at age three years.

Free tongue as soon as possible, then repair the lower lip in infancy, Z-plasty [neck] in childhood and mandibular wiring or bone grafting in later stages of life.
Most reports show a simple V excision of the lip with direct closure and the use of a Z-plasty if the cleft extended into the neck. In 1935 William Stewart in the *Archives of Surgery* reported this infant with a cleft extending through the lower lip, tongue and mandible. The two sides of the bifid tongue were attached to the floor of the mouth and vermilion. Stewart approximated the soft tissues and released the tongue without an attempt at closure of the cleft in the mandible in the initial procedure.

The charming Albert D. Davis of Stanford University School of Medicine, San Francisco, who published a forthright paper on median clefts of the lower lip and mandible in *Plastic and Reconstructive Surgery* in 1950, was probably the first young American student to study with Gillies in London. This was in the early 20's when it was common for plastic surgeons in Europe to demand remuneration for their teaching. Davis recalled to me with a twinkle how he would "slave" under Gillies as long as his money held out and then cross the Channel to work in a Paris hospital to make enough money to return to England for further months of study.

In 1948 a 4-year-old girl who had had a simple closure of a complete cleft of the lower lip at one month of age came under the care of Davis. At this time she had a scar extending from the midline of the lower lip downward into the anterior neck region with the chin held in such marked flexion that there seemed to be no chin. Crying caused the entire anterior neck region from sternum to chin to balloon as a distended pouch, which with inspiration collapsed in retraction. The chin was plastered to the suprasternal region by cord-like strands, and there was a 2 cm. gap in the midline of the mandible with a full complement of deciduous teeth present on each side. Davis described his 1949 operation:

A low collar incision was made above and between the clavicles. The skin overlying the cords was mobilized. These cords were seen to be dense scarred bands replacing the normal ribbon muscles in the anterior neck. No remnants of the hyoid bone or thyroid cartilages were felt. The anterior hypopharynx and laryngeal wall appeared to be intrinsic with these bands. The scar tissue was released and excised as much as possible. . . . The bone ends were cut back to healthy bone and the two edges of the mandible wired together.
Davis further reported candidly:

Following this procedure, the chin could be lifted higher without stretching and there seemed to be less contracture of the vertical cords. After several weeks, however, it became evident that contractures had again occurred, and that the edges of the mandibular cleft, while more nearly in approximation, were being pulled downward. . . Several procedures will be necessary to obtain further correction.

When there is severe absence of tissue, particularly in the concavity of the neck as in such cases, flap tissue shifted locally when available or from a distance when necessary will probably offer the best final solution to the problem.

In 1971, in the British Journal of Plastic Surgery with J. A. Lehman, Jr., M. Deane and W. P. Garst, I presented the fortieth case to be reported in the literature. The patient was a newborn with an incomplete midline cleft of the lower lip and a bifid mandible. The mother had been diagnosed as having Stein-Leventhal syndrome, and a bilateral ovarian wedge resection had been performed several years prior to the conception. There was no familial history of congenital anomalies. The infant, seen 22 days after birth, revealed an incomplete cleft of the lower lip with a submucosal cleft of the orbicularis oris and a midline furrow to the chin. There was hypertrophy of the upper lip frenulum and a tight frenulum tethering the tongue to the groove in the alveolus. There was bifurcation of the mandible which was confirmed by x-ray film.

Release of the tongue and correction of the lip defect were performed at age five months. First the upper lip was released by a Z-plasty of the hypertrophied frenulum. The normal-sized tongue was freed by release of the lingual frenulum's attachment to the alveolar notch and closure of the defect on the ventral aspect of the tongue in a straight line except for a Z-plasty interruption at its inferior extremity.

The lower lip cleft, being a submucosal type, notched in the vermillion but with the skin only grooved by a depression without an actual fissure, called for surgery designed to avoid unnecessary scarring of the skin and even maintenance of that part of the congenital groove that lay in the normal chin dimple posi-
tion. Thus, a midline incision was made in the posterior mucosa and continued down vertically to the labial sulcus. The mucosa was undermined on each side of the defect and the orbicularis oris muscle dissected free. The fibrotic union of the muscle in the midline was excised vertically, except at the normal chin dimple position, and the muscles were sutured together across the cleft. Excess mucosa and vermilion were trimmed, and the posterior wound was closed with fine catgut.

