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Cleft Craft: The Evolution of Its Surgery—Volume I: The Unilateral Deformity

D. Ralph Millard Jr.

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CLEFT CRAFT
THE EVOLUTION OF ITS SURGERY
I. THE UNILATERAL DEFORMITY

D. RALPH MILLARD, JR., M.D., F.A.C.S.
To Louis Calder Memorial Library
Director Mildred Langner
in appreciation
for all the help
in the 37 pages!
of references
1976
CLEFT CRAFT

THE EVOLUTION
OF ITS SURGERY

I
THE UNILATERAL
DEFORMITY

D. RALPH MILLARD, Jr.
M.D., F.A.C.S.

LITTLE, BROWN AND COMPANY  BOSTON
This work is affectionately dedicated to

my mother,

Florence Nightingale Hamilton Millard (Vassar '15),

who with artistic aptitude, high intelligence and

serene confidence has always encouraged endeavor
toward unattainable goals

and

my wife,

Barbara Lou Rene Smith Millard (Northwestern University '50),

who with clairvoyance, empathy and wonderful wit

and wisdom has aided through rough waters

and shallow shoals.

Furthermore,

both regal beauties have *inspiringly* straight columellae,
symmetrical cupid's bows, balanced philtrum columns
around dimples, smooth orbiculares oris,

excellent occlusions, supple soft palates—and that,

after all, is what these volumes are all about . . .
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ABOUT ten years ago in San Francisco, Bill Littler suggested I write a monograph on cleft lip. Six years later I finally started, but it eventually got out of control like Jack’s beanstalk. You cannot blame Bill for three volumes, but it is partly his fault for ever mentioning the subject in the first place.

Littler’s qualities of great presence, true artistry and advanced philosophical and technical accomplishment in the area of the hand would make any cleft surgeon yearn to be a Littler of Lips. Thus he was persuaded to write an artistic foreword complete with Rubenistic cupid’s bows and philtrum dimples.

DR. R.G.
'76
Dear Ralph,

There is no denying my obstinacive character. But here is the attempt at some thing too difficult for me — what it would be for your tremendous work is too elusive.

More the less, you have my best wishes for a great success and waiting of your Masterpiece.

Cordially,

Bill

July 14, 1975

During

Ralph Miller contributed to several works that should a hand should work on face. separate, the between them caused by a hand. But, the restoration of stigmatic,

In 1806, published a collection wherein he response to hand culminating Mechanism masterpieces two emotion the words of organ of expression face. Both, resulting

Advantages function during women were corner of the the fashion concept of "La Gioconda"
DURING the past two decades the refined work of Dr. Ralph Millard in cleft surgery has greatly enhanced the contributions of other gifted plastic surgeons in this field. But why should a hand surgeon be invited to introduce a three-volume work on facial cleft anomalies? Although the two regions are separate, there is a special functional and esthetic affiliation between them and, not infrequently, coexisting defects. The anguish caused by a cleft lip is certainly matched by that of the cleft hand. But, fortunately, both conditions share a predictable restoration of contour and function, and relief from the insensitive, stigmatic terms “hare-lip” and “lobster-claw hand.”

In 1806, Sir Charles Bell, the distinguished anatomist, published a collection of essays, “The Anatomy of Expression,” wherein he made a study of the facial musculature and its response to emotion. And in 1833 his thorough study of the hand culminated in the classic work concerning “. . . Its Mechanism and Vital Endowments, as Evincing Design”—two masterpieces which display his unlimited appreciation of these two emotionally and functionally related regions. The hand, in the words of Paré “that instrument of instruments,” is also an organ of expression, though, obviously, far less animated than the face. Both, nonetheless, are reflexly complementary.

Advantage was taken of the delicate nuances of facial muscle function during the Renaissance when, in Italy, Florentine women were taught to develop “a tempting smile in the left corner of the mouth.” A trace of such facial muscle function, in the fashion of the day, was enough to endow Leonardo’s portrait of “La Gioconda” with a timeless sense of mystery.
Restoration of this subtle mechanism requires the ultimate in surgical precision and artistry and that inexpressible capability to anticipate its later consequences. Dr. Millard has given of his vast experience in this comprehensive work.
Preface

CLEFTS of the lip, alveolus and palate along with the nasal deformity represent lack of normal development of this area of the face. To the plastic surgeon, the deformity offers a challenging puzzle with central facial pieces missing or misplaced. Surgery’s attempt through the ages to fit or force various pieces into the puzzling cleft seems to us today almost haphazard and without design. Yet there has been a thread of logic running through this “gain a little, lose a little” progress. The losses have followed most often when the surgeon ignored the first principle of plastic surgery—know the normal.

The plastic surgeon, probably more than any other surgeon, requires imagination for he must look into the puzzle of a cleft and project beyond surgical stages, growth, heredity and time to a specific ideal normal end result. With this picture as a transparency in his mind’s eye, superimposed over the cleft patient, the surgeon is abetted in the sorting out and fitting together of the pieces of the puzzle. Only with the normal as a guide is it possible to evaluate what is present in the area of the cleft in order to utilize to the best advantage what we have to create what we want.

This book is concerned with describing in intricate detail logical ways of finding the missing pieces and fitting them carefully into the puzzle so that the final picture is complete, normal and happy in function and appearance.

Semper investigans, nunquam perficiens.
Always searching, never quite achieving perfection.
A WARNING

*Cleft Craft* is a personal and biased work *not* to be misconstrued as a typical textbook for it will *not* outline the various aspects of the cleft problem with diplomatic impartiality and the usual superficiality. All milestones will be noted not only to give due credit for priority but to trace and interpret their position in the step-by-step evolution of cleft surgery. Only then can we evaluate our present position and proceed without unnecessary repetition. Since this work has been developed in careful sequence, in the spirit of an Agatha Christie mystery, it is hoped you will read it from beginning to end in its proper order, even if you skim or skip from time to time.

Be it completely understood that at all times *my evaluations* as presented have been based on *principles* rather than personalities. The individual sketches of participants that appear occasionally are merely touches of color in the "black and/or white" text.

NO CHARGE FOR SECONDARIES

I have called it as I see it today; tomorrow will be another day. If there are mistakes, and in such a work there may be, or if a deserving surgeon has been omitted, bring this error to my attention. The discrepancies will be amended to the best of my ability in the next edition, if there ever is one. For, as with any secondary correction which has been done for the good of the whole, there is the hope that the previous wounds will soon lose their angriness, soften and fade away.

KNOW THYSELF

There are three types of cleft surgeons for whom this book has been written.

There are those who have a standard approach complete with a set of blue dots. These surgeons are able to work smugly within the security of their routine and seldom wander far either below
or above the standard. Only when their blueprint fails to fit the problem are they forced to "freewheel" or flop.

Then there are those who look at each case as though they had never seen another like it. Yet here the naiveté ceases, for when they look, they see not only what is missing but what is available. Then, aimed at an ideal and guided by plastic principles, they shift what they have to make what they want, rarely slipping below standard but often transcending it.

There is a third type of surgeon, alas, who does not fit into either category as he has neither blueprints nor principles; he above all should use this book to raise himself into one or the other group for he is at present makeshift and dangerous.

**ANIMAL CRACKERS**

If you accept the premise that a camel is a horse put together by a committee of plastic surgeons, then plastic surgeon III will be responsible for producing "humped horses." Plastic surgeon I, with a standard blueprint, will turn out regular "saddle horses" which in time, although dependable, become a bit swaybacked. Plastic surgeon II, unhampered by a memorized design but visualizing an ideal and guided by principles, may make from what is available that which is desirable even unto a "Whirlaway."
Acknowledgments

This book is indebted to all who have contributed to the world literature on cleft surgery. Each contributor has been given not only as a reference but has been assigned his or her paragraph, page or chapter and, when possible, a personal characterization, an anecdote or an extracurricular activity has been added. Whenever history is written, truth must be the first essential, insuring accuracy of description and dates. Personal detail then adds its touch of color giving greater insight into the characters, enabling better understanding of their work and evaluation of their contributions.

There are those who deserve special acknowledgments because of their contributions toward the actual construction of this book.

First, a very personal thanks is extended to William Dean Warren, Chairman of the Department of Surgery, University of Miami School of Medicine 1964–1969; Emanuel M. Papper, Vice President of Medical Affairs and Dean of the University of Miami School of Medicine, and Robert Zeppa, present Chairman of the Department of Surgery, University of Miami School of Medicine.

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I. Basics
1. Embryological Theories

The embryological development of the face is still somewhat of a mystery. From the scant evidence we have, it is impossible to determine exactly how clefts form. It is like trying to re-create an intricate and technical full-length movie from a few one-frame film scraps cut at random out of the reel. There seem to be a number of intriguing theories, each of which has some evidence in its favor.

FusioN of Processes

The theory that separate processes fuse to form the central face was first advanced by Meckel in 1808 and later supported by Baer in 1828, Rathke in 1832, Kölliker in 1860 and Kollmann in 1868. German anatomist Dursy in 1869 and German biologist Wilhelm His of Leipzig University in 1901, working on chick embryos, popularized the theory of embryological development of the mid-face by the fusion of five facial processes about the rim of the primitive oral cavity or stomodeum. Superiorly there is the frontonasal process; laterally there are the paired maxillary processes and inferiorly the paired mandibular processes. According to the classical theory, all of these processes grow forward as finger-like projections to fuse with each other to form the normal face between the fifth and eighth weeks. The frontonasal process gives rise to three processes, the frontal, nasomedial (globular) and nasolateral, responsible for the development of nose, prolabium and premaxilla. The maxillary process by fusing with the nasomedial process forms the lateral upper lip and
The mandibular processes meet to form the lower jaw, chin, and lower lip. This hypothesis reigned some 30 years as the accepted basis of facial formation. The failure of fusion of these processes seemed to explain the formation of the various degrees of unilateral and bilateral clefts and even the rare midline upper and lower lip cleft.

Thomas Mullen of San Francisco in 1931, following the Dursy-His hypothesis, described it this way:

Embryologically the growth toward the median line of the processes going into the formation of the mouth and lips, progresses, until in the seventh week they have fused. The manner in which the processes unite is similar to the healing of wounds. The ectodermic coverings of the processes unite and the mesodermic elements spread across the line of epithelial union to give rise to the muscles and connective tissue of the adult structure. Epithelial ingrowths separate the lips from the alveolar portion of the jaw.

Thirty years later Patten, for Pruzansky’s 1961 book *Congenital Anomalies of the Face and Associated Structures*, presented this schematic design of the fusion hypothesis.

The fusion theory is no longer in vogue. The term “process” implies a finger-like projection of tissue, and “fusion” implies that the projections meet, their epithelial walls disappear and they then grow together. As shown as early as 1910 by Pohlmann, this is not the case. Inspired by Fleischmann, Pohlmann was the first to cast doubt on the classical theory, realizing it was not a question of separate processes but of localized prominences.

**Migration of Mesoderm**

Zoology professor A. Fleischmann of Erlangen, Germany, in 1910 had a hypothesis that
cleft palate is the arrest of the disappearance of the epithelial membrane which remains intact, not penetrated by the adjacent mesoderm.

This mesodermal penetration theory appealed to Victor Veau, who admitted that until 1930, at the age of 60, he had never even looked at an embryo. As he wrote in 1935:

I was searching for an operative method for the treatment of cleft lip.... I ascertained the fact that the only productive methods were those which approximated normal development: surgery of malformations is experimental biology.... The theory of the coalescence of the processes led me to a method that I thought to be a good one because it had an embryological basis. I experienced a series of disasters.

In 1934 Veau, disenchanted with the old facial process theory which he now considered a “myth,” sent data obtained from Fleischmann to Professor Hochstetter of Vienna. Hochstetter had been the first to describe the oronasal membrane, an incomprehensible finding according to the theory of facial processes. Hochstetter answered Veau by sending him two embryo specimens that had been puzzling him for some time: a 22 mm. unilateral cleft and a 23.3 mm. bilateral cleft. Veau was ecstatic:

You can imagine how joyful I was.... I found the undisputable proof of the Fleischmann theory.

Veau, the surgeon, noted in 1935:

I have been the gardener who has been responsible for the growth of the small plant, once it was germinated. The embryologists ignored Fleischmann or only referred to his hypothesis with irony. I showed that his theory could be applied to all clinical varieties of the cleft lip malformation.

Thus Veau endorsed the theory that with the penetration of mesoderm across the groove (arrow) normal development ensued while failure of the mesodermal migration eventually led to breakdown and cleft formation.

It is of interest that, although Veau changed his embryological ideas, this switch did not greatly influence his treatment of clefts. His acceptance of the importance of mesodermal penetration might, however, explain his enthusiasm for wire approximation of the muscles across the cleft.
Studious Richard B. Stark of St. Luke’s Hospital, New York, with access to several more embryos with clefts, probed the mysteries of cleft formation and, like Veau, came up enthusiastic about the mesodermal migration hypothesis. He has written much on this subject, beginning in 1954 and including his presentation at the 1971 Melbourne congress, but extracts from his personal correspondence in 1972 are most pertinent. He outlined the pathogenesis of facial clefts during the first four to seven weeks:

As the discoid embryo develops a head and tail fold, so too does it develop an oral dimple, a two-layered stomodeal plate, composed of oral cavity ectoderm and entoderm of the primitive gut. The bilamellar membrane that forms in the region of the upper lip consists of two layers of ectoderm called an “epithelial wall” by Hochstetter.

If these gossamer two-layered membranes are not bolstered early, rapid embryonic growth dooms them to rupture with the production of a cleft. . . .

In the head and neck regions, mesoderm migrates over as well as around the head. Migration over the head is necessary if the forebrain, nasal dorsum and the central lip are to develop normally. Migrating around the head bilaterally, mesoderm reinforces the “epithelial wall,” the branchial membrane of the lip, first posteriorly near the future incisive foramen. As more mesoderm migrates medially, it forms the nasal floor as far as the nostril sill and reinforces the alveolabial complex, then the lip and finally the vermilion.

Mesoderm does not always arrive in sufficient amount to prevent the unreinforced membrane from splitting apart. If reinforcement fails totally, the result is a complete cleft whereas if the mesoderm is only partially present there will be a partial cleft. If the mesoderm arrives too late for effective reinforcement the anomaly will exist as separated but fully developed parts.

While the primitive nose takes form as two nasal placodes, inverted
ectodermal horseshoes, it is reinforced with mesoderm in the region of the nostril floor. The ectodermal cells involved begin to proliferate carving furrows and sulci and digging cavities and tunnels to create nostrils and alveolabial sulci. Deeper burrowing extends the twin nasal fossae through the mesenchyme and mesoderm into the oral cavity with a double tunneling “break-through” which actually circumscribes the mesoderm of the prolabium, premaxilla, anterior nasal septum and columella of the primary palate (P.P.). All this occurs from the 4th to the 7th week. After the 7th week the dental lamina appears and late-arriving mesoderm migrates into the prolabium piling up on either side as philtrum ridges.

Richard Stark and Joshua Kaplan in 1973 attributed insufficient mesoderm migration into the lip and nasal floor as the basic cause of cleft formation and the absence of dental lamina and the philtrum in the area of the cleft. They also tag part of the blame on the cannibalistic sculpting of ectoderm burrowing into the wall, attenuating it, fraying it, finally severing it...

and the tension of rapid growth causing traction to the point of rupture. In an incomplete cleft it is their opinion that the epithelial plug has remained as Simonart’s band.

The area of lip and palate clefting has been divided into two major parts with the incisive foramen as the demarcation point.

1. The primary palate, consisting of the anterior nasal spine, columella, medial portion of the upper lip and premaxilla, develops during the fourth to seventh week of intra-uterine life.

2. The secondary palate, consisting of the hard and soft palate, develops during the seventh to twelfth week of intra-uterine life.

Division of the primary and secondary palate is marked by the incisive foramen in the roof of the mouth and bilateral sutures which extend from this midline foramen to the space between the maxillary lateral incisor and first canine tooth.

A SIMPLIFICATION

Quite simply the mesodermal migration theory proposes that coincidental with invagination of the oral cavity and nasal pits
there is a "heaping up" of the adjacent tissue forming facial prominences. As the oral and nasal cavities deepen, there is an increase in the sizes of these prominences due to the penetration of mesoderm. As more mesoderm enters the area, the bulging effect is increased so that what used to be a wall of tissue with ectoderm on one side and endoderm on the other is transformed into a conglomerate of hills and valleys. The difference between a "hill" and a "valley," or a prominence and an apparent groove, is merely dependent on the amount of mesoderm between the two epithelial layers. As these prominences approach each other, their blending is at the expense of the "valleys" or grooves, and the normal facial contour evolves. Failure of sufficient mesoderm to migrate into a specific area would be responsible for the persistence of a groove. With consequent epithelial breakdown, the persistent groove gives way to an established cleft.

A MERGING

Bradley M. Patten, Emeritus Professor of Anatomy at the University of Michigan, was the son of a professor of anthropology at Dartmouth College, and throughout his life there was always a bit of the Ivy League about him. He combined the Dursy-His and Fleischmann-Veau theories and was adamant about his interpretation. He proposed the theory that the original frontal area was submerged by tremendous forward and downward growth of the paired nasomedial processes, implying both mesodermal infiltration and fusion of parts. He diagramed his merging theory in a chapter on "Normal Development of the Facial Region" for Pruzansky's book Congenital Anomalies of the Face and Associated Structures. Then, for Cleft Lip and Palate by Grabb, Rosenstein and Bzoch, he discussed the embryology of clefts by comparing three unilateral clefts of the lip: minor, halfway and complete. He noted that the variable in this series is clearly that part of the nasomedial process which contributes to the formation of the median part of the upper lip. . . . On the medial side of the cleft there is a small portion of the prolabium which, by reason of its relation to the midline, could only have been derived from the left
nasomedial process. This process, however, was sufficiently feeble in its growth so that it did not meet and unite with the maxillary process as it normally should. . . . Close scrutiny of the mesenchyme adjacent to the nasal fin of normal embryos reveals that on the nasomedial side the mesenchyme is more richly cellular and more highly vascular. I believe this indicates that it is the prime mover in this important union and that when its growth is inadequate a cleft will remain.

In reference to the accompanying nasal deformity, Patten noted that even when the cleft of the lip is relatively small there is a striking asymmetry in the configuration of the nose. He also noted that Avery has shown that in cases of unilateral cleft lip there is a marked accompanying deficit in the growth of the nasal capsule on the side of the cleft. This means that the disturbance of the potentialities of the mesenchyme of the nasal processes, which is so obviously involved in defective formation of the fibromuscular part of the lip, is manifested also in its chondrogenic potentialities. It is not surprising, therefore, that the extent of the nasal asymmetry is correlated with the extent of the defect of the lip.

Hamilton, Boyd and Mossman summarized in 1962:

Current embryological opinion regards the elevations or "processes" of the developing facial region as in the nature of surface swellings produced by proliferation of the underlying mesoderm. The furrows between the elevations become smoothed out in subsequent development as growth and fusion of the mesoderm centres proceed beneath the ectoderm.

They cited Streeter's 1948 stand:

Under the circumstances no ectoderm requires absorption; it is simply flattened out in adaptation to the changed surface.

They admitted:

Nevertheless for descriptive purposes, it is convenient to retain the terms maxillary, mandibular and fronto-nasal processes.

In the mesodermal migration and merging theories when the mesoderm penetration is retarded, the groove persists and disruption along the line of a groove results in a cleft. This all seems simple enough and quite logical. Yet, as Vaclav Karfik
of Prague noted in 1967, it is too simple, for there is no embryonic facial groove to explain the lateral oro-ocular cleft which, although rare, does occur.

OTHER THEORIES

There are other theories besides the failure of fusion, mesodermal penetration or the merging of prominences. There is the theory of failure of the epithelial wall to develop, as proposed by Tondury in 1950, and the rupture of previously formed cysts in the soft tissue bridges, as suggested by Steininger in 1939.

In Hamburg in 1966 Pfeifer offered still another theory. Clefts in which the vermilion ceases at a distance from the nostril with skin and mucosa meeting in the cleft in a scar line flanked on each side by ends of muscle were termed "secondary clefts." Pfeifer proposed the possibility that these were formed not by failure of fusion but by the breakdown of a lip once intact. Here again, to prove the theory we would have to rerun the movie, but preferably backward.

STILL GUESSING

Obviously no theory enjoys universal acceptance, and as no one has been an eyewitness to the entire "in utero show," as yet it is impossible to propose and prove exactly what is happening. Embryologists continue to make educated guesses from 12 single frames, for as of Stark's latest publication only 12 known human embryos with cleft abnormalities had been studied. Of these only one, examined by Tondury, was less than 18 mm., and beyond 18 mm. the facial "clefts" are no longer normally present.

EMBRYOLOGICAL GEOGRAPHY OF FACIAL CLEFTS

With one exception, which is quite rare, congenital facial clefts have been correlated with grooves normally seen in the 6 to 12 mm. embryo. More specifically, a facial cleft has been considered to result from the failure of developing facial prominences
Cyclopia (B²)
Holoprosencephaly (B¹)
Hemicephalus (B³)
Median cleft (7)
Naso-ocular cleft (2)
Unilateral cleft (1)
Horizontal cleft (5)
Medial oro-ocular cleft (3)
Lower midline cleft (6)
Lateral oro-ocular cleft (4)
Treacher Collins syndrome
Holoprosencephaly (B1)
Cyclopia (B2)
Hemicephalus (B3)
Median cleft (7)
Naso-ocular cleft (2)
Unilateral cleft (1)
Horizontal cleft (5)
Medial oro-ocular cleft (3)
Lower midline cleft (6)
Lateral oro-ocular cleft (4)
Treacher Collins syndrome
or processes to obliterate these grooves by mesodermal migration or merging. This failure then allows the abnormal persistence of a groove which, in turn, breaks down and produces a cleft. The relationship of facial clefts and embryonic facial geography can be charted in this manner:

1. **Cleft lip**—failure of both maxillary and nasolateral prominences to merge with the nasomedial prominence. The nasolateral prominence successfully unites with the maxillary.

2. **Oblique cleft, naso-ocular type**—failure of nasomedial, nasolateral and maxillary prominences to merge with each other (example from Bartels, O'Malley, Baker and Douglas).

3. **Oblique cleft, medial oro-ocular type**—failure of maxillary prominence to merge with either nasolateral or nasomedial prominences. There is successful merging of the nasomedial and nasolateral prominences (example is case of Thomas J. Zaydon, Miami).