This closure of the muscle gap advanced the sides of the lower lip cleft medially enough to allow excision of the notched free border vermilion. A step closure was designed which carried the mucocutaneous junction line in an overlapping vermilion flap. Then only a 3 mm. vertical V skin excision was necessary to facilitate the alignment of the mucocutaneous "white roll" and still achieve a full-bodied vertical closure of the vermilion free border without tendency toward notching. The ends of the mandible were left undisturbed with the plan to complete bony continuity at a later age. This will probably require a curved iliac onlay graft for added contour as well as union of the two fragments. The tongue maintained its freedom, and the lip healed with a satisfactory aesthetic and functional result.

A complete cleft of the lower lip would be treated with the same general design but would require an inverted V paring of the cleft edges to allow a three-layer closure with emphasis on the muscle approximation. When the cleft extends into the neck, a
Z-plasty may be of value, but if there is a marked lack of tissue in the area, well-planned local flaps may be necessary to achieve adequate chin-neck construction.

**EARLY BONE GRAFT**

At the 1973 Cleft Palate Congress in Copenhagen, a lower lip cleft was presented by Jan Grochowski, Puk Erwin and Gallas Zofia of Krakow, Poland. This was a complete cleft of the lower lip and mandible 2 cm. in width with a bifid anterior tongue, fistula in the mental region, absence of the hyoid bone and 1 cm. wide connective tissue bands extending from the free mandibular margins to the sternum. At about three months of age, two tibial bone grafts were used to bridge the mandibular gap. Three months later, the fistula was excised and the lower lip closed by the LeMesurier quadrilateral flap principle. Two years after surgery growth and development were reported to be progressing normally.
LOWER LIP

CONGENITAL lip sinuses, equally well known as mucous pits, were first described in the lower lip by DeMarquay in 1845. In 1951 Watanabe could find only 100 cases reported in the literature, but by 1967 Coccia and Bixler had found 200 and the numbers are mounting, as evidenced by Hoffman’s 13 cases in 1971 from Mt. Sinai Hospital Cleft Palate Clinic, New York. Of course, many cases are not specifically reported. For instance, Viale-Gonzales, Barreto and Ortiz-Monasterio have so many clefts they can afford to include a case with mucous sinuses in association with a bilateral cleft presentation and not bother to report it separately.

INCIDENTS OF ASSOCIATION WITH CLEFTS

In 1964 Gorlin and Pindborg found this anomaly associated with cleft lip or palate in approximately 70 percent, but a review of the world literature reveals that most authors find the association closer to 80 percent. In 1954 Van der Woude estimated that 0.5 percent of patients with cleft lip and palate also have mucous pits while Rintala, Lahti and Gylling estimated the association at 0.9 percent.
ETIOLOGY

Theories of the etiology of these sinuses range from intriguing to ridiculous. Sir Arthur Keith suggested that the phylogenetic origin might be found in the mucous canals of the lower lip of sharks, but Ludy and Shirozy failed to find any sharks with mucous canals. Other theories lay the blame on an attempt by the lower lip to close a cleft of the upper lip, amniotic adhesions, abnormal invagination of lip mucosa, faulty union of the mandibular processes and presence of epithelial pearls. Wang and Macomber considered each in detail and then struck them all off.

Evidently Steida in 1906 was the first to suspect the “sulci laterales labii inferioris.” In 1912 Huber noticed in the human embryo a secondary notch on either side of the median groove of the lower lip after complete fusion of its two halves. In 1934 Sicher and Pohl found the presence of lateral sulci in 6.5 mm. embryos and, more clearly defined, in 9.2 mm. embryos; in later embryos these had disappeared. In 1952 Warbrick, McIntyre and Ferguson studied serial sections of human embryos and proposed that these sinuses were due to failure of obliteration of the cephalic end of the lateral sulcus of the developing mandibular arch.

Wang and Macomber in 1956 and S. Hoffman in 1971 favored this lateral sulcus theory. These congenital sinuses most often occur as a pair of dimples on each side of the midline. Yet they can occur unilaterally, usually on the left but occasionally on the right and very rarely in the midline, which condition seems
consistent with the theory of the persistence of the lateral sulci and, when in the middle, the median groove.