4. **Oblique cleft, lateral oro-ocular type**—does not correspond to any embryonic facial geography. The cleft traverses the maxilla lateral to the infraorbital foramen (example from Pitanguy and Franco). As noted by L. Hovey, this anomaly bears some resemblance to examples of the Treacher Collins syndrome such as the one published by Rogers in Converse's *Reconstructive Plastic Surgery*.

5. **Horizontal cleft**—failure of maxillary and mandibular prominences to merge (example from Millard and McNeill).

6. **Midline cleft of lower lip and mandible**—failure of merging of the paired mandibular processes (example from Stewart).

7. **Median cleft**—failure of merging of nasomedial prominences. These clefts can be divided into two main groups.

   A. Failure of mesodermal migration or merging of the nasomedial prominences resulting in a varying degree of a midline cleft (example from Millard and Williams).

   B. Complete agenesis of the frontonasal process resulting in arhinencephaly, cyclopia, etc.

      (1) Agenesis of nasomedial process—nasolateral processes and maxillary processes will merge. In this case there will be absence of the premaxilla, prolabium and nasal columella.
(2) Cyclopia—agenesis of frontonasal prominence including nasomedial and nasolateral processes. Maxillary processes may merge; hence the absence of the nose (example from Millard and Williams).

(3) Hemicephalus with median lip cleft (Darwin’s missing link?) (example from W. B. Davis).

*This chart only scratches the surface*

This classic chart of the geography of facial clefts does give a general surface outline of the position of most clefts but must not be considered the total picture. In 1957, Max Grob of Zurich diagramed the various paths of oblique and transverse facial clefts concluding,

Note inability to explain paths of clefting using classic embryonic concepts.

In 1970 Robert Gorlin of the Division of Oral Pathology, University of Minnesota School of Dentistry, questioned the validity of clefts running along embryologic grooves when he wrote,

Only rarely, however, does the oblique facial cleft follow the epithelial grooves and other explanations should be sought.

Facial grooves are superficial and do not represent actual through-and-through clefts. As pointed out by Otto Kriens, what is more important are the goings-on under the surface as a chain reaction of one fault inducing another. Then to this third dimensional factor must be added also the element of time. It is becoming more and more apparent that clefts occur not over a period of weeks or months but within a very short interval of hours or, at most, days.

**MYSTERY VALLEY**

Another area of mystery besides the various cleft formations is the method of creation of the philtrum. Ian W. Monie, a Scottish anatomist from the University of Glasgow, a past president of
the Teratology Society and a Guggenheim Fellow, has been Professor of Anatomy and Embryology at the University of California, San Francisco, since 1952. In 1972 he wrote:

The study of the philtrum was undertaken because the development of this region seemed to have received relatively little attention. I recall J. B. de C. M. Saunders, Professor Emeritus of Anatomy, drawing attention to this in the course of one of our chats.

Thus Monie with Cacciatore in their 1962 study of the development of the philtrum noted two previous theories of philtrum formation: (1) persistence of the groove between the globular elements of the frontonasal process (Waterston) and (2) a heaping up of the maxillary mesoderm on either side of the middle line (Boyd). They then proceeded to study transverse sections of the upper lips of embryos, ranging in age from nine weeks to term, along with comparable sections of the upper lip of adult humans. They found no evidence that the philtrum is related to the lines of fusion of facial processes in the embryo. On the contrary, the philtrum does not appear until several weeks after the union of such processes has been completed. They found the philtrum primarily in association with the increasing density of the connective tissue in the median portion of the upper lip and first apparent between the third and fourth months of fetal life. In the September 1962 issue of Plastic and Reconstructive Surgery, they diagramed three human embryos to show the timing of the philtrum. At three months (60 mm.) there was a transverse crease but no philtrum, at three and one-half months (85 mm.) a transverse bow-shaped crease but no philtrum and, finally, at four and one-half months (130 mm.) no transverse crease but at last a philtrum.

Monie and Cacciatore pointed out that the paramedian eminences which flank the philtrum were found closely associated with the development of the philtrum but were independent of the lines of "fusion" of the facial processes, and although they contain considerable muscle postnatally, their development and configuration seem independent of it.

R. A. Latham, oral biologist at the University of North
Carolina School of Dentistry, stated at the 1973 cleft symposium at Duke, and again wrote personally that

It is very likely that the philtral dimple is due to an attachment between the lip epidermis and the mid palatal suture; and that the philtral ridges are due to some extent to the flared out posterior ends of the medial crura of the alar cartilages.

He also promised:

If this is correct, it should be demonstrable and more information will be forthcoming.

In 1973 Latham discarded his previous theory, explaining that

Studies of the normal fetus show muscle fibers arising from the alveolus in the lateral incisor area coursing anteromedially to insert near the epidermis in the medial philtrum portion of the lip.

As this is contradictory to the findings of Monie and Cacciatore, it may or may not reduce the shadow hovering over “Mystery Valley.”

Again, there are missing links, and again, the little embryological data available give us very minimal assistance in surgical correction. Creation of a philtrum still offers difficulty requiring relatively extensive surgical acrobatics.

ACADEMIC INTEREST

The embryological explanation of cleft formation is of great academic interest. No doubt if ever we are able to see an entire trimester movie of cleft formation from beginning to end, we may have better insight into the most appropriate surgical method of correction of the deformity. As today's fantasies are tomorrow's facts, such a movie may not be too far from reality. The fertilized ovum has already been developed and observed in vitro to the one-month stage. Were it not for moral and ethical dicta, space-age scientists could soon solve the mysteries of human development.
Yet, even after complete understanding of how a cleft happens, I am not certain the surgeon’s task will be much enlightened. As with any large healed hole which has been created by gunshot, cancer ablation or congenital anomaly, the surgeon, to close it, still must take what he has available to make what he needs.

Anyway, by the time we know how a cleft occurs, we probably will know why it occurs and can devote less time to its repair and more to its prevention. Unquestionably, cleft causation and prevention is the goal of the future. Yet our knowledge of this subject today is so inadequate that no further lines will be wasted. The subject is now dismissed after the humble acknowledgment that it deserves greatly increased research and many books of its own and that its final solution along with associated findings will be important enough to usher in a new era in the history of man.
2. Anatomy in Multiple Dimensions

All anatomy and most surgical textbooks laboriously describe again and again the normal anatomy of the face. Most of us find that anatomy unrelated to surgery gets lost in its Latin. Yet when pertinent to the surgery, it becomes vital and exciting and will be called upon constantly throughout this book to influence the design of surgery.

Here in its own unrelated section, it will be reviewed in its multiple dimensions but in "bikini" briefness, just enough to cover the essentials but not so much as to put you to sleep. Certainly, a comparison of the anatomy of the cleft deformity and that of the normal in reference to muscles, blood supply and specific labial and nasal peculiarities merits our attention, as these elements should influence directly any plan of cleft lip surgery.

Remember, the anatomy of the cleft deformity reflects not only the varying extent of embryological failure but the ultimate result of growth and development in the absence of intact dynamic labial and palatal musculature as well as the lack of structural support of the bony arch and partition between the oral and nasal cavities. In fact, because of a unilateral cleft, growth and development exaggerate the asymmetry and with it the difficulty of correction.

Effect of the Septum on the Maxillae

Ralph A. Latham, trained at Queen's University, Belfast, and inspired in clefts by Burston in Liverpool, is now Associate
Professor of Oral Biology at the University of North Carolina School of Dentistry, Chapel Hill. In 1969, in *Cleft Palate Journal*, he proposed the hypothesis that the nasal septum is a key factor in the height and anteroposterior dimensions of the face and presented diagrams and microscopic studies for substantiation. He showed by photomicrograph a sagittal section from a 17-week fetus demonstrating the septopremaxillary ligament (SPL) in relation to the nasal septum (S) and the anterior nasal spine (ANS). Then at Georgiade’s 1973 Foundation Cleft Symposium at Duke University, he reproposed that in the embryonic period the nasal septum is the dominant growth structure and in the normal there is equal septal drag on both maxilla as diagramed. When a unilateral cleft occurs, one side is set free, but the forward drag is still present on the other side through the intact septopremaxillary ligament effecting deviation in growth. The broken line sketched by Latham shows that a bent septum must incur a deficiency in height of the premaxillary region. Then, in the latter half of the prenatal period and after birth when the maxillae begin to exert their own growth, the bent septum acts as a bridle impeding downward progress of one maxilla. Thus, Latham pins the blame on the septum for premaxillary rotation, first downward and later upward, pointing to the tethering restraint of the bent septum on both downward and forward growth of one maxilla. He describes the final stage as: “It is much like the way a fish pulling on the line bends the fishing rod.”

**ANATOMY OF THE UNILATERAL CLEFT LIP NOSE**

The typical nasal deformity associated with congenital unilateral cleft of the lip presents both a discrepancy and a displacement of parts which persists without great improvement during growth. The distortion, being confined to the cleft side only, is emphasized by the constant comparison with the normal opposite side.

1. **Platform.** When the actual platform of the nose is cleft, the projection and outward rotation of the premaxilla and the
retroposition of the lateral maxillary element certainly guarantee that the nose will sit *askew*. Even when there is no bony cleft, the discrepancies in maxillary contour are responsible for some degree of nasal asymmetry. This is an architectural fact, for any structure, with one of its key legs shortened or pulled out from under it, must tilt!

2. *Septum*. With the medial maxillary element forward and the lateral maxillary element backward the effect is reflected in the twist and slant of the septum. The anterior portion of the septum tilts over the cleft like a lean-to with its inferior edge dislocated out of the vomerine groove and presenting with the nasal spine in the floor of the normal nostril. This dislocation is responsible for a twist to the nasal tip.

3. *Nasal bones*. The asymmetry of the maxilla and premaxilla and the deviation of the septum assure some distortion of the nasal bones.

4. *Columella*. The columella is deflected by the deviation of the septum behind it. It also suffers a unilateral shortness in vertical height which can vary from three-fourths to two-thirds to even one-half that of the normal side.

5. *Nasal floor*. In complete clefts the nasal floor is cleft not only in skin and muscle but in bone, and the position of the maxillary elements can vary from overlap to abutment to gaps of millimeters or centimeters. In incomplete clefts there can be a variation from a thin skin bridge across a very wide nasal floor to a nasal floor within a millimeter of the normal width. I have never seen one the exact size of or smaller than the normal side.

6. *Lower lateral alar cartilage*. The alar cartilage on the non-cleft side should be normal but often seems to be overdeveloped when compared to the attenuated cartilage on the cleft side. The deformed alar cartilage arching the cleft is dislodged from its rightful balanced position beside its mate in the dome of the tip. Rather, its medial crus is lower in the columella, with the junction curve of the medial and lateral crus separated from the opposite alar cartilage and resting below it, being flattened, spread and stretched across the cleft at an obtuse angle.

7. *Alar crease*. The alar crease on the normal side runs parallel
to the upper border of the lower lateral cartilage and smoothes out as it approaches the bulge of the alar cartilage in the dome of the nasal tip. On the cleft side the alar crease has no alar cartilage bulge to give way to and consequently, unopposed by this structure, continues obliquely across the tip just lateral to the join of the columella and through the rim of the ala. This abnormal extension of the alar crease across the tip on the cleft side produces a disjointed effect to the tip and often is responsible for an actual kink in the alar margin itself.

8. **Alar base.** The alar base is invariably rotated outwardly in a flare. It can be wider in bulk than normal or grooved, everted or misformed in various ways to complicate the correction.

9. **Alar rim.** Invariably there is a skin curtain without cartilage which droops over the alar rim like a web further reducing the apparent length of the columella on the cleft side.

10. **Vestibular lining.** The lining of the nasal vestibule seems to be stretched over a greater area than on the normal side with actual eversion of the lining in the alar base region. Yet there is a paradoxical discrepancy in a shortness of lining along the axis from its lateral attachment to the pyriform opening to its join with the septum at the tip. A pull on the nasal tip will cause a band in the lining to rise like a web arching obliquely across the lateral vestibular wall. Gillies and I wrote that the bridling effect of the tissue shortage on the cleft side was responsible for dragging one entire alar cartilage from its normal riding position with its opposite fellow on the tip crest of the septum. In fact, this shortness in the vestibular lining inside coincides with the abnormal extension of the alar crease over the dorsum on the outside and may be partly responsible for the excessive grooving.
If the patient is approached from the left one may be presented with a prospective Hollywood profile, from the right a Fagan caricature. The appearance is truly bizarre, eye-catching and pathognomonic of this congenital anomaly.

It would seem that the presence of a cleft in the nasal floor associated with generalized spreading, a cleft in the lip muscle allowing unopposed dragging of the nasal spine to one side and the alar base to the other and the inequality of the maxillary platform ensuring an asymmetrical nasal tilt could account for all the characteristics of the unilateral cleft lip nose. Yet minor and even moderate degrees of this same deformity can occur in the absence of any lip cleft at all. In fact, here is a somewhat faded photograph I took in the Lord Mayor Treloar Hospital courtyard at Alton in 1948 of one of Kilner's cases which revealed a cleft lip type of nasal deformity with no history of cleft lip except a slight congenital scar. At the time, this boy caused me much concern as he nullified the myth that the associated nasal deformity is directly dependent upon the actual cleft in the lip.

This microform is more common than is generally realized. Besides the English boy just mentioned, the American girl shown here, and even a super movie star who has mumbled his way to more than one Oscar, show a first-degree nasal asymmetry which, if not traumatic, could be congenital. Then there is the international array of published cases by R. Brown, Stenstrom and Thilander, Tulenko, Boo-Chai and Tange and Kozin.

After H. Pashayan and F. C. Fraser wrote a paper entitled
"Nostril Asymmetry Not a Microform of Cleft Lip," Maria Tolarova of the Czechoslovak Academy of Sciences, Prague, challenged their stand, reporting that nostril asymmetry occurred frequently in the first-degree relatives of patients with clefts. That the excess of nostril asymmetries in her study was greatest in the relatives of patients with isolated cleft palate, hardly a microform embryologically, is puzzling. Yet Tolarova held her ground, noting that nostril asymmetry as a microform was accompanied by associated deformities such as: underlying bone deficiency or prenatal scar with vermilion deformity, alveolar ridge discrepancy at the lateral incisor, malpositioned teeth in this area, cleft uvula or osseous cleft or even bent alveolar arch in the lateral incisor region. At least all these examples of nostril asymmetry confirm that first there must be an interruption in the natural nasal development, probably associated with inadequate mesoderm migration in the nasal area.

To Stark's question, "Is the nasal deformity due to displacement of the cleft half as the alar base sinks into the crevasse, or is it due to an inherent tissue deficiency upon the side of the malformation?" there have been several answers. Huffman and Lierle blamed the malposition of the cleft half, and Stenstrom and Oberg pulled on cadavers to reproduce the deformity. Finally, Richard Stark and Joshua Kaplan turned to measurements of ectodermal volume on the two sides of the primitive nose in embryos with unilateral clefts and found a relative deficiency on the cleft side. In a 24.5 mm. embryo the ectodermal ratio of the normal versus the cleft side was 6.1 to 5.4 sq. cm. or a cleft deficiency of 7 sq. mm. In a 36 mm. embryo the ratio was 23.4 to 20.2 or a cleft deficiency of 32 sq. mm. In a 48 mm. embryo the ratio was 18.2 to 14.8 or a deficiency of 34 sq. mm. This last and largest (48 mm.) embryo had a smaller nasal ectodermal volume than the 36 mm. one, confirming the obvious fact that some individuals are destined to have larger noses than others.

So, the nasal deformity is probably the result of a combination of factors. Once the normal embryonic sequence of nasal events has been upset, all the other anatomical vectors act to exaggerate the distortion. In spite of the odd exception, there does exist
a vague correlation between the extent of the lip cleft and the
degree of nasal distortion. The nose in minor lip clefts, although
occasionally moderately deformed, usually has only minimal
distortion, whereas in complete clefts the nasal deformity is
consistently severe and often horrendous.

ANATOMY OF THE UNILATERAL
CLEFT LIP

The upper lip, attached above to the nose, blending laterally into
the cheek and curving into the lower lip at the commissures,
is formed of muscles and glands covered in front with skin and
lined behind with mucous membrane. These layers are tightly
adherent to the muscles and are sealed along the free margin
with a vermilion border which is unique in man. Brescia of
Loyola University described the red of the lip vividly in Cleft
Lip and Palate, by Grabb, Rosenstein and Bzoch:

In this transitional zone the epithelium is thin and not keratinized; also
the connective tissue papillae are numerous, densely arranged, slender, and
extend close to the surface epithelial cell layers. The abundance of eleidin
in the epithelial cell layers, which increases translucency, and the num­
erous rich capillaries of the papillae, create the red color of this area.

Burkitt and Lightoller explained the development of this aspect
of the human lip:

When lips ceased to be prehensile organs and were being used in a modified
way for speech, the marginal portion became weaker and was dragged
upwards and forwards by the more powerful m. quadratus superior and
downward and forward by the m. quadratus inferior and the platysma.
Originally this action exposed some of the mucous membrane of the
mouth, which, in course of time, became modified to form the present
red lip area.

MUSCLES

The orbicularis oris muscle around the mouth with its
sphincter-like ability to contract and relax has influential muscle
associates that act as happy elevators and sad depressors. These oral muscles, which are involved in normal labial and nasal action, are divided into two groups, both supplied by the facial nerve. Sir Arthur Keith in 1923 noted that muscles supplied by the facial nerve are peculiar in that many mental states are reflected in them, and their development goes hand in hand with the development of the brain:

The more highly developed the brain of any primate, the more highly specialized are its facial muscles.

As we go up the scale of development of the mammalia, we find that the muscles about the mouth and in the lips become greatly specialized and are finer and more delicate in texture. For instance, in his study of the facial musculature of the Australian aborigine, Lightoller found muscles that were much thicker and more powerful with less apparent differentiation.

*Orbicularis oris*

Burkitt and Lightoller in 1928 described the orbicularis oris not as a true sphincter muscle but as eight muscle components with their origins in the small muscle mass, the modiolus, at each angle of the mouth. Arising from their respective modioli, the orbicularis fibers of one side end by decussating in the median line with fibers from the opposite side. The orbicularis is composed of four pars peripherales extending from the rima oris outward in an ever diminishing sheet reaching as far as the septum nasi above and the labiomental groove below on the right and left. It lies approximately in the center of the lip, and its fibers are pierced and interlaced by the fibers of the quadratus labii superioris and inferioris and labial portions of the platysma, the so-called labial tractors which pass through it to gain insertion in the fibrous tissue beneath the mucous membrane.

Intimately associated with the pars peripheralis is the pars marginalis with its two right and left components lying in a plane superficial to the pars peripheralis and confined to the area beneath the lip vermilion.
Tractor muscles

Greatly affecting the action of this circumoral musculature are the labial tractors. They are radially arranged as superficial and deep muscles, and most have as an attachment the modiolus at the angle of the mouth.

In the upper lip, these include the superficial zygomaticus major and minor, the quadratus labii superioris and the deeper levator anguli oris, which raise the lips and corner of the mouth and spread the nostrils. In the lower lip are the superficial depressor anguli oris and the deep depressor labii inferioris and mentalis muscles, which pull the lip down and the corner of the mouth outward. Then there is the superficial risorius, which pulls the corner of the mouth laterally, and the deep buccinator, which tenses the cheek. The fibers of these muscles insert into both the skin and mucous membrane by means of elastic tendon.
According to Brescia, where the tendons insert in a concentrated area a dimple occurs, but where they insert in a linear fashion a crease is formed.

**Cleft muscles**

In the presence of a cleft, the orbicularis oris muscle fibers do not decussate transversely across the midline over the maxilla but tend to run up parallel to the cleft edges toward the base of the nose. With their integrity divided, they often contract into a disappointed, useless lump usually evident on the cleft side. With the orbicularis oris muscle sphincter crippled by the split and no longer a worthy opponent, the antagonist tractor muscles make the most of their advantage, exerting unnatural lateral lifting and distortion of the lip elements in both incomplete and complete clefts.
Muscle dissections

In 1965 Fara, Chlumska and Hrivnakova of Charles University, Prague, Czechoslovakia, dissected and described the orbicularis oris muscle in incomplete clefts. Then in 1968 introspective Miroslav Fara again reported his findings after dissecting the muscles and blood supply of three unilateral incomplete and four unilateral complete clefts of the lip out of 16 stillborns. His dissections revealed the muscle bundles running along the edges of the cleft turning upward toward the line of the nasal wing on the lateral side and to the base of the columella on the medial side. He found that the muscles on the medial philtrum side of the cleft were always more hypoplastic and did not extend to the very edge of the cleft as they did on the lateral side, suggesting limited ability of muscle fibers to grow across the midline. Rarely, but in two of his cases, he found muscle fibers
running horizontally to the cleft edge. In unilateral incomplete clefs the muscles did not, as a rule, cross the cleft unless the bridge was at least one-third of the height of the lip. These findings prompted Fara to exclaim:

They show what difficult tasks confront us, if we wish to bring the muscle fibers together "end-to-end" and not "side-to-side" or "end-to-side" in the primary suture of the lip—regardless of the method used.

It is interesting that almost simultaneously, in 1966, Pennisi, Shadish and Klabunde in San Francisco compared microscopic sections of the philtrum and the skin bridge in incomplete clefs with normal lips. Their work was finally published in 1969 when they noted that the muscle fibers in the normal were orderly and transverse whereas in the cleft lip the muscle fibers swept up vertically toward the nose, running parallel to the edges of the cleft.

These general findings were further corroborated by two Muscovites in 1969 when R. D. Novoselov and A. A. Lavrentiev studied the surgical anatomy of the mimetic muscles in the oral region in three cadavers of newborns with congenital unilateral clefs of the upper lip.

On the side of the cleft they have a number of morphological peculiarities: they are less differentiated (more densely adhere to each other and have common muscle fibers), the beginning on the bone is displaced 2-3 mm. anteriorly and posteriorly. The muscles of the surface layer are somewhat longer and wider, approach the angle of the mouth lower by 2-3 mm. Muscles of the deep layers are shorter and narrower in the cross section and are situated to the oral cleft in similar or blunter angles. Splitting of the musculus orbicularis oris is attended by changed direction and attachment of the main muscular bundles of the deep layer. The most powerful of them, the superior muscular bundle on the side of the cleft, is attached to the base of the nasal ala, and on the healthy side in the region of the nasal base. They play an important role in the mechanism of displacement of base of the nasal ala on the side of the cleft and base of the nasal septum on the healthy side. This should be taken into consideration when restoring the continuity of the musculus orbicularis oris. In connection with splitting of the musculus orbicularis oris, the function of the latter is lost. This leads to incoordinated contraction of mimetic musculature.
muscles in the oral region. The non-counterbalanced muscles-antagonists at the moment of contraction exert a faulty effect on the nasal cartilages and fragments of the alveolar process. This effect should be considered as one of the active factors in the mechanism of deformations of the nose and facial skeleton.

VESSELS

The main blood supply to the lip and nose area comes from the facial arterial branch of the external carotid artery. Auxiliary sources come from the ophthalmic and the infraorbital arteries. The facial artery gives off inferior and superior labial branches which arise near the corner of the mouth and course as the coronary vessels close to the free border of the upper and lower lips deep to the muscle and close to the mucous membrane. In the upper and lower lip, the right and left labial arteries freely anastomose to form a circle surrounding the oral aperture. The facial artery then proceeds upward along the nasolabial fold and at the ala gives off the lateral nasal branch and then becomes the angular artery proceeding up to anastomose with the dorsal nasal artery, a branch of the ophthalmic. Meanwhile, the posterior septal artery arising from the sphenopalatine artery in the roof of the nasal cavity courses down the vomerine groove to the incisive foramen, anastomosing with the major palatine and ascending septal branches of the superior labial arteries.

Near the inferior lateral attachment of the ala, the lateral nasal artery splits to run one branch along the lower border and another along the upper border of the lower lateral cartilage. These branches anastomose in the midline with the terminal branches of the anterior ethmoidal arterial extension of the internal carotid artery. The anterior ethmoidal artery comes through the cribiform plate of the ethmoid bone, enters the nose and passes along the undersurface of the nasal bone arch, continuing distally over the upper lateral cartilages to the tip of the nose. Here it joins the lateral nasal branches to continue into the columella, anastomosing with the ascending septal branches of the superior labial artery.
Fara of Charles University, Prague, in his dissections of three incomplete and four complete unilateral clefts found the arterial networks generally coursing along the edge of the cleft upward parallel with the muscle fibers and stronger on the lateral cleft side than on the medial philtrum side. In incomplete clefts the vessels crossed the bridge always from the lateral side.

Slaughter, Henry and Berger dissected out the blood vessels in clefts to demonstrate the variation from the normal, and their 1960 vascular patterns, with slight corrections, have been used as a guide for these anatomical drawings. Although there is an interruption in the usual arcade in the upper lip in unilateral clefts, there is sufficient blood supply to both lip elements and the nose to allow surgery without slough and with the expectation of adequate healing.
NERVE SUPPLY

The sensory nerve supply to the involved areas of the lips and nose comes from branches of the fifth or trigeminal nerve surfacing through the infraorbital foramen as the infraorbital nerve and through the mental foramen as the mental nerve.

The motor nerve supply to the muscles of the lips and nose comes from the seventh or facial nerve through its zygomatic, buccal and mandibular branches.

Of course, the presence of a cleft through the lip musculature interrupts the normal course of the nerve fibers, but they do extend to or influence the muscles up to the edges of the cleft. As the field of action is involved mostly with the terminal branches of these nerves, their significance in the surgery is limited.
SURFACE ANATOMY

The surface anatomy of the lip and nose is also important in the planning of surgery. It was Leonardo DaVinci, artist, anatomist, sculptor, architect, biologist and engineer, who during the Italian Renaissance, among other things, divided the face into three equal parts—the forehead from hairline to brow, the nose from its root to its base and the lips and chin from nasal base to inferior border of the mentum. These proportions with slight variations are essential for a normal face.

In the normal, the columella stands as a graceful central column, straight and narrow right up to the proud nasal tip. At its base, the columella flows as a nostril sill across in front of the nasal floors toward non-flaring alar bases. The arches of the alae are symmetrical, with equal bulges of the alar cartilages in the nasal tip.

The ideal length of the upper lip at rest places its inferior edge at the lower one-third of the upper incisor teeth. As the upper lip rises, more of the incisors are revealed until with smiling there is three-fourths to total incisor exposure.

The eversion of the upper lip places it slightly out in front of the lower. At the mucocutaneous junction of the upper lip, there is an uninterrupted 1 to 2 mm. rounded roll from com-
missure to commissure which tops the vermilion and picks up a white light. It coincides in its curves with the undulations of the cupid's bow of the vermilion, which has a central free border tubercle flanked by slight indentations. From the height of each arch of the bow, the philtrum columns curve upward toward the base of the columella. Between these columns is a philtrum hollow or dimple which accentuates the effect of the eminences.

Human noses vary according to race, sex and circumstance as to the straightness of the septum, height and width of the bridge, position and shape of the tip, shape and size of the nostrils, position and thickness of the alar bases and length and width of the columella.

Human lips also vary with race, sex and circumstance in length and width, muscle strength, amount of expression, degree of hair bearing, curve of the cupid's bow, width of the muco-
cutaneous “white roll,” depth of the philtrum dimple, height and direction of the philtrum columns, fullness of the vermilion, strength of the tubercle and amount of eversion.

MEASURING THE NORMAL

Farkas and Lindsay measured 100 normal Canadians, 50 boys and 50 girls from the ages of 16 to 20 years. They found:

Length of columella

<table>
<thead>
<tr>
<th>Gender</th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10-16 mm.</td>
<td>12.3 mm.</td>
</tr>
<tr>
<td>Female</td>
<td>9-15 mm.</td>
<td>12.2 mm.</td>
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</tbody>
</table>

Width of columella

<table>
<thead>
<tr>
<th>Gender</th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>7-10 mm.</td>
<td>8.2 mm.</td>
</tr>
<tr>
<td>Female</td>
<td>6-9 mm.</td>
<td>7.9 mm.</td>
</tr>
</tbody>
</table>

Lateral vertical length of lip

<table>
<thead>
<tr>
<th>Gender</th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>11-21 mm.</td>
<td>16.4 mm.</td>
</tr>
<tr>
<td>Female</td>
<td>10-20 mm.</td>
<td>14.6 mm.</td>
</tr>
</tbody>
</table>

Medial vertical length of lip

<table>
<thead>
<tr>
<th>Gender</th>
<th>Range</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>18-26 mm.</td>
<td>22.0 mm.</td>
</tr>
<tr>
<td>Female</td>
<td>16-24 mm.</td>
<td>19.6 mm.</td>
</tr>
</tbody>
</table>

The normal Canadian measurements for medial vertical length of lip were similar both to those of central European norms, which Hajnisova found to average 21.2 mm. in the male and 19.2 mm. in the female, and to those of west European norms, which Hajnis found to average 21.5 mm. in the male and 20.5 mm. in the female.

Michael Franz and Anthony Sokol of Columbus, Ohio, measured 40 normal philtrums from peak to peak of the cupid’s bow and the total distance from commissure to commissure. They then computed the philtrum-commissure ratio to be the commisural distance divided by a factor of 3.75 to provide the measurement of the proposed philtrum. More simply, the width of the philtrum should be slightly more than one-fourth of the width of the mouth.
Fully aware of the significance of knowing the normal, my residents, with Gaston Schwarz, a Molson Foundation Fellow in training from Montreal, as principal investigator, have taken calipers into their homes, kindergartens, hospital nurseries and wards to compare the key distances in the lip-nose complex at various ages. They have used the calipers on each other and have shown exceptional diligence in measuring the attractive secretaries, nurses and patients of our plastic surgical division. The numbers may not be of great statistical significance, but they follow a trend that might be expected.

RACIAL COMPARISONS

Of course, there are normal differences in races other than skin color, and in the nasolabial area these can be important in the design of cleft correction. A comparison of nose and lip measurements in Caucasian and Negro males and females at various ages reveals, in spite of specific variations, some general consistent differences. For simplicity, all measurements have been rounded off to the nearest tenth of a centimeter.
Averages in cm.

<table>
<thead>
<tr>
<th>Age</th>
<th>Newborns</th>
<th></th>
<th>5 Years</th>
<th></th>
<th>Adults</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Caucasian</td>
<td>Negro</td>
<td>Caucasian</td>
<td>Negro</td>
<td>Caucasian</td>
<td>Negro</td>
</tr>
<tr>
<td>Sex</td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
<td>M</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Columella height</td>
<td>0.4</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>2. Columella width</td>
<td>0.4</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>3. Nasal width</td>
<td>2.2</td>
<td>2.3</td>
<td>2.3</td>
<td>2.4</td>
<td>2.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Lip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Vertical height (base of columella to tubercle)</td>
<td>1.5</td>
<td>1.2</td>
<td>1.4</td>
<td>1.4</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>5. Vertical height (nasal base to cupid’s bow peak)</td>
<td>1.1</td>
<td>1.0</td>
<td>1.1</td>
<td>1.2</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>6. Width (cupid’s bow to commissure)</td>
<td>1.5</td>
<td>1.5</td>
<td>1.6</td>
<td>1.5</td>
<td>2.3</td>
<td>2.3</td>
</tr>
<tr>
<td>7. Width (philtrum, peak to peak)</td>
<td>0.7</td>
<td>0.7</td>
<td>0.8</td>
<td>0.6</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>8. Width (entire mouth, commissure to commissure)</td>
<td>3.3</td>
<td>3.5</td>
<td>3.8</td>
<td>3.0</td>
<td>5.6</td>
<td>5.3</td>
</tr>
<tr>
<td>Total number of cases</td>
<td>12</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>13</td>
<td>11</td>
</tr>
</tbody>
</table>

**Generalizations on Caucasian and Negro Measurements**

*Columella:* There is no real difference in height at birth, but with growth there is a greater increase in height and width in Caucasians.

*Nasal width:* In the Negro the nose is only slightly wider at birth but with growth becomes considerably wider.

*Lip length:* Negro and Caucasian are close in lip length at birth, but with growth there is more elongation in the Negro, especially in females. It is of interest that our Caucasians resemble the Canadian and European Caucasian in vertical lip measurements.
**Mouth width:** Sexes and races are close, but total mouth width is greater in the male Negro at birth and as an adult.

**Philtrum:** The races and sexes are close at birth, but Caucasian adult males have wider philtrums than Negro males.

**Comparisons with Orientals**

Curiosity about comparison of the Caucasian and Negro with the Oriental prompted me to ask my friend Khoo Boo-Chai in Singapore to measure some Chinese lips and noses. His measurements unfortunately were carried out on postoperative clefts, but as the normal side was measured there probably can be some correlation.

Averages in cm.

<table>
<thead>
<tr>
<th>Age</th>
<th>3 Months</th>
<th>5 Years</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chinese</td>
<td>Chinese</td>
<td>Chinese</td>
</tr>
<tr>
<td>Race</td>
<td>M</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nose</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Columella height</td>
<td>0.4</td>
<td>0.4</td>
<td>0.5</td>
</tr>
<tr>
<td>2. Columella width</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>3. Nasal width</td>
<td>3.1</td>
<td>3.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Lip</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Vertical height</td>
<td>1.2</td>
<td>1.1</td>
<td>1.3</td>
</tr>
<tr>
<td>(base of columella to tubercle)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Vertical height</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>(nasal base to cupid's bow peak)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Width</td>
<td>1.7</td>
<td>1.7</td>
<td>2.5</td>
</tr>
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<td></td>
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</tr>
<tr>
<td>7. Width</td>
<td>0.7</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>(Philtrum, peak to peak)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Width</td>
<td>3.3</td>
<td>3.4</td>
<td>4.1</td>
</tr>
<tr>
<td>(entire mouth, commissure to commissure)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of cases</td>
<td>7</td>
<td>3</td>
<td>7</td>
</tr>
</tbody>
</table>
Columella length and nasal width of the Chinese at five years are closer to those of the Negro and in the adult fall between those of the Caucasian and Negro.

In the Chinese lip length is shorter and mouth width is smaller than in either Caucasian or Negro, but the philtrum width is about equal to that of both Caucasian and Negro.

It is possible that these slight but consistent differences may explain, in part, the rash of variations appearing in the Oriental cleft lip literature.

**A BUILT-IN NORMAL**

In the unilateral cleft at least the surgeon has the non-cleft side as a guide to this individual norm and should use it as such.
3. The Naming and Classifying of Clefts

A CLEFT BY ANY OTHER NAME

The cleft anomaly may be more ancient than man himself, but the early evidence is sparse. Ortiz-Monasterio with Serrano found a ceramic sculpture of a chief with a cleft of the lip from Nayarit on the west coast of Mexico, which seems to date from approximately A.D. 12.

The Greek physician Galen, near the end of the second century, about A.D. 170, mentioned cleft lip, applying to it the term "colobomata."

One thousand years before the Inca Indian empire of the Andes, the Mochica culture flourished on the northern coast of Peru. Almost 2,000 years ago its people portrayed realism in their ceramic art, specializing in the human face, its expressions and deformities and the human genitalia, sexual positions and "perversions." Alberto Carrion Vergara, a plastic surgeon who does many of the cleft lips that go down to Lima from the Andes, forwarded pictures of ceramic sculptures of clefts from the Museo Arqueologico of Lima dating from A.D. 200 to 400.

One specimen is a small red-brown and white figure with a central lip and nose deformity which appears to be a median cleft but could represent the ravages of leishmaniasis or punishment for adultery by mutilation.

Another is a black stirrup spout vessel portraying with remarkable accuracy a bilateral cleft lip with a small prolabium.
The third is also a red-brown and white stirrup spout vase depicting perfectly the unilateral lip cleft with exposure of the distorted maxilla and a malpositioned tooth, a philtrum dimple and the typical nasal deformity.

It seems that the earlier Peruvian cultures might have missed an opportunity. Had they capitalized on the midline lip cleft and flat nose of their beast of burden, the woolly-haired ruminant, this anomaly today might enjoy the melodious label of "llama lip."

Instead, by A.D. 390 cleft lip was being referred to as "harelip" or T’u Ch’ueh as written in the original annals of the Chin Dynasty, compiled during the early Tang Dynasty and in 1966 translated by Khoo Boo-Chai. Through the centuries, the cleft anomaly consistently has been called T’u Ch’ueh, lagocheilos, bec-de-lièvre, hasenscharte, labis leporino or harelip. Indeed, there is a striking resemblance between the lip of the hare with its midline fissure exposing two prominent upper incisors and the congenital cleft of the lip, rarely midline but unilateral and bilateral, revealing incisor teeth. This haunting similarity is not limited to the lip alone as the flat nasal tip, short columella and flaring nasal alae blend into the unfused lip without a nasolabial angle to present an actual harelook.

Somewhere along the line a translator missed the point by a hair for by A.D. 950 in the Leech-Book the cleft anomaly was being referred to as hairlip. This spelling evidently was retained at least in Anglo-Saxon Britain until the fourteenth century. Although there is still a controversy raging as to how this unexplained and illogical reference ever occurred, it can most certainly be dismissed as a translator’s error. The same misspelling of "hare" as "hair" is seen even today on cleft lip hospital charts.

In fact, my introduction to plastic surgery as a student at Harvard Medical School was begun by a fascinating lecture with slides by Donald W. MacCollum. During his entire demonstration a distracting display remained at the front of the class: a cage containing a pair of large white rabbits. Each dutifully gnawed on a carrot with its exposed incisors to emphasize that harelip, not hairlip, was the present synonym for cleft of the lip.
The resemblance of the anomaly to the hare has now been noted but is not considered sufficient justification for continuing the comparison of a cleft lip infant and a burrowing rodent. Out of deference to patients and parents, the label of harelip, except in quotations, will not hereafter be perpetuated in these pages.

The influence of inheritance on the incidence of these congenital clefts might better justify the title heirlip. Fogh-Andersen stated in 1967 and confirmed in 1971:

With our present knowledge, we still must consider heredity the most important etiologic factor in typical cleft deformities, for CL(P) probably in 40 to 50% and for CP in 20 to 25%.

The more severe deformity of bilateral cleft lip and palate with a projecting premaxilla is often referred to as "wolf's snout." Here again, it is mentioned only to be dismissed.

THE CLASSIFICATION DILEMMA

There is a place for an anatomical and embryological classification of cleft lip, alveolus and palate deformity. Many systems have been offered but none has been universally accepted because of language differences, inaccuracies, omissions and lack of simplicity.

At the American Medical Association meeting in St. Louis in 1922, John Staige Davis of Baltimore and Harry P. Ritchie of St. Paul, after years of collaboration, proposed a new classification. This must have been a hotly contested presentation as in the assembly were other experts on lip and palate work such as J. E. Thompson of Galveston, T. Brophy of Chicago and, of course, V. P. Blair, each with his own ideas of classification. For the sake of uniformity and to facilitate communication and comparison, Davis and Ritchie submitted a grouping that proved to be the best of its time and was used for many years.
THE DAVIS AND RITCHIE THREE GROUPS

This classification recognized three major types of deformity: cleft lip = group I, cleft palate = group II and cleft of both lip and palate = group III. Unilateral, bilateral and median variants of these three main groups were indicated by further numbers so that a cleft of the lip unilateral would be group I, 1, a cleft of the lip median would be group I, 2 and a cleft of the lip bilateral would be group I, 3.

Clefts of the palate alone, or group II, were subdivided into uvula and soft palate as 1 and hard palate as 2, and each of these two subgroups was further divided into $\frac{1}{3}$, $\frac{2}{3}$ and $\frac{3}{3}$ cleft.

Clefts of lip, alveolus, hard palate and soft palate, or group III, were subdivided into unilateral = group III, 1, median = group III, 2 and bilateral = group III, 3.

At the time there was heated discussion of the Davis-Ritchie grouping. James Thompson said:

If a classification is to be accepted, it must not alone have an anatomic or embryologic foundation but it must be of practical surgical value.

Ritchie had indicated that the alveolar border was the basis for all surgical groupings, and from a practical point of view he was not far off. Brophy gave his own grouping as 16 somewhat unrelated items which, as Ritchie pointed out, could be fitted into their classification. Blair approved of Ritchie's plan but astutely suggested that surgery of the palate possibly had not progressed far enough to make didactic classification. He also made a plea that the classification finally chosen have universal acceptance. Actually it did not for 45 years.

The Davis-Ritchie classification is no longer in vogue. It did not subdivide the various degrees of incomplete clefts. As explained by Stark,

If the demarcation point were moved backward from the alveolus to the incisive foramen, the Davis and Ritchie classification would be comprehensive, embryologically correct and surgically acceptable.
VEAU’S FOUR GROUPS

In 1931 Veau classified degrees of deformity by a simple numerical scale: clefts of the soft palate = group I, clefts of the soft and hard palate = group II, unilateral complete clefts of the alveolus, hard and soft palate = group III and bilateral complete clefts of the alveolus, hard and soft palate = group IV. Although he ignored clefts of the lip and alveolus completely, his classification had many ardent followers such as Kilner and still is referred to often even today.

FOGH-ANDERSEN’S THREE GROUPS

In his 1942 monograph, *Inheritance of Harelip and Cleft Palate*, the sagacious Poul Fogh-Andersen of Copenhagen described his morphological classification of cleft lip and palate based on embryology and genetics. He divided clefts into three main groups:

1. *Harelip* (single or double) including all degrees from a small notch in the prolabium to a complete cleft of the lip extending “as far as the incisor foramen.” When the cleft was bilateral through lip and alveolus, he noted, “There is prominence of the premaxilla.”

2. *Harelip and cleft palate*, which is the largest group. He noted complete clefts from nostril to uvula and others broken
by osseous and skin bridges. This group included single and double clefts.

3. Cleft palate. This group included isolated cleft palate which he noted may involve the soft palate or the soft and hard palate and "is always median and it never reaches further than the incisor foramen." Fogh-Andersen also included the submucous cleft presenting a cleft in the soft palate but only a bony cleft of the hard palate with intact oral and nasal mucous membrane.

4. A group of rare atypical clefts was optional.

As Fogh-Andersen wrote in 1965:

This classification has been adopted later by a series of writers, and Kernahan and Stark's classification in 1958 is in reality identical with it.

KERNAHAN AND STARK REDUCE IT TO TWO GROUPS

Kernahan and Stark's 1958 classification emphasized the embryological basis of the incisive foramen's being set as the boundary marker. Clefts of the lip and premaxilla, occurring at four to seven weeks of embryonic life, were termed clefts of the primary palate. Clefts of the hard and soft palate posterior to the incisive foramen, occurring at 7 to 12 weeks, were termed clefts of the secondary palate. Then further description, such as left and right, complete and incomplete, was added.

Unilateral cleft-primary palate  Cleft of secondary palate  Bilateral cleft-primary palate
It is significant that the International Confederation of Plastic Surgeons accepted this classification in 1967, and many use it today. The fact that lip is not mentioned in the terminology reduces its popularity. Then, too, Conway, McKinney, Climo, Hugo, Cole and Goulian in 1968 used the Kernahan-Stark Classification on 850 clefts and found they had to add subcategories.

**HARKINS**

In 1962 Harkins, Berlin, Harding, Longacre and Snodgrass, for the American Cleft Palate Association, proposed three main cleft groups: (1) *prepalate* included unilateral, bilateral and medial lip clefts as well as congenital scars and all variations of alveolar clefts; (2) *palate* included all forms of palate cleft forward as far as the incisive foramen; (3) *prepalate and palate* included unilateral and bilateral complete clefts but also the combination of incomplete clefts of lip and palate. They then added a group (4) of rare clefts other than prepalate or palate types. These included the various facial clefts and lower lip clefts, which were charted in a diagram.

**VILAR-SANCHO**

Another interesting approach is that of Spanish plastic surgeon Vilar-Sancho, who in 1962 classified all clefts (SK) as incomplete (small letter) or complete (capital) using the appropriate letter of the Greek word for the area involved: K for *kilos* (lip), G for *gnato* (maxilla), U for *urano* (hard palate) and S for *stafilos* (velum). After the letter of the location and cleft extent, the side affected is indicated with d for right, l for left and s for bilateral. As pointed out by Stark, the declining popularity of classical languages in the Western world makes this impractical. It would, in fact, be "greek" to most of us today.
SCHUCHARDT

Professor Karl Schuchardt contrived a visual symbol to facilitate indexing cleft lip and palate cases for his Northwest German Jaw Clinic in Hamburg in 1964. One cannot but admit it has appeal, and certainly a symbol has possibilities.

INTERNATIONALLY APPROVED CLASSIFICATION

The subcommittee on cleft lip and palate nomenclature of the International Confederation for Plastic and Reconstructive Surgery announced in the newsletter following the 1967 Rome Congress the official Confederation cleft classification.

Classification of Clefts of the Lip, Alveolus and Palate
(classification based on embryological principles)

Group 1: Clefts of anterior (primary) palate:
(a) Lip: right and/or left.
(b) Alveolus: right and/or left.

Group 2: Clefts of anterior and posterior (primary and secondary) palate:
(a) Lip: right and/or left.
(b) Alveolus: right and/or left.
(c) Hard palate: right and/or left.