**Heredity**

Wang and Macomber considered the anomaly due to a single defective gene. Van der Woude did also, and in her series of five families, including 94 persons, these interesting findings appeared which are of value for genetic counseling:

1. Autosomal dominant inheritance with a 50 percent chance of inheriting the gene was shown.
2. The affected individual could have pits alone, cleft lip or palate alone, all three or any combination (and a few had no abnormality but could transmit the gene).
3. Of her 94 persons, 55 had abnormalities (pits and/or cleft lips and/or cleft palates) and 30 of the 55 had cleft lips and/or palate.
4. Persons most severely affected (i.e., having pits and cleft lips and cleft palates) transmitted more severe defects to their offspring: 25 percent had cleft lips and palate, 8 percent had cleft lip, 8 percent had cleft palate.

Yet as cleft lip and palate and cleft palate alone are believed to be different entities by Fogh-Andersen and congenital lip sinuses have been found in both these conditions, it may be more likely that two genes are involved. Test and Falls found lip sinuses in five generations of the same family. Others have reported families with various combinations of sinuses and cleft lip and/or palate which can be traced back for several generations. In 1943 Straith and Patton from Detroit reported a family of 13 persons which, over a span of three generations, produced six persons (or 50 percent) with bilateral cleft lip and/or palate. Each member with a cleft also had bilateral mucous pits of the lower lip secreting tenacious mucus from each of its pair of ducts opening just above the mucocutaneous line.

These anomalies, as noted, can be transmitted to approximately one-half of the offspring. Even an unaffected member of an involved family may have severely affected offspring. Cases
reported in the literature suggest simple dominant inheritance with variable expressivity. In 1943 Fogh-Andersen first pointed out that the inheritance of clefts in the families with congenital lip sinuses is of a different character from that in families where no pits occur.

Robert J. Gorlin, Chairman of the Oral Pathology Division of the University of Minnesota, who also has an M.S. degree in chemistry, with J. Cervenka and S. Pruzansky, compiled a learned treatise for Birth Defects in 1971 entitled “Facial Clefting and Its Syndromes.” They noted, in reference to lower lip pits and cleft lip and palate:

The syndrome is transmitted as an autosomal dominant trait with 80% penetrance of any component of the syndrome but there is a possibility that the type of cleft present is influenced by modifying genes. The syndrome is seen with a frequency of about 1:75,000 to 1:100,000 live births and affects both sexes equally. On the basis of an analysis of 39 pedigrees, Cervenka, et al showed that an affected individual has a 22 to 39% chance of having an affected child with a cleft with or without lip pits. . . . Congenital lip pits of the same type have also been seen in association with the orofaciiodigital syndrome and with the syndrome of popliteal pterygia.

A MUCOUS VESUVIUS

These dimples, which may appear as a circular depression or a transverse slit, are often situated at the apex of a nipple-like elevation. Each dimple is the orifice of a blind sinus extending downward and backward to penetrate the orbicularis oris muscle. The pit can vary in diameter from pin caliber to 2 mm., and its tract may extend in depth from 5 mm. to 2.5 cm. Lined by keratinized squamous epithelium like the vermilion with numerous mucous glands in the depth of the blind end, the pit may secrete a copious amount of mucus requiring wiping. Sir Arbuthnot Lane reported a case in which the secretion increased at mealtime.

MEDIAN LOWER LIP SINUSES

Although these sinuses most commonly occur bilaterally and anteriorly near the mucocutaneous junction, four median lower lip sinuses have been reported—by Ruppe and Magdelaine in
1927, Sato in 1938, Wang and Macomber in 1956 and Rintala and Lahti in 1973. Then there is a case reported by Rintala, Lahti and Gylling in 1970 and presented again in 1973 which was unusual in that the sinus was midline, relatively large and opening more posteriorly on the mucosal side of the lip. This sinus was found to be bipartite in its deeper part, with its septum covered by intact stratified epithelium. There was an associated bilateral cleft of the lip and palate. Oberst in 1910 reported a similar case. Miller in 1896 and Rose in 1868 also reported somewhat similar cases, in which the middle part of the lower lip resembled a nose with two nostrils from which the fistulous canals ran 2 cm. deep, each terminating in a separate cul-de-sac close to the mucosa of the labiogingival sulcus.