Group 3: Clefts of posterior (secondary) palate:
(a) Hard palate: right and/or left.
(b) Soft palate: medial.
(For further subdivisions the terms “total” and “partial” should be used.)

Rare Facial Clefts
(classification based on topographical findings)

(a) Median clefts of upper lip with or without hypoplasia or aplasia of premaxilla.
(b) Oblique clefts (oro-orbital).
(c) Transverse clefts (oro-auricular).
(d) Clefts of lower lip, nose and other very rare clefts.

This was, in fact, the 1942 classification of Fogh-Andersen
but also confirmed the 1958 primary and secondary palate grouping of Kernahan and Stark.

In 1972 V. Spina, J. M. Psillakis, F. S. Lapa and M. C. Ferreira of São Paulo concurred with the Fogh-Andersen, Kernahan and Stark classification of clefts centered on the incisive foramen. In fact, they suggested the identical classification but went one step farther to include the incisive foramen in the actual terminology, grouping clefts as I, pre-incisive foramen clefts; II, trans-incisive foramen clefts; III, post-incisive foramen clefts; IV, rare facial clefts.

THE "Y"

Desmond Kernahan had his early training in cleft surgery with Kilner at Oxford and later with Osborne and Burston in Liverpool. Then he joined Stark in New York to create their embryologically based classification. Kernahan finally landed at the University of Manitoba in Winnipeg, where in 1971 he noted . . . that one recurring problem in a cleft palate clinic is the size of the charts of these patients . . . .

He ingeniously simplified the cleft record-taking, from the least to the greatest defects, in what seems to me to be the best and most practical method yet. It is interesting that Kernahan, a clock collector, has switched the principle and set his dials on top of three interconnecting hands. As he explained, the bilateral total cleft of the primary and secondary palates can be represented as a Y. The dividing point between the primary and secondary palates—namely, the incisive foramen—can be represented symbolically at the junctions of the limbs of the Y by a small circle.

The right and left limbs of the "Y" are divided into three sections: the anterior portion = lip (1 and 4), the middle = alveolus (2 and 5) and the posterior = the area of the hard palate from the alveolus back to the incisive foramen (3 and 6). Posterior to the incisive foramen, the hard (7 and 8)
and soft (9) palate are also divided into three segments. This segmented Y can be reproduced by a rubber stamp.

Kernahan elaborated:

To facilitate data processing in the cleft palate clinic, we have assigned a number to each of these subdivisions. This gives us a striped Y...

The method is adaptable. Cleft areas are indicated by stippling the respective segments. Submucous clefts of the palate are indicated by horizontal lines where a true cleft is not present. A Simonart's band at the threshold of the nostril is indicated by horizontal lines across the most anterior portion of the respective limb of the "Y".

When asked how he charted median clefts of the lip, Kernahan explained in 1972:

So far as median clefts are concerned, we have simply drawn in a straight line centrally between one and four on the striped "Y" for true central lip clefts and in cases where the whole primitive palate is absent as in trisomy and arhinencephaly we have blocked in the entire area between the two limbs of the "Y."

Lest complacency set in, Khoo Boo-Chai of Singapore, aided and abetted by Ichiro Tange of Tokyo, conjured up a new clinical subgroup of the cleft lip deformity, that of the isolated cleft
lip nose, which they suggested must be included in any comprehensive classification along with the usual minimal cleft lip with congenital scar. Kernahan was quizzed on this point and he suggested that the isolated cleft lip nose be indicated on the Y as a lazy S at the junction of the lip and alveolar segments.

**STRETCHING THE "Y"**

Then in 1972, just as those interested in clefts were settling down to this sound classification with its nice, neat, symbolic representation, Egyptian Nabil Elsahy, also from Winnipeg, Manitoba, dared to offer extensions which deserve consideration. He added triangular peaks (1 and 5) to the ends of the prongs to represent the nasal floor in case of incomplete clefts of the lip. This modification caused a shifting of the numbers in the squares with the lip represented by squares 2 and 6, alveolus by 3 and 7, hard palate anterior to the incisive foramen by 4 and 8, hard palate by 9 and 10 and soft palate by square 11. To indicate a vermilion notch on the left a narrow band of stippling is placed in the lower portion of square 6 while an alveolar notch on the same side has a band of stippling in the upper portion of square 7.

Collapse of the maxillary segments is indicated by filling in or stippling 3 and 4 or 7 and 8. Elsahy double-lined the squares (9 and 10) in the hard palate area and used arrows to indicate direction of deflection in complete clefts. He placed a circle (12) under the stem of the Y to represent the pharynx. Then with a dotted line from the Y to the O reflecting velopharyngeal competence, any break in continuity of this dotted line could be interpreted as the amount of incompetence. Elsahy also added circle 13 to represent the premaxilla, and the amount of its protrusion is indicated by the dotted line with an arrow and the position of circle 13.

An added value of this modified striped Y is that its symbolic representation, embryologically, clinically and physiologically, of
the cleft lip and palate deformity allows simple charting of the progress of the patient, not only before but during and after treatment, by mere comparison of the consecutive Y's.

Then it became apparent that there is no reason not to top Elsahy's triangular tips to Kernahan's prongs with inverted tips to be marked with horizontal lines indicating the amount of nasal deformity, ad infinitum.

In fact, a modified Y is being used in this volume as a simple preoperative case record. The Y will be capped with triangular peaks for the nasal floor, and these will be topped with similar triangular peaks turned upside down to represent the nasal arch. To indicate a cleft the area will be stippled, to indicate submucosal muscle and bony clefts, the area will be marked with horizontal lines, and to indicate the degree of nasal deformity the top triangle will be lined horizontally in density proportionate to the severity of the distortion.

THE DANGERS OF BUREAUCRACY

After full consideration of all efforts to group and number these anomalies, it is thought that the Y, striped, stippled, peaked or with a ball up and a ball down, in basic accuracy and endearing simplicity, offers the best plan yet for charting clefts in medical records.

It is further suggested that neither llama, hare, hair, heir, group I, 1, cleft of the primary palate nor KL, SK describes this portion of the anomaly as accurately and unemotionally as the simple term "cleft lip." Let us pursue Ivy's plea for universal acceptance of cleft lip, complete and incomplete, unilateral and
bilateral, left and right. It is even possible that the simple blanket term “cleft lip,” further described as unilateral, complete and right, is still too bureaucratic in its classification. As operating plastic surgeons, we must look at each case not as one of a group or part of a series but as an individual with its own minutely varied detail.

A SUGGESTION OF REPAIR

Closure of lip clefts is most commonly referred to as repair of cleft lip, but the word “repair” suggests that the lip was once intact, has separated and must be repaired. Webster defines the verb “repair”: “1. To restore to a sound or good state after decay, injury. . . . 3. To remedy, heal, . . . or mend; as, to repair a break, a wound. . . .” If we consider that the embryological processes become denuded of their epithelium, fuse and later split asunder, then our surgery could be spelled repair or better repare. As there is no proof of this event and as the cleft appears without evidence of previous soundness, I have avoided the word “repair” whenever possible except in others’ quotations.

A NOTE ON THE PHOTOGRAPHIC RECORDING OF CLEFTS

Sir Harold Gillies opened the First International Congress of Plastic Surgery in Stockholm in 1955, touching lightly on the development of this specialty through the years and reminiscing on what “the ancients and the not so ancients” had achieved in their plastic surgery. He concluded puckishly by whispering that the one most important factor responsible for modern improvements in results was “photography.”

It is true that photography can “make” or “break” a plastic surgeon. Even though plastic surgeons are knowledgeable enough not to be fooled consistently by photographic tricks, final results continue to be presented with the benefit of favorable effects. Bright flat lighting “burns out” the scars to invisibility and flattens unnatural contours while the position and angle of recording hide asymmetries. Although photographs can flatter
and deceive, they can also nullify a result by flattening normal contour, highlighting scars and exaggerating distortion. For example, here are three unretouched photographs of the same patient, evidently treated with a modified LeMesurier procedure, taken consecutively within a few minutes of each other with the same camera, with the same lens and by the same photographer, Jim Fletcher.

The first (A) is an honest record of the actual appearance of the patient as seen and as we have tried to portray the cases in this book. The second (B) exaggerates the surgical scars, and the third (C) wipes them out to such a degree that one might think remarkable surgery has been performed. According to Fletcher, the most deceiving of all photographic recording is that following reproductions from overexposed color transparencies which show no scars at all.

In the early days I took my own pictures. Then in Korea, fortunately the services of Marine photographer Brusseau became available. In 1960 John Madge, originally a baby photographer, joined my staff, and finally, in 1971 Jim Fletcher took over and has been responsible for most of this volume's final photography. Unfortunately, one photographer has not been recording from the beginning to the end, but great effort has been made to photograph accurately, and with babies this is no easy matter.

Consistent front, profile and subnasal views, although ideal,
have not always been available. Yet even these do not tell the complete story for it is impossible to judge a result from one still shot. A true evaluation must be live and in color, observing the combined actions of lips and nose in various positions from absolute stillness up and down the entire expression gamut from laughing to crying. Nevertheless, it is hoped that the photographic records presented will at least provide a clue or confirm a claim.
# 4. Incidence of Clefts in the World

<table>
<thead>
<tr>
<th>Date</th>
<th>Source</th>
<th>Location</th>
<th>Incidence</th>
<th>Ratio to Normal Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000-2000 B.C.</td>
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<td>Egypt</td>
<td>1:1,000</td>
<td>1:1,000</td>
</tr>
<tr>
<td>A.D. 1864</td>
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<td>Russia</td>
<td>118:180,000</td>
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<td>39:67,945</td>
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<td>24:28,083</td>
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<td>Peron</td>
<td>Paris</td>
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<td>1:952</td>
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<tr>
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<td>Gunther</td>
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<td>Sanders</td>
<td>Leiden, Holland</td>
<td>16:15,270</td>
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<tr>
<td>1934</td>
<td>Grothkopf</td>
<td>Hamburg, Germany</td>
<td>74:47,200</td>
<td>1:638</td>
</tr>
<tr>
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<td>1940</td>
<td>Henderson</td>
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<td>74:47,200</td>
<td>1:638</td>
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<tr>
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<td>Pennsylvania</td>
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<td>Mueller</td>
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<td>Hambart</td>
<td>Switzerland</td>
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<td>Ontario</td>
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<td>MacMahon</td>
<td>Birmingham</td>
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<tr>
<td>1955</td>
<td>Lutz</td>
<td>California</td>
<td>74:47,200</td>
<td>1:638</td>
</tr>
<tr>
<td>1955</td>
<td>Lorenzo</td>
<td>California</td>
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<td>1:638</td>
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<td>Kung and Chu</td>
<td>China</td>
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<td>1:638</td>
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<tr>
<td>1960</td>
<td>Rank and Thompson</td>
<td>Tasmania</td>
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<td>1960</td>
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<td>Utah</td>
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<td>Montana</td>
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<td>1:638</td>
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<tr>
<td>1961</td>
<td>Simkiss and Lowe</td>
<td>Africa</td>
<td>74:47,200</td>
<td>1:638</td>
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<tr>
<td>1961</td>
<td>Curtis</td>
<td>Canada</td>
<td>74:47,200</td>
<td>1:638</td>
</tr>
<tr>
<td>1963</td>
<td>Robinson</td>
<td>Trinidad</td>
<td>74:47,200</td>
<td>1:638</td>
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<td>1963</td>
<td>Knox</td>
<td>Northumberland, England</td>
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<td>New Orleans</td>
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<tr>
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<td>Millard and McNeill</td>
<td>Jamaica</td>
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<td>1:638</td>
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<tr>
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<td>Niawander</td>
<td>Phoenix</td>
<td>74:47,200</td>
<td>1:638</td>
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<tr>
<td>1972</td>
<td>Carlisle</td>
<td>Phoenix</td>
<td>74:47,200</td>
<td>1:638</td>
</tr>
</tbody>
</table>

If all the microforms could be included, then undoubtedly these percentages would be altered.
METHODS OF RECORDING

The discrepancies in the incidence of clefts in the different countries may be due in some part to the methods of recording. In Denmark, the fact that all of these defects must be reported to the National Institute of Speech Defects accounts for the accuracy of Danish statistics. In Finland, 99 percent of clefts are operated on at the Finnish Red Cross Hospital. In Pennsylvania, U.S.A., all defects must be recorded on the birth certificate, and yet Ivy showed that in spite of this regulation only 83.3 percent of cleft lip and palate deformity were recorded. Imagine the discrepancies elsewhere!

INCIDENCE

In all the ancient tombs of Egypt only one mummy with a cleft palate has been dug up, suggesting an incidence of about 1:1,000 during the years 4000 to 2000 B.C. But not just anybody could get pickled and swathed, so this probably eliminates the lower income population and reduces the recorded incidence. If, on the other hand, the ingenious Egyptians made a special effort to mummify clefts, the apparent incidence may be too high.

THERE IS A DIFFERENCE IN RACIAL INCIDENCE

Caucasian

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>Incidence</th>
<th>Ratio to Normal Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>1926</td>
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<tr>
<td>1956</td>
<td>Fogh-Andersen</td>
<td>644:393,457</td>
<td>1:611</td>
</tr>
<tr>
<td>1957</td>
<td>Rank and Thompson</td>
<td>160:96,510</td>
<td>1:603</td>
</tr>
<tr>
<td>1961</td>
<td>Ivy</td>
<td>311:242,128</td>
<td>1:779</td>
</tr>
<tr>
<td>1963</td>
<td>Woolf</td>
<td>90:59,650</td>
<td>1:663</td>
</tr>
<tr>
<td>1965</td>
<td>Longenecker</td>
<td>51:22,092</td>
<td>1:433</td>
</tr>
<tr>
<td>1967</td>
<td>Chung</td>
<td>30:16,385</td>
<td>1:546</td>
</tr>
<tr>
<td>1971</td>
<td>Fogh-Andersen</td>
<td>150:75,000</td>
<td>1:500</td>
</tr>
</tbody>
</table>

In countries where the population is of Caucasian origin, the incidence is now generally between 1:500 and 1:600.
African

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>Incidence</th>
<th>Ratio to Normal Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>Simkiss and Lowe</td>
<td>3:2,068</td>
<td>1:689</td>
</tr>
<tr>
<td>1969</td>
<td>Gupta</td>
<td></td>
<td>1:1,055</td>
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</tbody>
</table>

Although there are very few studies from Africa in those series reported, the incidence of cleft lip and palate seems less common. The practice of infanticide in many uncivilized tribes of Africa would certainly tend to reduce the incidence. Oluwasanmi reported 128 cases from Ibadan in Nigeria, but in general it is difficult to get records with infanticide in progress and with the unwillingness of the family to give a history of a cleft because of the stigma attached thereto.

New World Negroes

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>Country</th>
<th>Incidence</th>
<th>Ratio to Normal Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>1924</td>
<td>Davis</td>
<td>America</td>
<td>7:12,520</td>
<td>1:1,789</td>
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<td>1961</td>
<td>Ivy</td>
<td>America</td>
<td>11:43,032</td>
<td>1:3,912</td>
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<tr>
<td>1963</td>
<td>Altemus</td>
<td>America</td>
<td>36:79,842</td>
<td>1:2,218</td>
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<tr>
<td>1963</td>
<td>Robinson</td>
<td>Trinidad</td>
<td></td>
<td>1:1,888</td>
</tr>
<tr>
<td>1965</td>
<td>Longenecker</td>
<td>America</td>
<td>112:173,936</td>
<td>1:1,553</td>
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<tr>
<td>1965</td>
<td>Millard and McNeill</td>
<td>Jamaica</td>
<td>30:56,000</td>
<td>1:1,887</td>
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<tr>
<td>1967</td>
<td>Chung</td>
<td>America</td>
<td>14:16,959</td>
<td>1:1,211</td>
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</table>

The low incidence of cleft lip and palate in the American Negro has often been noted. In 1924 in Baltimore, John Staige Davis reported an overall incidence of 1:1,170, crediting the low incidence on the large number of Negroes in his area. He showed a much lower incidence in the Negro (1:1,790) than in the Caucasian (1:915). In 1965 Longenecker in New Orleans corroborated Davis’ findings with an incidence of 1:1,553 in Negroes compared with 1:692 in Caucasians. Altemus reported 1:2,218 in Negroes.

Caribbean islands

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
<th>Country</th>
<th>Incidence</th>
<th>Ratio to Normal Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>1963</td>
<td>Robinson</td>
<td>Trinidad</td>
<td></td>
<td>1:1,888</td>
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<tr>
<td>1965</td>
<td>Millard and McNeill</td>
<td>Jamaica</td>
<td>30:56,000</td>
<td>1:1,887</td>
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</tbody>
</table>
Robinson's Trinidad is composed of 54 percent Negro-mixed and 36 percent East Asian Indian. Although the total incidence of cleft lip and palate was 1:857, the East Asian Indian incidence was 1:500 and the Negro-mixed was 1:1,888.

McNeill and I studied the percentage of clefts in the 56,256 births at Victoria Jubilee Maternity Hospital in Kingston, Jamaica, from 1960 through 1963. At least 90 percent of these births were Negro or Negro-mixed, and the incidence over these four years is of interest: lip only, 1:6,250; palate only, 1:9,091; lip and palate, 1:3,704; all types combined, 1:1,875.

Logical reasons for low incidence in New World Negroes

Infanticide. It has been suggested that in the uncivilized tribes of Africa the practice of destroying all deformed newborns would have a discouraging effect on the propagation of clefts.

Selective specimens. The reduced incidence of cleft lip and palate has been demonstrated only in the Negroes of North America, Trinidad and Jamaica. These are a selective group, having been chosen originally as excellent physical specimens to bring a good price in the slave market. It is unlikely that the avaricious slave traders would have taken up the space in their ships to transport cleft lip and palate slaves who would be certain to demand a lower sales value.

Survival of the fittest. Infants with the more severe cleft deformities, particularly as seen in the bilateral type, have great difficulty with breast feeding. In uncivilized areas or even in underdeveloped countries where breast feeding is the only source of food for the newborn, the chance of survival for infants with such clefts is slim. Even in Jamaica, when a child with a severe cleft is seen at the initial visit at Kingston Public Hospital, he is extremely malnourished. This infant is usually one of a large poor family, and if the cleft is not closed early the child often does not survive.

Confirmation in reverse

As will be noted later, in the New World Negro the entity cleft palate alone is relatively more common than in the Caucasian. This finding can be explained by the same logic in reverse. A
simple palate cleft unnoticed at birth would spare the infant’s life, unnoticed in the slave mart would not affect the sale and if not severe would allow enough breast feeding for survival.

**Japanese**

<table>
<thead>
<tr>
<th>Date</th>
<th>Author</th>
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</tr>
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<tr>
<td>1958</td>
<td>Neel</td>
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</tbody>
</table>

In 1958 Neel reported the high incidence of 1:373 in Japanese.

**American Indian**

<table>
<thead>
<tr>
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<td>Miller</td>
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<td>Tretsven</td>
<td>Flathead</td>
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<tr>
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<td>Niswander</td>
<td>Montana</td>
<td>50:25,340</td>
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<tr>
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<td>Carlisle</td>
<td>White Mountain Apache</td>
<td>9:2,948</td>
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<td></td>
<td></td>
<td>Apache</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>San Carlos Apache</td>
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<td>Pima</td>
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<td>Papago</td>
<td>5:2,930</td>
<td>1:586</td>
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<td></td>
<td></td>
<td>Hopi</td>
<td>2:3,300</td>
<td>1:1,630</td>
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</table>

In 1963 Miller reported that the incidence in American Indians in British Columbia is nearly as high as among the Japanese. Tretsven reported an even higher incidence of 1:276 in Montana Indians.

The high incidence among American Indians has been attributed by Jaffe to the traditional life style of these poor people, who suffer from infectious diseases and widespread malnutrition. There is also considerable inbreeding as marriage outside the tribe is discouraged.

Carlisle in Phoenix noted that the incidence of clefts varied greatly in the different Indian tribes in the southwestern U.S.A.
In the Flathead tribe of Montana there is a very high—1:154—incidence of clefts. Any group bearing such a name and producing clefts at that rate naturally stimulated our curiosity. H. Wolfgang Losken of Pietermaritzburg, South Africa, during his Maytag-McCahill Fellowship in Miami, assisted in compiling these data on cleft incidence and on his way home stopped off at the Museum of North Arizona in Flagstaff to trace the origin of the name Flathead. According to Catlin, it was the custom of the Chinook to flatten the head of the papoose with a wicker cradle head-board, and the squashed result was considered a mark of distinction and superiority. It was disappointing, however, to find that the people listed in the official reports as Flatheads never practice artificial head flattening. It would be too much anyway to have both a flat head and such a good chance for a cleft! split uvula. Jaffe examined 944 Navajo school children and found an incredible 1:9 (106 cases) incidence of split uvula. He reported a 65 percent one-fourth cleft, 25 percent one-half cleft and 10 percent three-quarter and total clefts of the uvula.

Shapiro and Cervenka reported a 1:10 bifid uvula in American Indian school children having at least five-sixteenths Chippewa ancestry. A striking positive relationship between prevalence of bifid uvula and percentage of Indian ancestry was observed. In children having thirteen-sixteenths to full-blooded Chippewa ancestry, a remarkable 1:5 incidence of bifid uvula was recorded.

### Hawaii

<table>
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<tr>
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<th>Ratio to Normal Births</th>
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<td>Chinese</td>
<td></td>
<td>1:1,000</td>
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<tr>
<td>1958</td>
<td>Kung and Chu</td>
<td>Chinese</td>
<td></td>
<td>1:1,000</td>
</tr>
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<td>1963</td>
<td>Robinson</td>
<td>East Indian</td>
<td></td>
<td>1:500</td>
</tr>
<tr>
<td>1966</td>
<td>Krantz</td>
<td>Filipino</td>
<td>15:4,249</td>
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<tr>
<td></td>
<td></td>
<td>Caucasian blends</td>
<td>16:3,834</td>
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<tr>
<td></td>
<td></td>
<td>Hawaiian blends</td>
<td>27:7,748</td>
<td>1:287</td>
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</tbody>
</table>

An incidence of 1:1,000 was reported in the Chinese. Krantz and Henderson in Hawaii found a high incidence of clefts in
Filipinos, Caucasian blends and Hawaiian blends. It was felt that mixed races have a higher incidence than pure races.

Indonesia

Anthony Pelly of Sydney, Australia, passed by Miami in 1973 after a plastic surgical sojourn with the Javanese of Indonesia. He had some interesting statistics. Six babies with clefts are born every hour in Indonesia or 360 clefts in 2 1/2 days. This is the total number of clefts produced in Australia in one year where the ratio of clefts to normal births is 1:600. At Tjipto Hospital, Jakarta, he found the ratio of clefts to be 85 percent CL, 2 percent CLP and 13 percent CP. This again suggests high perinatal mortality in total clefts causing selection by survival of the fittest.

Racial Incidence of Cleft Lip With or Without Cleft Palate

There is considerable evidence to support the genetic independence of cleft lip, with or without cleft palate, as a distinct entity from cleft palate alone (Fogh-Andersen, 1943; Woolf and Broadbent, 1963; Clark Fraser of Canada, 1955; Metrakos, 1943; as well as Tor Goran and Henriksson of Sweden and Palmi Moller of Iceland).

Ivy and Stark feel that cleft lip, cleft palate and cleft lip and palate should be studied separately.

Cleft lip with or without cleft palate is very rare in New World Negroes (Millard, 1:2,344; Altemus, 1:4,696). Robert Ivy stated that cleft lip is six times more common in whites than non-whites.

The percentage of cleft lip in most Caucasian series of clefts is 25 percent, CLP 50 percent and CP 25 percent.

Cleft Palate

Fogh-Andersen reported that 25 percent of clefts in Denmark were cleft palate alone. A similar figure is found in most series consisting of only Caucasians. In the American Negro cleft palate alone is relatively more common. Fifty percent was reported by
Chung and Myrianthopoulos and 47 percent by Altemus. Fogh-Andersen reported a 76 percent cleft palate incidence among clefts on the Faroe Islands and 82 percent among Eskimos in Greenland.

**GENERALIZATION OF INCIDENCE**

A concise guide to the pertinent and approximate facts on the incidence of clefts has been compiled by Lazarus and Ryan of Tulane University School of Medicine in their programmed instruction text on cleft lip and cleft palate.

Cleft lip and cleft palate together occur 1:1,289 live births. Cleft lip alone occurs 1:1,000 live births, more commonly in the male sex and three times as frequently as cleft palate alone. Cleft palate alone occurs 1:2,500 live births, with a higher incidence in the female sex.

According to Sesgin and Stark in 1961, the incidence of cleft lip–cleft palate as compared to the frequency of the 10 most common congenital anomalies (and least wanted) is low on the list.

1. Foot deformities  
2. Hydrocele  
3. Hypospadias  
4. Mongolism  
5. Cryptorchidism  
6. Congenital heart disease  
7. Polydactyly  
8. Hemangioma  
9. Cleft lip and cleft palate  
10. Hydrocephalus

**CLEFTS ARE ON THE INCREASE**

Recent studies show an increasing incidence, particularly over the last century, to 1:500. Poul Fogh-Andersen in 1963 stated that the frequency in the population had doubled in the past 50 years and trebled in the last 100 years. His accurate records in the kingdom of Denmark over the last 30 years have shown a definite rising trend. In 1941 the incidence was 1:770 and in 1971 it was 1:500.
### Reasons for Increase

1. **Falling perinatal mortality.**

2. **Decreased operative mortality.** Peron quoted a 13 percent mortality rate in the first 10 days of life, and Fogh-Andersen quoted a similar figure. In 1954 Ivy reported that 10 percent died within the first year of life—nearly all had multiple congenital anomalies. In 1962 Lewin reported that of the 5,000 infants with clefts born in Russia in one year, one-third die. Fogh-Andersen reported a reduction to 0.4 percent mortality (3 deaths in 900).

3. **Attendant increase in fertility.** Molsted Pedersen (1964) reported a 1:170 (5 in 853) incidence of clefts in children born of diabetic mothers. Many who not so long ago would have died of grave illnesses like diabetes now have children.

4. **Importance of intermarriage.** Consanguineous marriages may account for rising incidence in small countries such as Denmark, Finland, Greenland and Tasmania. Small communities where marriage outside the tribe is frowned upon may account for the high incidence in American Indians.

5. **Steadily improving operative results.** Books like this, devoted to the study of the evolution of corrective surgery of these anomalies, suggest definite improvement of the methods and their results. This, of course, continues more and more to prevent a cleft from interfering with marriage and possible cleft propagation. As 30 to 40 percent of patients demonstrate heredity for the defect, it is not surprising that the incidence is increasing.
It is probable that the contraceptive pill may take part in the reduction of cleft incidence. Yet, until the geneticists find the true causes of cleft, prevention will remain out of reach. In the meantime, we must accept our part of the blame for the increase and get on with improvements until having a child born with a cleft is of no more concern to a family than having a child with an inguinal hernia.

THE INFLUENCE OF GENETICS

F. Clarke Fraser, Professor of Human Genetics, McGill University, and Director, Department of Medical Genetics, The Montreal Children's Hospital, always liked mathematics and then, during the first genetics lecture he attended, something clicked. He was halfway through medical school when the argument on the relative importance of heredity and environment grew hot. As the pendulum seemed to be swinging too far toward environment and he felt it was actually a combination of both, he leapt to the defense of genetics. His hypothesis was that environmental agents fired at animals of different constitutions would produce different frequencies of malformations. Hamilton Baxter got him some cortisone with which he produced cleft palates in mice and confirmed his theory when he did, indeed, produce strain differences!

In the Grabb, Rosenstein, and Bzoch's 1971 book *Cleft Lip and Palate*, Fraser outlined in a tout sheet the chances of parents having children with clefts, assuming that known genetic and chromosomal syndromes had been excluded. Noting the frequency of the defect in the general population to be 0.1% for CL ± CP and 0.04% for CP, he correlated various situations with estimated percentages.

If *both parents are unaffected* and they have *an affected child*, the probability that their next baby will have the same condition if,

- they have *no affected relatives*: 4% in CL ± CP, 2% in CP
- they have *an affected relative*: 4% in CL ± CP, 7% in CP
- they are related to each other: same as general population
- the *affected child has another malformation*: 2% in CL ± CP, 2% in CP
If *unaffected parents* have *two affected children*, the probability that their next baby will have the same condition is 9% in CL ± CP and 1% in CP.

If *one parent is affected* and they have *no affected children*, the probability of the next baby being affected is 4% in CL ± CP and 6% in CP.

If *one parent is affected* and they have *an affected child*, the probability that their next baby will be affected is 17% in CL ± CP and 15% in CP.

If *both parents are affected*, Fraser estimated, assuming a heritability of 80%, the risk for the offspring would be about 60%. Their having one or two affected children increases the risk only slightly above this, presumably because the two affected parents contribute about all the “susceptibility” genes there are.

**Distant relatives**

It is interesting that affected relatives; outside the parents and siblings, have been found unrelated by Fraser. My cases of unilateral CL ± CP revealed a 20% positive family history. Fraser explains:

20 percent positive family histories is about par for the course and means that you did not go out into the fourteenth cousins (in which case it might have been a 100%) or stopped at first degree relatives (when it might have been about 7 or 8%).

**Other malformations**

It is puzzling that when there is another major malformation which is not part of a genetic syndrome, the risk becomes smaller for recurrence of the cleft anomaly.

**The degree of cleft**

According to Carter, the more severe the patient’s defect, the higher the recurrence risk with 2.5 percent for unilateral cleft lip to 5–7 percent for bilateral cleft lip and palate.

**A feminist trend**

Both Carter and Woolf concur that the rate of recurrence is a little higher for females than males.
5. Optimum Time for Cleft Lip Surgery

Surgeons have disagreed as to the best time to close the lip cleft through the centuries, and the controversy continues in most clinics throughout the world today.

The cleft surgeon of the Chin Dynasty had such strict and prolonged postoperative orders that it is unlikely he would have attempted closure on any but mature and responsible adults.

What illustrations have survived from the works of the sixteenth-century French surgeons such as Paré and Guillemeau suggest that they operated on their patients in later childhood or early adult life.

About 1666 James Cooke of Warwick, England, noted:

'Tis more dangerous to perform upon a grown than young person, though happily perform'd on some of 28 years of age. The younger children are when cut, 'tis the better, yea while Infants, unless they be sick or weak. It's more fitly done in Summer than Winter, in Spring than Fall.

To operate in, choose a very clean place, and put the Child in the Lap of a discreet person, and let one stand behind to hold the Head, the Child's Hands being ty'd down, and if possible keep it from Sleep for ten or twelve hours before the Operation, that it may be disposed to Sleep presently after. . . . cut both sides of the Hair-Lip with Scissors, so much is needful; after pass through a Needle or two, . . . leaving them in, winding the Thread about, as Taylors do when they stick them on their skirts.

The skillful Dutch surgeon Henrik van Roonhuyzi, in Amsterdam in 1674, recommended surgery on cleft lips at three to four months, warning that if performed prior to this the chances of success were markedly reduced.

Consistent with the general French attitude that early cleft
operations were dangerous and unnecessary, LeClerc in 1701 advised that the operation should not be practiced upon old nor scorbutic Persons, nor upon young Children by reason that their continual Crying would hinder the Re-union. But if any are desirous that it should be done to these last, they are to be kept from taking Rest for a long time; to the end that they may fall asleep after the Operation, which is thus effected.

As Heister, the founder of scientific surgery in Germany, wrote in 1739:

It has been the opinion of the ancients that it is not safe to perform the operation for the harelip upon infants before they are two years of age or even four or five. The contrary of which is taught by experience from whence we are furnished with instances of infants happily cured of a harelip when they have not been above five or six months old, if they are well in other respects and the operation rightly performed . . .

Even the Boston *Evening Post* in colonial 1770 put in its two cents' worth with an editorial comment after reporting two cases, a young man and a child, treated for cleft of the lip by Mr. Charles Hall:

The Impressions these unhappy Sights are apt to make on married Women, should be an Inducement to have this Defect in Nature rectified early in Life, as there are numerous Instances of the Mother's Affection having impressed her Offspring with the like Deformity.

Dupuytren preferred the second or third month, Sir William Fergusson the end of the first month, while Dieffenbach advised postponement until dentition was accomplished.

Surgeons like Malgaigne and Giraldes approved a very early operation: immediately or soon after birth. Guersant in 1826 reasoned that children can do without the breast for four days and noted that out of seven operations performed immediately after birth he had failed only once, whereas out of seven performed at one month he failed five times. Mason cited the examples of Dawson of Dungannon, who operated on an infant at seven hours, and Douglas of Shatford (1854), who operated successfully at two hours. Blair at Washington University, St. Louis, in 1930 advocated cleft lip closure early:
During the first few days of life, there probably remains some of the immunity to surgical shock which is necessarily present during the process of birth. Operation may be done in the first 24 hours. In our series no deaths have occurred from operations on 24 hour old babies. During the period of jaundice, usually from the fourth to the tenth day, the clotting time may be prolonged and operation is not done in this period. The technique of the operation at this early age is difficult but the advantages to the baby and its mother outweigh the disadvantages to the surgeon.

Robert H. Ivy of the University of Pennsylvania has often spoken forth with sense backed by experience. At school he was a long-distance runner, then a dentist, a 1905 missionary in China and finally a plastic surgeon who continued to run the long race of life, and even after 92 years still with a spry but steady stride. Although a longtime friend and admirer of Vilray Blair, he did not let personal feelings influence his common sense. In 1955 he wrote:

Regarding early treatment, it should be stated that newborn cleft lip and cleft palate do not constitute a surgical emergency. Frequently the physician who has delivered a baby with one or both of these anomalies is under the impression that immediate closure of the cleft is imperative to allow the baby to nurse and without surgical closure, starvation is imminent. Nothing is more erroneous. The surest way to kill a baby in a poor condition of nutrition is to operate on it. . . . By the use of a little ingenuity and patience, feeding can be carried out with a medicine dropper, spoon or special feeders. Swallowing of the food is facilitated by holding the baby in the upright position. Some surgeons advocate operation a few days after birth. We do not subscribe to this, as we feel that accurate coadaptation of the cleft edges is more difficult when the parts are so small and much better end results are obtained by waiting until the child is six weeks to three months old or has reached ten pounds in weight.

In 1954 MacCollum and Richardson of Boston Children’s Hospital answered the parents’ question “When will the operation be done?” with “We usually operate when your child is around six pounds, must be gaining in weight steadily, and must be in good health.” Evidently, this dropping of the limit by four pounds was not a hazard at Boston Children’s Hospital as they reported in 1958 no operative deaths in a series of 2,635 cases.

Clarkson, of Guy’s Hospital, London, said in 1955:
Once the baby is gaining weight and is considered by the surgeon fit to stand his operation, the lip should be closed. Apart from the psychological upsets which the open cleft causes to the parents, and apart from the feeding difficulties associated with it, there is the fact that the infant by sucking its thumb and using it as a lever in the cleft will enlarge the size of the palatal cleft and increase the difficulties of its successful closure. The rule which holds generally in this country [England] that the baby should be at least 10 lb. in weight was possibly a reasonable one when this work was done in general services. Its effect in practice to-day is to delay the primary repair of most cleft lips in England until the baby is between 3 and 6 months of age. I believe this to be quite unnecessarily late, and indeed undesirable, when the work is done at plastic centres.

Claire Straith in Detroit operated at a very early age and used local anesthesia to reduce the dangers. But Straith was an unswerving Scotsman and a fast surgeon not easily disturbed by minor details such as a twisting head or distances measured in millimeters. I have heard him defend his stand on early surgery with

If I don't operate, someone else will and it is important that the lip be done correctly.

A peek behind the Iron Curtain in 1959 revealed to me, and was confirmed by Michael Lewin in 1962, that most Russian surgeons operate on clefts of the lip between six months and one year. The old master, Limberg of Leningrad, withholds surgery for at least an entire year.


The operation for cleft lip should be done in the first few months of life; it may be done within the first twenty-four hours if the baby is healthy in every other respect. . . . The mother need never see the deformed baby. Another period of hospitalization for the baby will be unnecessary. The problem of feeding will be simplified. . . . If early operation is impossible, closure of the lip should be postponed at least until after the birth weight has been regained—usually in two or four weeks.

Holdsworth of London noted in 1970 that in Great Britain 4.5 kg. weight or three months age is the usual criterion for primary lip operation. He wisely suggested:
Parents will be more reconciled to their child, and his surgery, if they have lived a few weeks with the untreated deformity. As a gesture of kindness to over-wrought parents, the early operation is a mistake.

After one month of age, the patient has better cardiovascular-pulmonary adjustment, nutritional transition and ability to combat infection. This combination emphasizes Wilhelmsen and Musgrave's 1966 preoperative requirements in the "rule of 10":

- Weight—10 pounds
- Hemoglobin—10 grams
- White count under 10,000 per cubic millimeter

Most modern surgeons follow this general rule.

As I wrote in 1965, the cleft of the lip can be closed any time from the day of birth to old age. There is no need to rush from the womb to the operating room. The best final results are being achieved when the first operation is carried out at about three months, which is after the nose and lip components have had a chance to increase in size along with the patient, who should weigh 10 to 12 pounds. In 1967 the general "rule of over 10" was proposed as a criterion for lip surgery:

- Weight—over 10 pounds
- Hemoglobin—over 10 grams
- Age—over 10 weeks

The addition of the simple adhesion procedure in the wide clefts has enabled us to move up the initial surgery to a few weeks after birth and to postpone the final lip closure to six months.

Denis Glass lamented in 1970:

It is a pity that the work by Straith (1955) and McCash (1957) has not received more attention. Lip closure in the first week of neonatal life under local anaesthesia would seem to have many beneficial effects.

This was spoken like a true orthodontist, interested in alveolar molding with little insight into the details of actual lip surgery. He would probably settle for a "lip adhesion" at three weeks which will start early molding of the maxillary elements. This might be, indeed, the best compromise for all sides, leaving the
detailed surgery until the baby is six months old, when he will be stronger and offer more and better tissue toward the lip and nose construction. As the time for surgery is not a life-and-death matter today, surely if the surgeon can do a better operation later with a more nearly perfect result, this advantage can never be outweighed by either comfort or expediency to patient and parents.

THE BEST OF BOTH TIMES

Today I postpone an incomplete unilateral cleft to at least three months of age and preferably to four or five months when possible. Of course, at the time of surgery a hemoglobin level of 10 gm. and freedom from infection are required. The same timetable is used for complete clefts without alveolar distortion or palate cleft. For complete clefts with alveolar distortion and cleft of the palate, a lip adhesion procedure and a soft palate closure are carried out at about two to three weeks of age with the same general blood requirements even though these preliminary operations are quick and bloodless. Then, at approximately six months of age the definitive closure of the nasal floor and lip and correction of the nose is accomplished.
II. The Evolution
Through the ages the anomaly with its variations and the surgeon’s ultimate goal of the normal have remained essentially the same. With the advances in anesthesia, fluid replacement and chemotherapy, such distractions as mortality, morbidity and wound disruption have been reduced to nil. The surgeon has thus been set free to concentrate on the discrepancy between his results and the normal and to devote more time to the detail of closing this gap.

In 1971 David Davies, for the Melbourne International Congress Transactions, summarized the unilateral cleft lip surgical family tree to chart the evolution of its progress. He included the main branches with 16 legitimate offspring and one bastard, leaving out many good and some bad for the sake of simplicity.
Although I do not agree entirely with his "tree" format or the position of rotation-advancement, the only changes made in Davies' chart are the addition of his own name, which he modestly omitted, and the blackening of Owen's. The rest of this volume will be devoted to rearranging the branches, adding others, covering them all with leaves and finally collecting and comparing the fruit.

In following the line of progress in the evolution of cleft lip surgery with all its bifurcations, detours, lay-bys, shortcuts and breakthroughs, we are certain of one fact: The progress has not proceeded in a precise chronological order. Rather it has been a haphazard chain reaction, sparking here and there, with one idea setting off another but not always in a forward direction. A more primitive approach was being modified while more advanced methods had been in use for years. To understand what has occurred, it is necessary to follow each fundamental principle from its conception to its perfection. When its highest potential still fell short of the ideal normal, it was time to discard it and usually this is what happened. The motivation that forces the discarding of familiar inferior methods is the frustrating dissatisfaction suffered by the surgeon with the result of his or others' methods. This is the stimulus that is constantly firing the search for a better way.
6. Paring and Approximation with Needles and/or Sutures

It is not known for certain who was the first to operate on a cleft of the lip. There have been inferences that Aurelius Cornelius Celsus, a Roman physician of the first century A.D., was the first, but no real proof has ever been cited.

CLEFT LIP SURGERY IN THE CHIN DYNASTY

Translation by Khoo Boo-Chai, of Singapore, of the Chin annals compiled in the early part of the Tang Dynasty reveals what must be the first cleft lip surgery described in world literature. It seems that Wei Yang-Chi, a Chinese farmer’s son, was born with a harelip (T’u Ch’ueh) deformity. Boo-Chai commissioned artist Steve Lu to illustrate young Wei in typical fourth-century Chin Dynasty plain peasant dress.

In about A.D. 390 of the Chin Dynasty an unusually astute fortune-teller studied Wei’s palm and predicted wealth and honor for the boy. At age 18 Wei took what rice he could carry and set out to see Governor Yin Chung-K’an. The governor was impressed with this lad and called in one of his physicians who specialized in lip clefts. The cleft surgeon took one look at Wei and explained:

I can cure your condition by cutting and stitching the edges together. However, after the operation it will be necessary for you to rest the affected
part for 100 days. During this time you can ingest only thin gruel and you cannot smile or talk.

Wei replied:

What is 100 days to me when for relief of my condition I would remain silent for half a lifetime.

The operation was done, and Wei kept his word by keeping his mouth shut for 100 days. After this, as could be predicted, he prospered, eventually becoming the governor general of six provinces and being honored by his emperor with an ancient order. Wei is shown here many years after the operation and clothed by Lu in an official ornate governor’s gown.

Sometime during the Tang Dynasty (A.D. 618 to 907) Fang Kan gained considerable fame as “the doctor of lips.”

FROM THE LEECHES THROUGH THE MIDDLE AGES

We are all indebted to our walking plastic surgery library, Blair O. Rogers of New York University Medical Center, for his intellectual curiosity and ability to extract important historical data from the world literature. Along with Plastic and Reconstructive Surgery Editor Frank McDowell, Associate Editor Robert Goldwyn and others, he has made it possible to piece together the early history of clefts.

THE LEECHES CLOSED LIP CLEFTS

The Saxon surgeons of pre-Norman Britain, known as “leeches,” are the next group of specialists to describe surgery of the cleft lip in Europe. The principle of early cleft lip surgery from the time of the leeches through the Middle Ages and, in fact, well into the eighteenth century was directed toward simple freshening of the edges of the cleft and approximation of these edges until firm union occurred. In the Leech-Book of Bald, about A.D. 950, the operation is described simply:
For hairlip, pound mastic very small, add the white of an egg and mingle as thou dost vermilion, cut with a knife the false edges of the lip, sew fast with silk, then smear without and within with the salve, ere the silk rot. If it draw together, arrange it with the hand; anoint again soon.

THE METHOD OF CAUTERY

In the original Sanskrit text of the Susruta Samhita, methods of cauterization of wounds were described. Based on this the Hindu surgeons of the sixth or seventh century B.C. used burning devices and handed their techniques down through the centuries. About A.D. 1000, Albucasis, the greatest surgeon of the Arabian school, used cauterization of wound edges. It is not known for certain that he applied this method in cleft lip, but it is likely that he and other Arabian surgeons as well as those influenced by this school employed the cautery approach in preference to the knife because of the reduced bleeding. Turkish surgeons five centuries later still preferred cautery as have surgeons of many other nations.

FLEMISH FIGURE-OF-EIGHT

In the early part of the fourteenth century, the Flemish surgeon Jehan Yperman first described in detail the repair of both unilateral and bilateral clefts of the lip. As noted by Rogers in 1964, Yperman actually sutured the edges of the freshened borders of the cleft lip by using a triangular needle threaded with a twisted wax suture and reinforced this closure with a long needle passed through the lip some distance from the edges of the cleft in order to make a more accurate approximation. This latter needle was held in place with a wraparound figure-of-eight thread. Yperman mentioned that some surgeons of his era used relaxing incisions externally in the cheeks to close very wide clefts, but he himself refrained from this procedure because of the facial disfigurement which might "compromise the reputation of the surgeon."

During the fourteenth century it was probably the barber-
surgeons of England who passed on the skills required to repair clefts of the lip.

**INTERRUPTED SUTURES**

Heinrich von Pfolsprundt, a Bavarian army surgeon, in his 1460 book, *Buch der Bundth-Ertznei*, described cleft lip closure using a razor or scissors to freshen the edges and the placement of sutures through the entire thickness of the lip. Over this he applied a plaster containing a red healing salve which was changed twice a day until the wound was healed in three weeks.