The occurrence of lower lip sinuses is often associated with minor facial developmental anomalies such as a short frenulum (found by Holbrook), sinus of the frenulum and fistula of the nasal bridge (MacKenzie) and preauricular tragal hillocks and occular dermolipoma (Parisien and Berken).

TREATMENT

In 1868 E. Rose suggested the indirect approach of an intraoral window to open the fistula into the oral cavity. In 1939 Baxter advocated more direct electrocoagulation of the entire tract. Mark Wang and Brandon Macomber, from experience with 15 cases, noted that the modern approach was complete surgical excision of the mucosal tract together with the surrounding glandular tissue. They warned that incomplete excision of the mucous glands would result in a mucoid cyst which in turn requires excision. They also advocated careful closure of the defect with special attention to the muscles to avoid undue looseness of the lower lip following orbicularis oris stretching from the presence of the sinus. Hoffman mentioned vertical elliptical excisions of the pair of sinuses in one of his cases.

Bill Lindsay in Mustardé's *Plastic Surgery in Infancy and Childhood* warned about mandibular lip pits:

The pits may be single or double, superficial dimples or deep sinuses. The
treatment is transverse elliptical excision including sinus opening and tracts. All the involved mucous membrane must be excised or the sinus will recur.

T. D. Rees and D. Wood-Smith in their elegant red and gold 1973 book, *Cosmetic Facial Surgery*, presented a case of upper and lower lip vermilion hypertrophy which also had a small midline pit surrounded by a tubercle in the vermilion of the lower lip. Paring of the excess vermilion and excision of the pit improved appearance but still enabled the patient to achieve a normal lip seal.

The most fascinating description of lip sinus surgery was reported by A. Rintala and A. Lahti of the Finnish Red Cross Hospital in Helsinki in 1973 in the *Scandinavian Journal of Plastic and Reconstructive Surgery*.

After making an elliptical incision parallel to the lip around the lower lip sinus and elevating the edges of the sinus in order to facilitate dissection, it appeared that the sinus, extensive in its upper part, was divided into two at a depth of about 7-10 mm. Division was caused by a septum in the mid-line, like a pair of trousers... Each "leg" continued separately almost to the bottom of the labiogingival sulcus for a distance of over 1.5 cm. The "legs" ran relatively close to the oral mucosa and converged toward the fundus, terminating close to one another in separate blind sacs from the bottom of which a fibrotic strand passed on to the anterior surface of the mandible.

**PERSONAL CASES**

I have had several congenital mucous sinuses of the lower lip in cleft lip and palate cases. There has been nothing of special importance to note except that complete excision is not always easy. Of those I have treated, four are of varied interest. In two I treated the clefts and the sinuses primarily, in another the clefts primarily but the sinuses secondarily and in the third both the clefts and the sinuses secondarily.

One case of bilateral lower lip sinuses, first seen in 1963, was associated with a severe complete right unilateral cleft of the lip and palate. There was no family history of clefts or pits, but it can be predicted that there will be. The mucous sinuses were in the vermilion of the lower lip near the mucocutaneous junction on
either side of the midline. They were excised individually and transversely and the scars revised several years later.

Another case of bilateral lower lip sinuses was seen in a girl with associated complete bilateral cleft of the lip and alveolus with protruding premaxilla but no cleft of the hard or soft palate. There was no history of clefts or pits in the family.

At 2½ months the premaxilla was set back and fixed in the notch in the hard palate after subperiosteal resection of a portion of the vomer. Lateral mucosa and muscles were joined behind the prolabium and a forked flap was banked as "praying hands" with the alar bases.
Eight months later, methylene blue was painted into the depths of the two pits and a transverse elliptical excision was extended 2 cm. deep into the lower lip dissecting out the sinuses like a pair of closed end trouser legs. The methylene blue facilitated total excision. The wound was closed in layers.

A boy was born in 1970 with a right complete cleft of the lip and alveolus associated with mucous sinuses of the lower lip. The mother had had a cleft of the lip and had a history of others in her family with clefts, but no mucous sinuses were reported. Rotation-advancement closure of lip was carried out at four months of age but sinus excisions were postponed. An attempt elsewhere resulted in right transverse and left oblique scars but persistent secretion of mucus.