About 1530 Hieronymus Brunschwig, an Alsatian army surgeon from Strasbourg, strapped his cleft lip patients to a table with towels, freshened the cleft edges with scissors and achieved union by interrupted waxed silk sutures reinforced with a pinching clasp dressing or a self-retaining clasp. The wound was anointed with a thick paste made of powder of eggshell chalk and egg, and a cloth was wrapped over the entire wound, face and neck, the bandage being looped under the arms in a Roger of Salerno twelfth-century dressing.

**FRANCO AND PARE**

In the sixteenth century two gifted Frenchmen made contributions to this surgery. Pierre Franco in 1556 described the operation in detail, and Ambroise Paré in 1568 first illustrated the procedure. These two Huguenots are inevitably coupled. Franco was the senior but a student of Paré. Paré was the more influential, serving as surgeon to four kings, while Franco worked in the provinces or in exile. It is true that even today Franco's name is mentioned only by the specialists; Paré is known by everyone. After much research, Barsky suggests that Franco developed the early surgery of cleft lip of his day whereas history has recorded it mostly as the work of Paré. Yet the contributions of each had much influence on surgeons in the centuries to follow, and undoubtedly Paré's writings and illustrations had the most far-reaching effect.
Franco wrote in 1556:

The entire skin margins of the cleft which are to be joined must be cut with razor or scissors, or [seared] with the cautery. Then put on dressings to ease the pain and leave them for one or two days . . . if cautery is used . . . the eschar [is removed]. . . . After this is accomplished, the margins must be brought together so that . . . no portion of one . . . does not touch the other. This can be done in two ways, one with needles . . . and the other with pieces of cloth triangular in shape . . . made adherent with a special ointment including egg albumin to the cheeks on each side of the cloven lip. By suturing the points of the cloth together the edges of the cleft are brought into apposition.

This was before the advent of anesthesia, and Franco partly explains that the adhesion method is preferable because of:

causing the least pain and the least scarring.

He also had the ingenuity to free the lip elements from their attachments to the upper jaw to ease the closure in wide clefts. This principle was enhanced by Dieffenbach in 1830 with wide undermining and lateral cuts under the nostrils well out into the cheeks and in modified forms is still used in many clinics today.

Ambroise Paré, son of a cabinetmaker, at age 16 learned the rudiments of surgery from Jean Vialot, the barber of Laval. He then became a surgical resident for three years at Hôtel-Dieu and during this time contracted bubonic plague. Paré not only survived with a few scars but lived to be 80. His next surgical experience came while he was in the army. Lack of formal education enabled Paré to bypass superstitions of his dark age and find truth by observation and experience. He said, “Surgery is an art,” and set five proper duties of a surgeon which are actually the first published plastic surgical principles!

To take away what is superfluous.
To restore to their places things which are displaced.
To separate those things which are joined together.
To join those which are separated.
To supply the defects of nature.
Paré pared the edges of lip clefts but preferred closing the cleft by transfixing the lip elements with a needle and fastening it with a figure-of-eight wraparound thread. He wrote:

Wherefore you must use a three or four square needle . . . being thred
with a waxed thred; and with this you must thrust through the lips . . .
and leave the needle sticking in the wound, then wrap the thred to and
again over the ends thereof eight or ten times, just after the manner which
women use to fasten a needle with thred in it, upon their sleeves, or Tailors
to their hats or caps, that they may not lose them. The needle thus fastened
shall be there untill the perfect agglutination of the wound; this kind of
suture is used in . . . harelips, for so we commonly call lips which are
cleft from the first conformation in the wombe by the error of the forming
faculty.

A ROYAL COMPENSATION

According to the research of Nagdy Saad and John Barron of
Salisbury, England, both Paré and his Oeuvres, published in 1575
and containing much of the information on Paré, were saved
by a king. During the terrible 1572 massacre of St. Bartholo-
mew's Night instigated by Catherine de'Medici, Paré narrowly
escaped death. King Charles IX, exclaiming over the shame of
the loss of the life of one who had saved so many lives, hid
the Huguenot in his royal chambers until all other heads had
rolled.

TAGLIACOZZI

Gaspar Tagliacozzi of Bologna qualified in medicine in 1570 and
probably studied under Paré as he often referred to Paré in his
writings. By 1597 Tagliacozzi was excoriating the cleft edges and
stitching them together with interrupted sutures. He wrote:

Let the Artist therefore take up that part of the Lip, which must be
excoriated, in his Left Hand, and then take off the Skin equally with a
very sharp Knife, till the Blood comes, to the very Angle of the Hiatus. . . .
This Operation may also be performed very quickly and safely with a pair
of Scissors. The same must be done on the other side. Then we must draw
the parts together with the Hand, and stitch them. We must observe this,
not to take our stitches superficially, but through all. The Artist must
therefore pass his Needle straight through the Lip from outside inwards, and on the other side he must pass the Needle from the inside outwards. He must tie the threads . . . and then cut them off . . .

RETENTION BANDAGE

Hieronymus Fabricius of Padua, a pupil of Fallopius and teacher of Harvey, about 1600 advised use of buccal mucosa and tissue from the alveolus in closing clefts of the lip. If the cleft was wide, Fabricius used an agglutinative bandage to bring the edges of the cleft together before he began freshening the margins and inserting needles, the ends of which he bent over after having passed them.

GERMAN TEXTBOOK

In the most popular surgical work of the eighteenth century, the German surgeon Lorenz Heister in his *Chirurgie* recounted:

Many German Quacks and Mountebanks frequently retain the Lips of the Wound together by strong Thread passed through them instead of Needles, after which they tie the Ends of the Thread in the same manner as we directed for the knotted Suture in Part I, Book I, Chapter VI . . . and thus they succeed, and perform good Cures, though in an awkward manner, and by obtuse and unfit Instruments, especially when the Fissure is but small, for when it is large this method will hardly succeed.

COLONIAL AMERICA

From newspaper reports, scholarly Blair Rogers has pieced together cleft lip work in colonial America.

On Friday, September 1, 1770, in the Boston *Evening Post*, there was an interesting item:

A few Weeks since the Operation for the Hare-Lip was performed to great Perfection on a young Man in Milton near Brush-Hill; and a Child in Boston has received as much Benefit from the Operation as the Case would admit of by Mr. Hall, Surgeon of the 14th Regiment.

These were exciting times in more than one way in America.
In April 1775 silversmith Paul Revere made his famous midnight ride. Just one month later, in May 1775, rivaling Revere’s news, an advertisement was placed in a Philadelphia paper by “Dr.” Anthony Yeldall with testimony from one of his patients’ parents:

For the benefit of others, be it made public, that I John Dunbar, of the City of Philadelphia, had a daughter with the deformity of a Hare-Lip; I then applied to Dr. Yeldall, who, to my satisfaction, did the operation in one minute, by the watch, and compleated the cure in four days.

John Dunbar

None need despair, having the above mentioned deformity, for let them be ever so large or frightful, or have been cut ever so often before, they will be done in one minute, and the cure compleated in four days, or nothing will be required. Poor people may have them done GRATIS.

Dr. Anthony Yeldall

On March 29, 1780, in New London the Connecticut Gazette published the following advertisement:

Lawrence Stork, From Germany, Informs the Public, That he undertakes to cure . . . hair-lips . . . and he further informs, that if he makes no cure, he expects no pay. He may be seen at Mr. Jacob Fink’s in New London.

In a more traditional style, Matthew Wilson, a minister and physician from Pennsylvania practicing in Delaware, wrote an unpublished compendium of medicine from 1765 to 1787 called the “Therapeutic Alphabet” in which cleft lip surgery is described in the quaint vernacular of that period.

Labium Leporinum: Hare lip. see Lagocheilos.
Lagocheilos: Harelip. Is a Deformity in which ye Lip is divided by Chasm or Fissures. . . . The Operation should be omitted, untill ye Child has some Reason to suffer it to be done. . . . Separate ye Lip from ye upper Jaw; divide ye Frenulum we connects it to ye Gums. If ye Dentes Incisorii too much projected, cut ym out in Infants. Cut off ye callous Lips wt Scissors ye whole length, but take Care to make ye Wound in Straight Lines. Then bring ye two Lips of ye wound exactly together, & pass a couple of pins, one pretty near ye Top & ye other as near ye bottome, thro’ middle of both edges of it, & secure ym in yt Situation by twisting a Piece of Wax’d thread, across & round ye pins 7 or 8 times. . . . In 8 or 9 Days ye parts generally are found united, yn gently extract the Pins and apply dry Lint
and Adhesive Plaster. . . . Silver Pins & Steel Points suit ye Pomp of ye Great, but common Pins Answer ye End fully as well.

NEEDLES AND PINS, THREADS AND STITCHES

The eighteenth-century controversy over the use of harelip pins with the figure-of-eight wraparound thread versus interrupted sutures passing through the lip edges and tied across the cleft is reminiscent of controversies that have raged and will continue to erupt as long as surgeons are individuals free to seek and promote a better way. Often the new or unorthodox method is labeled quackery. It is true that untrained surgeons, often no more than quacks and charlatans, by their “unshackled” nature may in some small item supersede the staid, trained traditionalist. Yet, in time, the best methods by their results, regardless or in spite of the promoter, eventually win out.

It seems that the wraparound technique illustrated by Paré had more appeal to colonial surgeons such as Wilson than the more sophisticated suturing described by Tagliacozzi. Yet Heister considered the figure-of-eight wraparound thread, which had been the traditional cleft lip suture for four centuries, the more scientific. He accused quacks of using the interrupted sutures. We can surmise from Heister’s writing that Lawrence Stork probably used interrupted sutures rather than the figure-of-eight. Yet when we read how fast Yeldall could close a lip, we are prompted to think that, quack or not, he might have been using the figure-of-eight.

Certainly J. A. Pancoast indicated in 1844 that he was still paring the cleft edges in a straight line with a bistoury and using a pair of harelip pins with wraparound thread.

NEEDLE REMOVAL

LeClerc’s 1701 advice in handling the through-and-through needles carrying the figure-of-eight thread is of interest:
The Patient must be drest three Days after; and it is requisite at the first time only to untwist half the Needle, loosening the middle Thread if there be three; to which purpose a Servant is to thrust the Cheeks somewhat forward. On the eighth Day the middle Needle may be taken off, if it be a young infant. Nevertheless the Needles must not be remov'd till it appears that Sides are well join'd; neither must they be left too long, because the Holes would scarce be brought to close.

FROM A FIGURE-OF-EIGHT TO 3 M

Whether the early surgeons used cloth bandages with ties, needles or pins with figure-of-eight wraparound threads or interrupted sutures, they were not far behind us in this aspect. Today's sophisticated techniques of three-layered Ethicon suturing, 3 M taping, adhesive “butterflies” and Logan’s bow are mere refinements of the earlier methods. Unfortunately, it is also true that this knowledge has not permeated to all corners of the world so that even today untrained surgeons in underdeveloped areas use antiquated techniques of simple paring and approximation with results no better than those obtained by Wilson, Paré or the better “leeches.”
7. Increasing Vertical Length of Cleft Edges

**VON GRAEFE**

The next step in the logical progress of cleft lip surgery involved a more radical paring of the borders to increase the vertical length of the cleft edges. Carl Ferdinand von Graefe, Professor of Surgery at the University of Berlin, about 1816 advocated curved excisions in paring of the cleft edges in lip closure.

**HUSSON**

In 1836 Husson, a British surgeon, described curved incisions which actually excised much lip tissue, but with approximation of the curved edges there occurred not only a lengthening of the edges to prevent eventual shortening by contracture but also a relative fullness or pout at the free border.

**NELATON**

Auguste Nélaton, a French surgeon more famous for orthopedic and urological procedures, in 1859 devised a simple lip-lengthening operation which was advocated in incomplete cases when the cleft did not extend into the nostril. A transverse inverted "V" incision was made above the fissure, and the notch was then pulled down, leaving a diamond-shaped wound. Several sutures closed this wound in the vertical direction with specific lengthening at the area of the cleft but not without skin distortion and with far from an ideal scar.
William Rose of London, 1847-1910, came from a long line of surgeons and himself became an expert operator with "an exquisite sense of touch in manual skills." He was a drummer, deer hunter (he had antlers everywhere) and the first-rate whip often seen driving his four-in-hand. He was a good teller of tales with "a laughter that could be heard in the next street." Quite early he attracted the attention of Sir William Fergusson, who took Rose with him into private practice and obtained for him an appointment on the staff of King's College Hospital. For a surgeon who knew how instruments should be used, it was a pleasure to watch Rose operating:

He had large and apparently clumsy fingers which were actually extraordinarily dextrous. To see him using the finest of gut in the finest curved needle in a hare-lip operation was to feel that one had met a master surgeon. He came to the Hospital at tea or dinner time to see for himself how the cleft patients fared.

In 1879 Rose advocated a design similar to that of Husson with curved incisions mutually concave from nostril to vermilion and through the vermilion at a 60-degree angle. This provided a line of union of such length that contracture of the scar would not make a notch in the red margin. Rose was responsible for popularizing this approach some 60 years after von Graefe and at least 40 years after Husson first described the principle.
James E. Thompson, 1863-1927, originally from Northwick, England, subsequently became Professor of Surgery at the University of Texas in Galveston. In 1912 he described an angled paring to lengthen the cleft edges and delineated with feeling and a sketch the lovely curves of the normal lip:

The mucous membrane of the upper lip is separated from the skin by a sharply defined line which is carried from one angle of the mouth to the other in a beautiful curve known as the cupid’s bow. The convexity of the bow points upward toward the nostrils, but the middle of the bow takes a sharp downward turn. . . . Resting on the middle of the cupid’s bow we have a pear-shaped depression which forms the center of the upper lip.

After this poetic discourse, he acknowledged reality:

Even the most sanguine operator never dreams of reproducing a Cupid’s bow.

He admitted that

the completed lip is often a wretched imitation of Nature’s masterpiece.

He emphasized that

the newly formed lip must not be too short but must be lengthened so that it will more than cover the gums.

He designed his paring procedure generally in the shape of a diamond excision and advocated accurate marks with a compass so that the angled excisions on each side would make it match its opposite. When the vermilion thickness varied, the angle of the mucosal incisions was varied to balance the vermilion closure. Thompson also noted the importance of medial placement of the alar base.

These are Thompson’s own 1912 words in defense of the originality of his procedure:

The flaps are pared according to the method of Rose, but the conception and actual performance of the operation differ so radically from his that the operations are totally unlike.
Ironically, progress has narrowed this gap, and history groups their contributions into the Rose-Thompson principle.

A MAYO

Charles H. Mayo, one of the famous Rochester, Minnesota, surgeons, was said to have a "sixth sense"—mechanical versatility. He could master a difficult situation with exceptional speed, and, since he enjoyed variety, his operating list might include excision of a knee joint, sectioning of the gasserian ganglion, a hysterectomy and a cleft lip. He developed a method for lip clefts which was respected enough to be included by Binnie in his 1916 book. It was designed for certain incomplete notched lip clefts in which the ala of the nose was flared and the nostril wide. Mayo advocated relieving the tension thoroughly by separating the ala from its deep attachments. Then, after denudation at the floor of the nostril and by pulling the lip downward and introducing sutures, he converted the horizontal nasal floor wound into a vertical one. This resulted in obliteration of the lip notch along with correction of the deformed position of the ala. The economy of correcting two deformities with one maneuver has appeal.

L A D D

The tall and distinguished William E. Ladd, pioneer in pediatric surgery at Boston Children’s Hospital, corrected every deformity occurring in a baby from cleft lip to imperforate anus. In 1915 he developed a cleft lip procedure which increased the vertical length of the cleft edges by straight paring carried further laterally and cutting through the vermillion at a 90-degree angle.
Staige Davis approved this method in 1919, but actually it seems in principle to be a step backward because lengthening by extensive lateral parings tightens the lip from side to side, particularly at the free border, and destroys any eversion or natural pouting.

In 1945 I was one of Dr. Ladd’s last group of surgical interns. I remember that he was more concerned with tracheo-esophageal fistulae at that time and seldom operated on a cleft lip. He acknowledged that a plastic surgeon specializing in this problem should produce better results. By this time cleft lip surgery had become a specialty beyond the scope of the general surgeon; fortunately, many of the general surgeons were wise enough to accept this fact.

BROWN

Because of their region of interest, the oral surgeons compose another group of specialists who have been active in cleft lip and palate work and in the early days also made contributions. Even today they often concern themselves with the problem. G. V. I. Brown, D.D.S. and M.D., at Milwaukee’s Children’s Free Hospital in 1918 described straight turning of mucosal flaps from the cleft edges to form an asymmetrical tubercle similar to the plan of Ladd and with similar discrepancies.

The more popular Rose and Thompson methods paradoxically became known as the conservative surgical approach to cleft lip. It now has become apparent that this approach was indeed more radical than realized as it inadvertently destroyed natural landmarks. Yet other surgeons made their name embracing the same principle, and a few continue to do so even into the second half of the twentieth century.

VEAU

In 1925 Veau published his first cleft lip method which, although primarily a straight-line closure, had aspects similar to those of Mirault’s final design. Veau subsequently abandoned this early plan as he gradually changed his technique.
Victor Veau, a general surgeon of Paris, was one of the great cleft surgeons of all time. He was a tall, gentle man with a small goatee and an aura of bonhomie. Through his voluminous cases, as seen in his *Bec-de-Lièvre* published in 1938, he not only had extensive experience with many designs but a remarkable influence on cleft surgery throughout a great part of Europe and Britain.

**Sophisticated straight line**

Veau’s final unilateral cleft lip design was a variation of lengthening the edges of the cleft by paring. On the non-cleft side he pared the mucosa just distal to the mucocutaneous junction line far enough to achieve a length equal to the normal. On the cleft side he pared laterally just proximal to the mucocutaneous junction line an equal distance, freeing a mucosal flap for overlapping the free border on the non-cleft element. This aspect of his approach, strangely enough, is reminiscent of a technique originally attributed to Mirault as his second method but is not the method now recognized as Mirault’s procedure. Veau also freed the alar base and turned it across the cleft just inside the entrance to the nostril, a trick used by surgeons before and after him.

Principles of cleft closure for which Veau also was renowned involved his vigorous approximation of the muscle elements with wire *suture musculaire* and his closure of the anterior palate simultaneously with lip surgery. He rarely was able to achieve a symmetrical cupid’s bow and, invariably, ended up with severe asymmetry of the nose, the disadvantage of a straight-line vertical scar and often subsequent retrusion of the maxilla. Yet, in its simplicity and several aspects of surgical soundness, the Veau approach still enjoys popularity today in various areas throughout the world—and certainly wherever the French have had influence and their lovely language is understood, even unto Indochina.

**LIMBERG**

In his gray and silver 1963 handbook, translated by resident Tony Wolf, Alexander A. Limberg of Leningrad, a gentle and refined
senior surgeon of Russia, incorporated the modern touches of primary nasal correction and preservation of the cupid's bow into the old Veau straight-line design.

Important in his complete cleft closure is the release in the upper buccal sulcus which he refers to as a right-angled "poker incision." The soft tissue of the lateral lip element is freed from the bone and advanced without tension. As he explained:

Angle K closes from 90° to 0, while angle M opens from 0 to 180° and due to the elasticity of the mucous membrane the advancement occurs without conical distortion.

On the non-cleft side, his "poker incision" starts at the high point of the vermilion border, continues along the edge to the nasal vestibule and at the lateral surface of the nasal septum cuts at a right angle and opens 45 degrees. A triangular flap with a superior base taken from the cleft edge of the lateral lip element is transposed across the cleft into this medial dart. A vermilion flap from the cleft side is also inserted into a releasing incision in the vermilion on the non-cleft side in another maneuver similar to that of Veau but credited by Limberg "after Miro, 1844."
The modern British champion of the conservatives was Nuffield Professor Thomas Pomfret Kilner of Oxford, trained in plastic surgery by Gillies. He was short, rotund and genial enough to remind one of a Toby jug, but his appearance was deceptive for he could be quite irascible. Son of a Manchester schoolmaster, he always retained some of the teacher characteristics, being a strict disciplinarian with an organized, tidy mind insisting that everything be preset and absolutely correct. As noted by Dick Battle, a student of and assistant to Kilner for years, his inflexibility was reflected in one of his favorite dictums:

God protect me from the surgeon who changes his plan in the middle of an operation.

His cleft lip method was a careful straight-line approximation of the separated parts with the removal of the minimum of tissue, paying particular attention to muscle union. Actually, the method used by Kilner was a refined combination of Rose, Thompson and Veau, paring to lengthen and then to approximate. What he wrote in 1937 he stuck to the rest of his life.

In my opinion, it is wiser to underdo things at the early operation than to sacrifice too much tissue in a desire to produce a perfect cosmetic result. The essential principle in primary lip cleft repair is suture in layers and adequate apposition of the muscle layer is the keynote of success. When the lip has functioned and developed for a few years it is easy to add any finishing touches which are required. The ease with which this is done varies according to the simplicity of design of the initial repair. All types of flap operation render it more difficult.

His design of a unilateral pre-alveolar cleft with paring and mattress suturing had the appeal of simplicity.
Kilner was a pure irreversible conservative. When baited about the merits of a flap method he would glare sternly over the top of his little half-spectacles and insist:

I am unalterably opposed to chopping up the lip with flaps!

Of this straight-line closure David Davies of Cape Town said in 1971:

I was privileged to assist the late Pomfret Kilner with a lip repair on his visit to South Africa in 1958. Meticulous and loving workmanship produced a near perfect lip from a straight line repair. One cannot ignore such a display of virtuosity but as a corollary one cannot accept such techniques as the norm. Straight line repairs have the advantages of simplicity, ease and speed but the long term results are not satisfactory. Kilner pointed out that the operation is so sparing of tissue it lends itself to secondary correction. However, no secondary correction is really as easy as the primary repair and one should aim for a normal shape and form at the initial operation.

FARA

Miroslav Fara of Charles University, Prague, obsessed with the worthy desire to get the orbicularis oris muscle fibers joined end to end across the cleft, explained to me in 1972,

In the case of unilateral clefts I prefer now to operate by methods using straight or almost straight incisions and sutures because I am able more easily

1) to fold down the muscles for suture end to end,
2) to shape the ala nasi by means of an auxiliary skin flap, going from the lateral to the medial side in the threshold of the nostril, and
3) to perform the final corrections on the lip.

This is the Kilner philosophy but with more sophistication in the positioning of the muscles and a Trauner adjunct for the nose.

PEET

The genial Eric Peet had served as a plastic surgeon in India during World War II and, at the same time, become a tiger
hunter. Fortunately, he lived to tell such tales as that of the
day he was thrown from an elephant into tall grass with a
wounded tiger. In the fall he lost his rifle, but the faithful
elephant boy drove the elephant back into the tall grass to bait
the tiger’s second attack. This gave Peet the seconds he needed
to retrieve his gun, retreat and wait for a pickup by the elephant
before the final return to finish off the tiger. After incidents like
this it is easy to understand why Peet was content to become
one of the archconservatives of Oxford.