At age four years both scars were included in one large transverse excision carried deep to remove all mucosa of the sinuses. Wounds healed without difficulty, but the patient returned to South Africa. Although the father reported that all is well, no photographs have been forwarded as yet.

A baby girl was born in 1968 with right complete cleft of lip and alveolus with bilateral mucous sinuses of the lower lip. Lip closure and sinus excisions were carried out elsewhere. It is of particular interest that the great-grandfather, the grandfather and the father all have had mucous sinuses of the lower lip. It is also of importance that the patient has a normal fraternal twin.
In 1972 the lip and nose were revised and the mucous sinuses reexcised. A large mucous cyst formed postoperatively which required another, more extensive transverse excision resulting, finally, in complete removal of the intact mucocele and excellent healing.

Total excision, of course, is the answer. If the sinus appears as a transverse slit, it may be easier to excise it horizontally, particularly if there is a pair. Occasionally better scar and contour may be achieved by excision of a vertical ellipse. Fortunately this anomaly, if handled correctly, leaves little to no residual deformity, and the importance of this outcome is multiplied as the defect has a 50-50 chance of reappearing in future generations.

**Midline Sinus of the Upper Lip**

The earliest cases were reported by the French, Lannelongue and Menard in 1891 followed by Clavet in 1899. There are eight cases in the world literature; seven of the sinuses opened in the center of the philtrum and one at the base of the frenulum. MacKenzie’s case had a 1 cm. blind tract not piercing the orbicularis oris ending near the nasal spine. Holbrook’s case had a 2 cm. wide opening in the center of the philtrum surrounded by red epithelium. Microscopically these tracts have been seen to be lined with squamous epithelium. Clavet’s case also had areas of columnar and polyhedral epithelium. In Holbrook’s case the tract was surrounded by hyaline cartilage and, unlike the other cases, had
no hair follicles or sebaceous glands. Most cases had occasional mucus drainage, and two had a history of infection. There have been associated anomalies reported: Kriens' case had a double frenulum; MacKenzie's case had a cyst and fistula on the dorsum of the nose. Treatment, when recorded, has been excision of the entire tract.

A VERMILION SINUS

Roger Bartels and Robert Howard of Orlando in December 1973 reported in *Plastic and Reconstructive Surgery* a case with mild hypertelorism and a minimal midline cleft of the vermilion of the upper lip with a tiny dimple at its center, the squamous epithelialized tract extending superiorly through the orbicularis oris muscle for 1 cm., then submucously for 2.4 cm., ending in a blind sac attached by a small fibrous band to the nasal spine. Total excision of the tract was carried out and followed by an uneventful recovery.
Bartels and Howard summarized upper lip sinus embryology in 1973:

Whether a midline sinus of the upper lip is a variation of (1) failure of downgrowth of the nasofrontal process, (2) breakdown of the mesenchyme-poor, fused, maxillary processes, or (3) failure of complete fusion of the maxillary processes growing together over the nasofrontal process, is not known. The association of hypertelorism with a midline sinus and cleft of the upper lip in our case supports the theories of Boyd and Frazer, that this anomaly is related to an abnormality of the nasofrontal process.

**A DIMPLE IN THE DIMPLE**

In 1960 I reported the incidental finding of a midline dimple in the skin of the medial element of the upper lip just above the mucocutaneous junction in a right complete unilateral cleft of the lip and palate. The tract extended several millimeters. It was observed as the medial component was rotated down into balanced position and then later simply excised.
63. The Never-Ending Challenge

Many articles have been written in minute detail to encourage surgeons to explore the primary and secondary possibilities of rotation and advancement, the forked flap, the midline Abbe flap and many other procedures. Even after faithfully reading all published material, visitors to Miami often say:

I’ve read every paper, but seeing the operation makes all the difference; and incidentally, it’s encouraging to see that you too have to struggle to get the result.

It is true that words and diagrams are an aid, but nothing teaches like the actual surgical procedure, when the method is adapted to the peculiar aspects of a specific case. It has been my privilege to rotate and advance, to fork-flap and to lip-switch in numerous places, varying from a tiny hospital on the volcanic island of Grenada to Reed Dingman and Bill Grabb’s great center at the University of Michigan, Ann Arbor; from the famous Massachusetts General Hospital, Boston, to TV from Hermann Hospital, University of Texas, Houston. The circumstances have sometimes been a bit distracting.