By now, however, the importance of preserving the cupid’s
bow had become established, so his markings and excisions took
these landmarks into account. As he wrote for Rob and Smith
in a book which was published after his death:

The medial incision is a curved one, equal in length to the normal side
of the philtrum. The angle between the lower end of this skin incision
and the skin vermilion line is designed to be the same as that between
the philtral ridge and skin vermilion line of the uncleft side, in an attempt
to produce a symmetrical Cupid’s bow. The skin incision on the lateral
side of the cleft will usually be almost a straight one, equal in length to
the normal side of the philtrum.

A secondary Z-plasty

Yet Peet’s sporting streak got the best of him eventually
for he partially broke from the purist stand and prescribed a
Z-plasty in the middle of a straight-line closure in cases in which
the vertical height of the lip was unduly short on the cleft side.
He mentioned that his Z-plasty produced a natural eversion of
the lip.

For Peet, this divergence from the straight line was venturing
into tiger country with Kilner, who considered such action only
that of a “renegade.”
At first thought, one may be lulled into Peet's logic. As a conservative turned flapper, he had a point:

Z-plasties are the accepted approach to straight line contractures.

Yet when used in this fashion in cleft lip, two plastic surgery principles are violated. First, the use of generous curved excisions for paring the cleft edges causes much valuable tissue to be discarded, tissue that could well be used in the Z-plasty. Second, this is a Z-plasty that violates the natural lines as well as the philtrum of the lip.

**Masters**

A variation of the straight-line closure was described in 1954 by Frank Masters with Georgiade, Horton and Pickrell at Duke University. They advocated simple interlocking "Z's" with 90-degree angles in the repair of incomplete clefts. This approach did not lengthen the cleft edges except by paring but did interrupt the straight-line closure. It might just get by in very minor clefts but, as Masters says today, it is seldom used except in certain secondary cases with a thickened straight-line scar.

**Bartels**

Roger Bartels with O'Malley, Douglas and Wilson in Orlando, Florida, in 1970 modified the interlocking for a wider variety of cases by varying the angles in the lateral incision. As Bartels explained in 1972, he rarely sees primary clefts, but this method has been useful occasionally in secondary cases as a slight amount of edge lengthening can be achieved in addition to a breaking of the straight line of closure. Yet it would be the latest Disney World fantasy to claim that this more primitive principle would satisfy modern standards in most clefts.

Both this and the Masters design call for much tissue discard, an unnatural scar line and no provision for positioning or salvaging natural landmarks.
In summary, it can be said of the so-called conservative approach that paring to lengthen vertical height produces a fairly good-looking lip, depending on the craftsmanship of the surgeon, and reasonable function inasmuch as the muscles have been united. Yet, since both tissue and important landmarks have been discarded, the results are lacking both in substance and in natural detail, and these, alas, are then lost forever.
8. Full-Thickness Flaps for Vertical Lengthening

A means of shifting tissues from an area of plenty to an area of paucity is achieved by the concept of cutting full-thickness flaps of skin, muscle and mucosa of the lip. This more advanced principle was used almost as early as the angled paring of cleft edges to lengthen the vertical height. Paris was the center of this new fashion in lip surgery which came into vogue almost half a century before the Eiffel Tower.

MALGAIGNE

Joseph François Malgaigne at the University of Paris, frustrated by the contracture of the popular paring and straight-line closure of his day, wrote in 1843:

I came to the conclusion that with all the surgical skill available, we could only transform the severe case of cleft lip to its mildest form. It is virtually impossible to remove the notch of the vermilion.

Obsessed with the determination to obliterate the inevitable postoperative whistling deformity, Malgaigne designed a two-flap operation. He pared the upper half of the cleft edges. Then he made horizontal full-thickness relaxing incisions which, when opened like two “V’s” and closed one to the other in a straight line, exaggerated the lengthening of the edges. In fact, the
despised notch was transformed into an almost equally obnoxious asymmetrical tubercle.

MIRAULT

Following Malgaigne's report of the operation, G. Mirault, also of Paris, immediately saw its value and a flaw. Two months later he wrote Malgaigne suggesting the use of only one horizontal incision and the mere paring of the other edge to avoid the tubercle. This procedure, in essence, produced a triangular flap to overlap the opposite side. There seems to be much controversy as to which side produced his flap. In his thesis for Doctorat en Médecine in 1930, Paul Plessier of Paris outlined the two methods of Mirault. The first used a flap from the cleft side; the second took a smaller flap from the non-cleft side.

By 1846 Mirault's triangular flap method had gained enough importance to be reproduced in a surgical textbook by Claude Bernard, and the illustration indicates that the triangular flap was taken from the cleft side to bolster the medial element.
It is interesting to study the various renditions of the Mirault method as described by Thompson in 1912 and Binnie in 1916.

This method proved to be the stimulus for many modifications over a span of 100 years.

**AN IRISH MODIFICATION**

The best of the early modifiers was M. H. Collis of Dublin, who improved Mirault’s procedure by preserving tissue for the nostril floor, establishing a principle to be utilized later by many other surgeons. In 1868, in the spirit of a true plastic surgeon, he wrote of his "esthetic method."

I never throw away a particle of the parings. My incisions are made so as to make every fragment of them useful.

Here are two photographs kindly supplied by the Royal College of Surgeons, Dublin. They represent different cases, but both have Collis’ note inscribed beneath them. One shows a more severe cleft and the other the result of Collis’ procedure on probably a less severe cleft with minor discrepancies still present in the lip and nose.
OWEN'S FOLLY

During this period of pioneering there were many who in attempting to modify Mirault’s method actually mutilated it. For example, an Englishman, Edmund Blockett Owen, 1847–1915, was a vigorous surgeon at Great Ormond Street Children’s Hospital, a fly fisherman and captain of the St. Mary’s Hospital football team.

It is possible he poured too much athletic enthusiasm into his cleft lip operation when, in 1890, he modified Mirault. By reversing and exaggerating the triangular flap until it extended across the entire border of the lip, he actually displaced the mouth into a lopsided position.

A report by one who knew him well might explain this procedure:

The transparent honesty of Edmund Owen shown not least in an impulsiveness which led him to hasty conclusions, soon to be put aside so that he would vote tomorrow against that which he had advocated today.

It is hoped that such was the fate of his lip procedure before too many unsuspecting young surgeons had been tempted to try this atrocity.
Two great St. Louis surgeons directed their thoughts toward perfecting Mirault's principle and carrying it to its ultimate. They were Vilray Papin Blair, an anatomist and innovator, and James Barrett Brown, an exceptional craftsman. Both were well-trained general surgeons, and together they constructed a midwestern plastic surgery center at Washington University. From their headquarters by the muddy Mississippi they dominated the cleft lip surgical scene from 1930 to 1948, and during this time cleft surgery made great strides.

BLAIR

Vilray Blair was a descendant of one of the early French settlers who had come up the Mississippi River from New Orleans to St. Louis when this boomtown was the eastern gateway for adventurers, explorers, trappers, traders, missionaries, gamblers, soldiers and settlers. One of his forefathers was Vilray Papin, a trapper who often left his family for long intervals while out catching animals for skins. There was one time when he was gone for over a year. Upon his return he found that his wife, thinking him dead, had remarried and started a new family. Blair, a devout Catholic, delighted in the fact that he had descended from the legitimate side. He attended Christian Brothers College and had to ride horseback out and in from Grand Avenue, which, as he put it,

was one of the main reasons I was sent out there to school . . . and to shoot a few birds on the way home.
From extracts of reports by J. P. Webster, Barney Brooks, R. H. Ivy and Gordon Letterman, the preparatory exploits that led to the making of this plastic surgeon can be unfolded. After one year in St. Louis Medical College, Blair took a year off to help string high-tension telephone wires across the Rocky Mountains. He returned to school and proved his ingenuity by graduating with his original class, having managed to receive credit for stringing wires. After six years of postgraduate training, he “broke flat,” as he termed it, and took to the sea, ending up in Edinburgh where he tried to get into the Boer War as surgeon on a British ship. Barney Brooks, who had been at Washington University with Blair and Brown years before, was my surgical chief at Vanderbilt University in 1947 when he wrote of Blair’s Edinburgh experience.

His application was refused because he did not have with him his medical credentials. He was out of money and pawned his watch chain, a family heirloom, for a pound. . . . Then he received a telegram offering him the position of surgeon to a ship sailing to Para. He wired acceptance and went to the Public Library to find in what part of the world Para might be.

Blair sailed a thousand miles up the Amazon and its Negro River branch and then signed on for a voyage to the white man’s graveyard, the Gold and Ivory Coast of West Africa, where he joined a troop transport ship during the Ashanti War. His description of events was vivid.

I had not been at sea a month before my curiosity was permanently piqued by the partly fabled, partly true tales of the wealth, the dismal forests, the great rivers, the savagery, the mahogany, the gold and the curios of the surf-bound, fever-stricken west coast of Africa, which has furnished gold, ivory, and slaves to the civilized world from time immemorial. . . . I had not only the curiosity of an ordinary traveler, but my opportunities of observation of fevers of the Javery, yellow-jack, and beri-beri in the Brazils and leprosy in the islands, had taught me there were advantages in studying endemic diseases in their native habitat.

Blair was 30 years old when he returned to St. Louis, finally content to embark on a surgical career.

In time, Blair got to be known as the “lemon” surgeon of
St. Louis because everyone sent him problems and complications. He was a modest, unassuming type of genius who would wake up in the night and scribble down possible answers to problems. Then in the morning he would call in a friend to help him decipher his scribblings and decide whether the idea was any good or not.

Appalled by the many absurd operations being used at this time on cleft lips, Blair wrote:

As a rule the simpler plans are easier to execute but they are less plastic. Every added complexity of technique is a distraction. Before adopting the more complex methods, therefore, the operator should make himself familiar with every detail of the operation and should understand the logic for doing it. As the operator acquires more skill he may feel justified in adopting a method that in earlier days he considered less feasible, but each modification will be like changing a golf stroke—not always free from immediate grief.

In 1930 Blair and Brown wrote:

We have had experience with three different operations consecutively. The Mirault type was taken up ten years ago and has been used ever since. The Rose operation was finally abandoned on account of the difficulty in controlling the tendency of the reconstructed lip to be inartistically long. The Owen operation, which is a decadent form of Mirault, was also abandoned because the results were still more objectionable. It is upon the "Mirault operation" that the following procedure was based, but the details as given in this paper were gradually worked out from our own experience. The logic of the Mirault plan is that a flap is taken from the upper part of the lip where there is excess tissue and implanted into the lower border where tissue is most needed.

It was their belief that the lip defect is triangular in shape and positioned apparently in the lower part of the lip. This is the premise on which all Mirault-type operations are based.

The Blair-Brown outline of operative technique can serve today:

The first step is to mark off on the lip the plan of the external skin incisions. This will outline the raw surfaces to be united by sutures. Upon the accuracy of these cuts will depend the possibilities of the ultimate result. Therefore, while they are first planned and measured off with the eye, they
are checked up with fine pointed dividers and pricked in with aqueous methylene blue solution on a fine "crow quill" pen or a hypodermic needle, before any cuts are made, so that the landmarks are not obscured by the undermining and the accompanying flow of blood. The first operative step is the mobilization by undermining of each distorted or displaced tissue. This should release the restraining tissues from their underlying bony attachments, and at this stage cartilage may have to be shifted in its relation to bone, its fellows or the overlying skin. The most important point in the operation on the lip is not to excise too much tissue from the lip or any at all from the lining of the nose. Bad suture scars are almost as great an evil.

The Blair-Mirault design

The specific markings were set by pricking point A on the mucocutaneous junction where the oblique base of the columella intersects vermilion. B was placed just above where the ridge that bounds the philtrum on the opposite side meets the mucocutaneous junction. C is halfway between A and B. Okay so far . . .

On the cleft side A' is pricked just below the point of the ala. The placement of point C' has a mercurial elusiveness which almost discouraged me in 1944 from trying to become a plastic surgeon at all. In Blair's own words:

The placing of point C' requires some consideration. It should be under and rather internal than external to A', and at a vertical distance from the vermilion border equal to CX. X is supposed to represent the future level of the vermilion border at this point.

B' is on the mucocutaneous line at a distance from C' equal to BC.

In the creation of a triangular flap C'B'X' from the cleft side, a relatively large amount of tissue was left attached above to the alar base as flap A'C'B'. Like Collis, Blair used as much as seemed indicated to aid in reconstructing the nasal floor. Unfortunately, much of this valuable tissue had no place to go and was simply amputated. Before the marks were incised, hemostatic clamps were applied; then A was sutured to A', B to B' and C to C'.

The vermilion Z flaps were interdigitated.
The hazards of placing C'

Misplacement of point C', with, for instance, C'X' being longer than CX, can be and often has been responsible for strange derangements, and the purse-string correction is not as easy as it seems.

As a pioneer of the flap approach to cleft lip, Blair was bombarded with arguments offered by the conservatives and he proceeded to collect scientific data to prove them wrong. He wrote:

The statement has been lately emphasized that using a displaced flap in the repair of a lip cleft would cause muscular distortions in the movements in the new lip; with this point in view, we have recently made a study, both directly or by means of movie films, of about thirty cases operated on by this plan, and, in none of them, after the immediate postoperative stiffness disappeared, were there any asymmetrical contortions evident.

Blair and Brown were among the first to define and try to correct the transverse axis of the cleft nostril and the flattening of the nasal tip on that side:

To correct these nostril distortions it is necessary first to mobilize all mal-related structures with the least amount of external scars; second, to draw them into the most natural form and position attainable; third, to fix them by suture until healing has occurred.

Blair also alluded to the importance of talent in the operator:

After the surgeon has gained the greatest possible surgical and mechanical skill with the most congenial method, he may still find that the results are not really pleasing unless his technique included also artistry, which here, as in portraiture, can camouflage a multitude of defects.
Although Blair's sense of artistry made him painfully conscious of one of the shortcomings of his method, he accepted it with rationalization:

It seems impossible, by an acceptable means, to restore the philtrum, but the lack of one bordering ridge is not very noticeable if the restoration is otherwise pleasing.

Blair was crazy about horsehair for suturing skin, considering store sutures brittle and worthless. He kept an old white horse at the little Mullanphy Catholic Hospital, and whenever his supply got low he would go out and pull a few specially chosen hairs from the horse's tail and have them boiled. Then he would sit and hum while happily tying knot on knot in the horsehair sutures of his cleft lips.

W. L. Shearer was visiting one time and watched Blair at work until he could stand it no longer.

"Why is it, Dr. Blair, that you tie 6 knots in the horsehair each time?"

Whereupon Blair answered:

"Because 5 won't hold!"

Teacher

Blair was a great teacher, and among his early students were such famous names, along with James Barrett Brown, as William Hamm of Atlanta, Earl Padgett of Kansas City, Louis Byars and Frank McDowell of Saint Louis. Most of the men who became leaders in America at one time or another observed Blair at work. In fact, surgeons came from far and near. As Hector Marino of Buenos Aires, Argentina, recalls:

I remember seeing Old Papin Blair undo a lip two, three times because the result was not up to his artistic expectations. And, how he took his time to explain to his young assistant the unapparent little secrets of the trade that made all the difference in the end result.

Evidently it depended on his mood, for Gerald O'Connor of San Francisco recalls once asking Blair:

"Vilray, I have read your article 50 times but I noticed you did not explain how you make that beautiful alar sweep at the base of the cleft nostril. Could you explain how you do it and where the lining comes from?"
O'Connor said Blair rubbed his chin, looked him square in the eye and said:

"I don't know, Gerald, it just comes from experience."

Selling plastic wares in the marketplace

Realizing the importance of general doctors' knowing modern developments in plastic surgery, Blair set up a cleft lip exhibit on the famous Steel Pier in Atlantic City at the American Medical Association meeting in the mid 30's. He arranged an automatic slide projector to present each step of his operation. When his friend Robert Ivy sauntered by his demonstration, Blair called him over and they stood and watched the series of slides.

"You know, Bob, they accuse me of not showing every step of the operation. Now look, there is the original deformity, there the important marks are made, there are the incisions, there are the flaps being fitted into position, there is the final result with the sutures. What more do they want?"

"That's right, Vilray," said Ivy.

"Trouble is," admitted Blair with a twinkle, "the machine changes the slides too fast!"

A BOSTONIAN SOOTHSAYER

Varaztad H. Kazanjian of the Massachusetts General Hospital and Eye and Ear Infirmary was an astute Armenian who had served in World War I as a dentist in the Harvard Base Hospital Unit with the British Expeditionary Force in France and upon whom King George V conferred the Order of Companion of St. Michael and St. George. This pioneer of face and jaw wounds eventually became Professor of Plastic Surgery at Harvard University. His vast experience and sagacious observation in the trauma and healing of lips and maxillae prompted him in 1939 to lay down some wise criteria for making a choice of the primary lip procedure, whether it be, as he said, "Mirault, Blair, Rose, Husson, Thompson, Veau or Ladd," for these were the popular methods of this time,
but the method that answers the following qualifications should be given preference:

1) It should involve a minimum of operative trauma.

2) The operative method should be designed toward bringing the separated parts into their normal anatomic position ... so that when the child grows the lip will develop along normal outlines.

3) For the sake of the immediate result the procedure must not unnecessarily sacrifice skin tissue, because the excision of a piece of skin as small as one-quarter of an inch in length is equal to one-half an inch in length in adult life. A tense lip, besides lacking normal contours, causes undue pressure against the alveolar process of the upper jaw and becomes partially responsible for the retrusion of the upper jaw.

4) It must include correct approximation of the nostrils as an important element of the surgical problem.

A RETENTION SUTURE

To Blair's modification of the Mirault cleft lip procedure Cyril Callister of the University of Utah in 1948 added a special retention suture set to prevent the lateral creeping of the alar cartilage. After completion of the primary lip operation he inserted a soft rubber catheter to fit the constructed nostril on the cleft side. Then he passed a strong silkworm gut suture from the septum of the normal side through the catheter, on through the alar cartilage near its tip and laterally down and out through the skin at the base of the flaring ala on the cleft side. A split shot was crushed on the suture external to the alar base. This tube and shotted suture were left seven to eight days to protect the lip closure and to allow the dissected tissues to stick down in their corrected position. Of course, the effectiveness of this retention stitch as with most retention sutures lasts as long as the suture retains. After the removal of the stitch, if the operation was not designed to prevent alar cartilage creeping, the chances are there will be a surreptitious creeping back again.

McDowell's comments on this stitch are pertinent:

The retention suture attributed to Callister was used by Blair in the 1930's and 1940's as shown in a diagram from his 1930 S.G.O. paper. Blair usually used small lead plates on each end but sometimes split shots ... and sometimes both. I had to squeeze the damned split shot on a number of them. Brown hated them. The results were zero.
James Barrett Brown, working with Blair since 1929, by 1945 had become dissatisfied with the original Mirault-Blair procedure that Blair and he described in 1930. With McDowell he explained:

The main principle of the operation remains just as desirable as ever but better results may be obtained by using a small flap to produce the fullness in only the lower one-third or one-fourth of the lip. . . . A repair with a large Mirault flap (one-half the length of the lip) may be better than a straight line repair, but is not so good as when a small flap is used. It is apt to present the following disadvantages: (1) the large flaps by their greater contraction are apt to lump up more and give a "trapdoor flap" effect; (2) it is necessary to sacrifice a greater amount of lip on both the cleft and columellar sides to fashion and fit in a large flap; (3) the break in the profile line where the forward thrust begins is in the midlip rather than down just about the vermilion border where it normally occurs.

Brown and McDowell continued:

This simplified plan of marking has facilitated the entire operation, has made the teaching of it easier, and has caused some interest to be developed by house surgeons who often appeared bored before.

Frank McDowell, one of the renowned St. Louis "four horsemen" and co-designer of the perfected triangular flap, reviewed the early days in 1972.

The great trouble with the Blair-Brown design was that all of the principal marks (A, B, C . . . and A', B', C' . . .) were tied in a way to each other but none were precisely related to the anatomy of the child in front of the surgeon and thus no clear indication was offered just where to put the marks. As a result many people have said they were doing the "Blair-
Brown operation,” or the “Mirault operation” and they were actually doing something quite differently without realizing it.

Barrett and I worked years to develop an easily reproducible design with each mark precisely related to an anatomical landmark on the child. Secondly, after experimenting with hundreds of these (at one time we were doing lip closures for the Crippled Children’s Divisions of 11 states) we found that a small triangular flap one-fourth of the length of the lip was far better than the half-lip flap that was used only for the first few years. The key to the precise design was the mark in the floor of the normal nostril (that X, not the old X down at the bottom of the vermilion). Once X is put in the same relationship to the columella as A is . . . then one has only to put A’ in the same relationship to the cleft alar base as X is to the normal alar base. When this is done, and A is brought to A’, it follows that the nostril floors on the two sides must be equal and the cleft nostril base will have to be in the same relation to the columella that the normal nostril base is. (The other marks are similarly assigned to fixed and easily determined positions.)

With these changes, we had almost a new operation and all of us for the last decades regarded this as the definitive version of the triangular flap operation (rather than the early abandoned one).

Curiously, Blair was never able to do what Brown, Byars or I would consider a really good lip repair—in spite of his interest and pride in it. Nor did he ever do very many. He was a genius in developing new concepts of his own and in quickly recognizing the worth of new concepts developed by others. Even 10 years before you knew him he wore gloves even longer than his large hands so that the fingers hung over the ends by half an inch, a floppy condition not conducive to delicate detail. But then he was never particularly good as a technician in doing little fine jobs.

McDowell is a rare combination of surgeon, encyclopedia, indexer, connoisseur and scribe. His writings were always formulated, as he said,

between the hours of 10 P.M. and 3 A.M. at a time when one is not competitive but reflective.

He did his nocturnal writing at 22 Kingsbury Place, St. Louis, in the second-floor study overlooking the central parkway which in winter was covered with snow and tinged yellow by the gas lights. During this time there was a little gray mouse who used to keep him company during these lonely hours. McDowell admits often crumbling crackers for the friendly rodent to show
his appreciation. When Mary McDowell found out about the mouse and was about to set a trap, Frank talked her out of it with

"But who else can keep me company at this hour?"

Here are a few of Frank’s most recent reflections.