A demonstration at the military hospital in Bogotá, during a Latin American Congress for the northern zone, had my dear friend Hector Marino moderating the surgery and spicing the show like a sportscaster at a bullfight:

Now he is ready to finish it off. The needle is poised. Wait! No! No! He is taking out all the stitches, ladies and gentlemen, and starting all over again.

Ralph Millard
Then there was the cleft lip demonstration at New York University Hospital when I was competing with the great John Marquis Converse doing his first hypertelorism operation in the adjoining room; or the time behind the Iron Curtain at Comenius University in Bratislava with such luminaries as Professor Demjen assisting and Peet and Schmid standing by, not to mention a likely Communist or two.

These have all been exciting times. I appreciate the kind invitations of my colleagues and cherish the memories.

The most I ever did in one visit was in 1964 at Mellon’s Albert Schweitzer Hospital on then Papa Doc’s island of Haiti. No plastic surgeon had been over for two years, and in three days, with two anesthetists, I did my best to handle the more severe problems such as extensive burn contractures, huge hemangiomas, a congenital hand deformity, an orange-sized keloid, adding up to 23 operations. They included 10 unilateral cleft lips, one bilateral and one median, with the rotation-advancement cases averaging 30 minutes apiece. As many preoperative clefts as could be found had been collected in front of the hospital the first morning, and a photographic record was taken.
Then, in the dawn's dim light on the morning of my departure, all cleft surgery patients who could stand, sit, lean or lie were herded together again, stitches and all, for the final photograph.

This series enjoyed a comforting influence not ordinarily offered rotation-advancement and forked flaps. At the entrance of this little hospital was the witch doctor's endorsement as indicated by his specially arranged voodoo pile of sticks, strings, stones and bones.

Eight years later I received a note from Frank Lepreau, Medical Director of Albert Schweitzer Hospital:

I have in hand a reprint of your 1964 article about rotation-advancement cleft lip technique which you autographed and left here for Dr. Mellon some years ago. I used it a few days ago and you are quite right. This approach definitely does help Haitian lip repairs. As a very general surgeon, I need this kind of help to get me through the day's schedule.

After thousands of words, hundreds of illustrations, and thousands of miles, it becomes a bit tiring to watch some surgeons take a "free flying" principle and unconsciously, with numbers and measurements, clip its wings, placing a ceiling on
its potential height of flight. Any old seagull on Miami beach, because of the natural width of its wingspread, can glide with grace into the sun, but it is not supposed to achieve great speed and certainly not in the dark of night. Yet Jonathan Livingston Seagull, using the same basic principles of flight but with persistence and adaptability, trimmed his wings to falcon proportions and exceeded the exploits of other gulls.

He climbed two thousand feet above the black sea . . . brought his forewings tightly to his body . . . and fell into a vertical dive . . . The wing-strain now at a hundred and forty miles per hour wasn't nearly as hard as it had been before at seventy and with the faintest twist of his wingtips, he eased out of the dive and shot above the waves, a gray cannonball under the moon.

The repetition by great and established surgeons of such ceiling-restricted clichés as "not suitable for wide clefts," "more than 3 mm. is the cutoff," "a banked fork vanishes," "only the author can make it work" almost sends me up the wall and without the aid of wings! At such times it is tempting to call upon the caustic words of Johann Friedrich Dieffenbach, who after an absorbing section on principles of reconstruction in his 1831 book concluded:

Should the surgeon find my description not sufficiently circumstantial, and be unable to supply anything from his own knowledge of general principles, that he may find wanting, he had better altogether abstain from operating.

This would indeed be the easy way out. Yet no teacher should turn his back on even one willing student, and I, therefore, once more offer this challenge. Our only true ceiling is the ideal normal, which in turn demands our eternal dedication to the study of knowing this beautiful normal. It is then that we can see clearly both what is misplaced or missing and what is present but superfluous. Finally, with a little imagination in the use of our basic plastic surgical techniques of rotation, advancement, transposition and free grafting, we can quite effectively execute the shift, taking what is expendable to create what is desirable. From this simple format the present procedures can be not only understood and mastered but, far more important, transcended!
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