I hope, Ralph, that you will state somewhere in your Book that the real test of any lip operation comes at about the age of 20 years in those patients who had wide total clefts repaired in infancy and who have had no operations since. This is not to say that secondary "touch-ups" should not be done, but for valid comparisons nothing will beat these. The usual history has been that each surgeon enthusiastically promotes the repair he is best at doing for about 15 years and when the results start to develop deformities, he jumps over to the newest and most popular repair of that moment—with no assurance whatsoever that the late results of this new procedure will not be even worse.

In comparing results of various operations, it is important to emphasize that the reader should compare the best results obtained by the few surgeons superior at each type of repair (making sure, of course, that they started with clefts of equal severity). There is no limit to the poorness on the downside; the only valid test is "How good are the best when the child is grown?" (and I am sure that none done by any method will be perfect).

As suggested by McDowell, here are examples of the ultimate that he was able to achieve with his perfected triangular flap. An incomplete cleft is shown but with only an early follow-up.

The lip is o.k., good rotation of the nostril, didn’t get dome of nostril up as well as in some.
This lip was mended in 1943 and should receive a high grade for its time in the evolution of cleft lip surgery. In fact, it is better than many of the "would-be sophisticated" methods of today.

A complete cleft operation by McDowell in 1957 did achieve excellent nasal correction, but the horizontal length of the lip from commissure to midpoint is short on the cleft side at six months and at six years still has this discrepancy plus an upside-down bow.

**NO BOW**

A cardinal criticism of the principle of all modifications of this Mirault-Blair-Brown-McDowell method has been that the final result was without the normal cupid's bow. Brown acknowledged the lack of a bow with one of his aphorisms,

*Only God can make a cupid's bow,*

and then rationalized the discrepancy:

The slight upward prolongation of the vermilion beneath the philtrum on either side, commonly known as a "cupid's bow," is present in some normal lips, but almost absent in others. The desire for it, among women, seems to vary with other fashion trends. Various operations have been proposed to create it in the cleft lip, most of them involving incisions opening up almost the entire mucocutaneous border, either at the primary operation or secondarily, and substituting a long scar for this normal soft undulation of tissue. It is thought that the resultant scar of these operations, in some instances, may be more deformity than the absence of the "bow." Men seem to care little for the "bow," women are apt to be undecided,
and it seems too ephemeral to be the object of an operation in most instances. It can be artificially suggested by very thin areas of tattooing, or in women by the use of lipstick.

Twenty years later (in 1966) Frank McDowell, editor of *Plastic and Reconstructive Surgery*, redefined this discrepancy with a skilled pen:

There will probably always be surgeons who feel that the "cupid's bow" is a desirable goal, and other surgeons who feel that it is something to avoid in ages and sexes other than teenaged females.

It is true that the exaggerated cupid's bow sported in the gay 20's by such movie stars as Clara Bow and later cartooned as Betty Boop is no longer in vogue. Yet the soft undulating curves of the normal lip's bow are desirable in any sex, any age, any time.

**ROOTS AND STUMPS IN ST. LOUIS**

Once in the study of plastic surgery it was inevitable that I would take at least a portion of my training in St. Louis. My grandfather, C. D. P. Hamilton, the original leather expert for the International Shoe Company, had been enticed from Easton, Pennsylvania, to St. Louis in 1899 when it was still a boomtown. Born at Barnes Hospital, I returned there 30 years later as a house officer during the first half of 1950. It was difficult not to be extremely impressed by the simple direct execution by masterful surgeons of the Brown-McDowell modification. When the baby was wheeled out of the operating room with mattress sutures through the external nasal skin tied over bolsters and the flattened nostril molded round with packing, the immediate result was no less than dramatic. Yet, unlike the other loyal residents, I had learned from Gillies that a lift gained by mattress sutures to hold up a flattened alar dome could be expected to last no longer than the sutures or the packing. I must have verbalized this from time to time.

It was exciting to have trained even for a short time with the great team of Brown, Byars, McDowell and Fryer of 400
Metropolitan Building. Unfortunately, I was not one of Brown's favorite house officers, but, like so many others, I gained from his didactic teaching—"the optimum time to operate a cleft lip is the first time." This dynamic native of Mark Twain's sleepy little hamlet of Hannibal, Missouri, probably had a boyhood that evoked the adventures of Tom Sawyer and Huckleberry Finn. He was a paradox of virtues, with intense likes and dislikes, an intolerance of others' methods and mistakes and yet not without a touch of Twainian humor. He loved strawberries, Beethoven and St. Louis and idolized a special favorite of many of us, the dexterous faker and humorous plastic problem, W. C. Fields.

Frank McDowell, who knew Brown best and considered him a king, wrote after his death:

The boyish twinkle in his eyes, present until his last working day, effectively punctured pomposity on sight.

This trait was exemplified by a story told by Lieutenant General Hal B. Jennings, Jr., Surgeon General of the U.S. Army, who had trained with Barrett Brown in 1950. Colonel Brown was being commended enthusiastically by Major General John Hurd for his fine work on the war-wounded at Valley Forge during World War II.

"I can say in all reverence that never since the time of Christ have such miracles of healing been seen upon this earth."

Whereupon Colonel Brown, not displeased, replied:

"God still does the healing, General, we surgeons merely rearrange the details."

A FEW WORDS WITH BLAIR

A true highlight of my St. Louis experience was a chance to dine one evening with the renowned, and at this time retired, Vilray Blair. Tall, white-haired and with a quiet gentleness, he listened with sympathetic patience to my questions about plastic surgery. Mindful of his many pioneering feats in head and neck surgery, I asked him:
"Dr. Blair, of all your many contributions to the specialty of plastic surgery which one is your favorite?"

He had a glint in his eye when he answered:

"My cleft lip operation, the modification of the old Mirault procedure which we published in the thirties."

INTERNATIONAL PROGRESS

Of course, the advance brought about by the high standards in St. Louis was caught up in other centers. There was a time in the 40's when the Blair-Brown-McDowell lip operation was used almost universally. Such great centers as Truman Blocker's University of Texas unit at Galveston and A. B. Wallace's unit in Edinburgh used the method exclusively.

Along with its worldwide acceptance new advances began to evolve. Take, for instance, the matador’s cape trick perfected in a Spanish surgical arena. Lorenzo Mir y Mir of the Medical School of Barcelona indicated in 1955 in Stockholm that he was convinced that the secondary retraction of the alar base was the result of contraction of the raw area created during the releasing incision which extended from the gingival groove upward through the lateral nasal lining in front of the inferior turbinate. He proposed the use of a mucosal flap salvaged from tissue usually discarded in the Mirault-Blair method which, when whirled like a red cape up into the nose, covered the lateral defect and interrupted potential contracture. This was an important first!
IMPERSONAL EVALUATION

In the fall of 1962, all plastic surgeons of the United States and Canada were sent a questionnaire on facial clefts, and from the 54 percent response Michael Lewin reported that the Mirault-Blair-Brown-McDowell procedure had lost popularity in the last decade, with only 13.9 percent of the surgeons acknowledging present use of it.

Probable reasons for the decline were outlined by Musgrave for Converse in 1964:

There is too much central vermilion discarded, no cupid's bow is salvaged and as the child grows older the upper lip frequently appears tight and the vermilion border thin.

MORE PERSONAL

Since those earlier days as a resident in St. Louis I have had an opportunity to see truly long-term follow-up results of cases operated on by the Brown-McDowell simplified method, some by inept surgeons but others even by an author of the method. My observations were corroborated in 1966 by McDowell's "twenty-year" follow-ups. Although some results are pleasing, it seems fair to say that, in general, the nose often still has a slight slump with asymmetrical flattening of the tip. The lip is scarred in an unnatural position without a philtrum or a dimple. Instead of the natural cupid's bow with its twin peaks, there is often an asymmetrical single peak. A varying degree of tubercle at the vermilion interdigitation is just off-center to the cleft side. The most serious deformity, which seems to occur often in complete clefts, is a relative side-to-side tightness of the lip's free border that exaggerates a protuberant lower lip. The problem is understandable as all the flap action occurs in the lower one-third of the lip. On the medial side the paring of mucosa is carried so far along the edge that when the lateral triangular flap advances to fit this freshening some tension is created. It actually causes gathering of the malleable free border tighter than is desirable, requiring radical secondary correction later. How this is best done is discussed in the Secondary section.
10. Constructing a Cupid’s Bow

**ARTISTS ASSIST**

**THROUGH** the years, medical artists when portraying the surgeon’s final cleft lip result invariably constructed a symmetrical cupid’s bow with their pen or brush. This possibly increased their popularity with the surgeons, but any similarity to the true postoperative result was quite unreal. Here are a few reproductions of artists’ concepts of the final result of methods that unequivocally destroyed the bow, yet shown with the cupid’s bow still standing in all its glory.

**FINALLY THE SURGEON DOES IT**

Thus it was an important breakthrough in cleft lip surgery when the surgeon actually created a cupid’s bow. The number one
champion of this development was the Canadian A. B. LeMesurier, primarily an orthopedic surgeon working at the Toronto Hospital for Sick Children. As LeMesurier himself acknowledged, his operation, except in detail, was not original. In fact, in 1884, 40 years after Mirault modified Malgaigne, the German Hagedorn designed a quadrilateral flap cleft lip procedure which was so far ahead of his time that it took 50 years and LeMesurier to gain it acceptance.

There were quadrilateral flap designs before and after Hagedorn. Actually, Gustav Simon, a Heidelberg surgeon, in 1864 was the first to introduce a quadrilateral flap operation. His main flap came from the medial side and had some advantages but did not create a cupid’s bow and never reached any degree of popularity except as an occasional reproduction in surgical textbooks.

KÖNIG

Another early quadrilateral flap maker was Franz König. He trained with Langenbeck and then became Professor of Surgery at Rostock until 1875, when he was summoned to Berlin as Bardeleben's successor. In 1881, three years before Hagedorn, König, to obviate the asymmetrical free border of Malgaigne and to achieve midline apposition, devised a frightening bilateral quadrilateral flap procedure for unilateral clefts. It might be construed as a "black sheep" of the quadrilateral flap family.

When well executed it could promise only poor results, but when miscarried, as shown in this photograph from Plessier's report, its effect was indeed shocking.

Both Binnie, 1911, and Thompson, 1912, referring to von
Esmarch and Kowalzig, gave König credit for two cleft lip procedures. The first has been described and was grotesque.

The second was so unlike the first as to be suspect and strangely similar to that of Hagedorn.

**Hagedorn**

The premier of the quadrilateral lip flap surgeons was Werner Hagedorn. From 1831 to 1894 he lived and worked as a general surgeon in Magdeburg, Germany, and at the age of 53 conceived a design for cleft lip which was less mutilating and actually quite ingenious. In principle it differed from the Mirault concept in that the flap from the cleft side was quadrilateral in shape. This lateral flap was transposed, not along the freshened edge of the medial element as in Mirault, but into the opened oblique full-thickness incision in the free border of the non-cleft element.

By 1892 Hagedorn had modified his own method but along the same principle.

As a result of the clever cutting and fitting of these flaps, a cupid’s bow was actually created.
The value of the Hagedorn design was unrecognized until LeMesurier presented his rendition of the quadrilateral flap at a dry clinic during an American Association of Plastic Surgeons meeting in Toronto in 1945. The excellence of the lip conformity in this series stimulated such interest that a pencil sketch made from a diagram by LeMesurier was photographed and sent to those requesting it. Several surgeons became ardently enthusiastic after using the method; LeMesurier was invited to present a detailed description of his operation at the 17th Annual Meeting of the American Society of Plastic and Reconstructive Surgery at White Sulphur Springs, West Virginia, November 1948.

The West Virginian shoot-out

To an audience of plastic surgeons always eager for a better cleft lip method, LeMesurier presented his procedure. Prominent in the crowd were the old champions of the Mirault principle. Blair was ailing, but Barrett Brown was there, as was Frank McDowell. Both were ready for the confrontation. LeMesurier fired both barrels:

The flap is cut from the lateral side of the cleft [A] and we have found it simpler and, in some ways, better to cut this flap in a more or less quadrilateral shape and after swinging it down and over, to make it fit on the medial side into a notch formed by the spreading apart of the two edges of a cut [B and C]. If the flap is made to extend far enough up the side of the cleft it will reach the mid-line and the suture line will be in the centre of the lip, which is an advantage. The opening up of the cut on the medial side turns down the muco-cutaneous line here, and the swinging down of the quadrilateral flap does the same on the lateral side. A cupid’s bow is thus formed which can be made of almost any height and, what is more important, can, with care, be made symmetrical on the two sides, with the two parts of the muco-cutaneous line meeting accurately.

All was quiet in the lecture hall as LeMesurier proceeded to show slides of his results for it was obvious to almost all in
attendance that these were the best results yet achieved. As he himself acknowledged, the nasal results left much to be desired, but indeed for the first time the postoperative result of a unilateral cleft lip now sported a symmetrical cupid’s bow.

The audience then turned in anticipation toward the opposition, which for years had reigned supreme without challenge. The air was charged with the tenseness of the rivalry as first Brown and then McDowell stood up and fired shots back in defense of their position with the simplified Mirault principle. The first shots fired by LeMesurier with a series of cupid’s bows had already hit their mark and set in motion a lip trend that was destined to gain momentum.

In fact, Wallace Steffensen came forward at this very moment. Three years previously he had been present during LeMesurier’s demonstration of cases in Toronto. Since then, guided by one of the photographs of LeMesurier’s rough sketch and with a wood-carver’s dexterity, he had developed two modifications, which he now proposed. The first was a triangular wedge excision instead of a mere incision in the medial lip element to facilitate the fitting. The second was an attempt to improve the nasal distortion. He advised the Smith dissection of the skin from the alar cartilage through a paramarginal incision and the sectioning of the chondromucosal lining from the septum and through the junction of the medial and lateral crus of the alar cartilage to allow better nostril adjustment.

LeMesurier and the quadrilateral flap had won the day. His success was not temporary because in the ensuing years many more began to use his method and others modified it.
Personal experience with the LeMesurier method

As the first half of 1950 came to an end, I left St. Louis with two students of plastic surgery from South America, Robert Milan of São Paulo and Guillermo Rojas of Bogotá. We three drove north, crossed into Canada and made our way to Toronto. Here we had the good fortune to meet LeMesurier, a distinguished-looking and most pleasant gentleman, who allowed us to watch him do one of his lip procedures. It was thrilling to see the author perform. Yet for us, who were trained in the meticulous detail of wound closure, he seemed more like a general surgeon, using larger sutures widely spaced.

During the second half of 1950, in Detroit on a fellowship with Claire Straith, I learned the practical details of the quadrilateral flap. With his plastic surgical technique it might be said that Straith out-LeMesuriered LeMesurier.

A chance to try

In 1951 as senior resident at Jefferson Davis Hospital in Houston, Texas, under Drs. Cronin, Hardy, Wise, Brauer and Freeman, I finally had the opportunity to treat two primary cleft lips with the LeMesurier technique. One of the patients, a pleasant teen-aged black girl, caught the eye of Dr. Truman Blocker, who had come up from Galveston to inspect our residency program for board approval. He turned to his friend Cronin:

"Tom, do you get results like that? I'm not sure I do with the triangular flap."
The discussion that followed favored the quadrilateral flap, and Blocker indicated that he would influence his residents to use the LeMesurier method but admitted, "For myself I plan to finish out my twenty-year series with Brown's triangular flap."

The second primary LeMesurier I did was on a remarkable woman of 35 years who happened to come into Jefferson Davis Hospital one day to see an ailing friend. When she laughed, which she did quite often, with good lighting you could see her tonsils. I must have revealed my lust to cut a quadrilateral flap on her just short of actual salivation for she laughed and said, "Better doctors than you have tried, son," and flatly refused surgery. The paucity of complete clefts in the residency at this time caused me to take her arm. She agreed to come with me to talk over the possibilities and when asked how she was getting along she reported: "Fine, been married twice! Had to divorce the first because of his continual drinking." "You have to admit he had a point!" I gambled, and although she laughed it was not so enthusiastically. Somewhere between there and the admitting office she reversed her decision.

The LeMesurier operation improved her appearance and function, and although I was disappointed in the artistry of the result she was elated. As soon as the stitches were out, she gave a party in her little Texas town and sent me an invitation. Although I was unable to get off duty that evening, it was reported later that 300 others came from all the ranches round about exclaiming she was now every bit as fine-looking as her sister.

During 1952–1953, while writing *The Principles and Art of Plastic Surgery* with Gillies, I had the opportunity to demonstrate the LeMesurier method on an incomplete unilateral cleft to Sir Harold. He observed and listened carefully, and when the operation was finished he commented:

> Very nice, dear boy, but I leave all those fancy markings to you. You know, I do not get many primary lip clefts any more. Shall we use this one in our book?

> We did.

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To simplify the basic plan of this quadrilateral flap design I have charted a numerical equation which offers some security toward the production of a symmetrical cupid’s bow. The key to the bow making depends on the incisions cutting the distance from 2' to 5' slightly less than from 3' to 4' and the distance 2 to 5 equal to 2' to 5' and 3 to 4 equal to 3' to 4'.

\[2-5' = 2-5 < 3-4 = 3'-4'\]

Meanwhile back in Texas, there was Raymond Brauer, who had learned the LeMesurier technique quite early, in 1946, from Fred McCoy, who, in turn, had learned it from Wallace Steffen-sen. Brauer introduced the method to Cronin in Houston and modified the design, winning an Honorable Mention prize in the Foundation Essay Contest. He advocated using the vertical length of the normal side to calculate the length of the cleft side of the lip, which he marked with ink points on an applicator stick to take the guesswork out of the marking. During his essay presentation in 1953 in England, Brauer recalled the reaction of pleasure by the British Association of Plastic Surgeons when they stamped their feet in response to an exceptionally fine color close-up of a single cleft operation by his method taken with the baby under heavy sedation.

Also in 1953 in Indianapolis, the compulsive and dexterous Thomas Bauer, with Trusler and Glanz, raced into the LeMesurier design but, as an interesting adjunct in wide maxillary clefts, suggested using mucous membrane flaps turned from the cleft edges to line the upper lip.
Finally, in 1962, the wise and unpretentious A. B. LeMesurier published his pleasant and personal little book, *HARE-LIPS and Their Treatment*, in which he presented, out of 1,444 cleft cases (more than half of which he had operated on himself), 14 long-term unilateral results. He divided the lip clefts into complete and almost complete, the halfway clefts and the minor notches, and he outlined designs for each type.

*For complete clefts*

![Diagram of complete clefts]

*For halfway clefts*

![Diagram of halfway clefts]

*For minor notches*

![Diagram of minor notches]

After 20 years' experience, LeMesurier reminisced:

... practically all the [1,444] operations were done on the same general principles. I was in a position, first as a junior and later as a senior, to see, or at least to hear about, any changes that were tried and any unusual results that were obtained. Many changes were tried, but during the whole twenty years, surprisingly few were adopted and all these were of a minor nature.

Here are two cases operated on by LeMesurier in the 40's, chosen at random by H. G. Thompson, at Toronto's Hospital for Sick Children, who noted in the boy:
A very adequate result with a tidy cupid's bow, good lip length and symmetry throughout.

For the girl Thompson pointed out:

The degree of cleft severity is slightly increased but the red/white lip junction has not been married uniformly. This has left the cleft portion of the cupid's bow high and is probably due to the fact that the tip of the flap was the same, or narrower, than the base. This left the young lady with a pleasing result but a notch in the red/white junction.

The method, while producing an artificial cupid's bow, requires the sacrifice of much valuable tissue. This discrepancy was defended by Steffensen:

The amount of tissue which is discarded appears great at first glance, but careful analysis of this tissue reveals that it is not satisfactory for utilization in the repair, nor is it necessary to effect the repair.
In clefts in which tissue is already missing any discard of further tissue is too costly. It is on this discrepancy of tissue discard that I attack the basis of Musgrave’s 1964 proposition that

The LeMesurier procedure must still be considered a good operation for the very wide and very severe cleft lip.

If, he adds,

\[\ldots\] the measurements are carefully made to keep the lip “short.”

He offers as a teaser:

It is not always necessary to discard some of the medial portion of the lip nor to insist that the flap must reach the midline of the lip.

Of course, this begins no longer to be the LeMesurier method.

**M A Y**

For years, Hans May of Philadelphia used the Axhausen technique for cleft lip, and with the revival of the Hagedorn quadrilateral flap method by LeMesurier he combined the two principles in 1955. E. V. McNett’s illustrations outlined his design with the marking of incisions, construction of the nasal floor, rotation of the alar base and finally fitting of the quadrilateral flap in the lip closure. This combination had the advantages of both but destroyed some of the natural cupid’s bow and did so with an unnatural scar line of union.
Hugh G. Thompson of Toronto, trained in cleft lip surgery by LeMesurier, recalls how the grand gentleman often walked into the operating room with a lighted cigarette hanging from his lips and his eyes squinting from the smoke. According to Thompson, in 1972,

The basis for Dr. LeMesurier’s lip repairs was always founded on excess fullness of the leading edge of the repaired lip. This included white and red but particularly red. He attempted to create the central red lip excess and, indeed, labeled this “Marlene’s blob” . . . and when evaluating a late cleft lip repair he referred to it as either “pretty” or “not pretty”—There were never gradations.

Thompson is making a name for himself, having become known as a “terror” among residents during Canadian Board examinations. In 1971, as he was working in LeMesurier’s old milieu at the Hospital for Sick Children, he was delegated by Grabb to describe with clarity the quadrilateral flap method. Previous descriptions had been vague, and Thompson claims that he merely parroted LeMesurier’s efforts with nothing original other than the fact that all measurements were exact and you can use compasses and come up stage by stage with the exact in vivo concept.

Actually his diagrams showed a Collis nasal floor flap and a triangular buccal-gingival flap Z taken from the medial side based on the premaxilla. This was transposed across the cleft to fill the triangular raw area resulting from the lateral vestibular releasing incision used to free the alar base and lateral lip from attachments to the pyriform fossa. The alar cartilages were freed from the skin in the Brown-McDowell dissection and temporarily fixed with mattress sutures. Thompson pointed out with candor and examples the typical unsatisfactory results with this method: (1) long cleft segment, (2) flat cupid’s bow, (3) notched or double cupid’s bow, (4) reversed cupid’s bow, (5) wide nasal floor, (6) redundant red lip.

I was fascinated to hear from Thompson in 1972 that:
When I originally started in practice eleven years ago, several of my patients had a quadrilateral flap repair but I then became enchanted with the Tennison-Randall-Thompson modification, and this we have used to a somewhat exclusive nature ever since.

**Critical assessment**

There is little doubt that the quadrilateral flap fitted into an incision on the non-cleft side as popularized by LeMesurier was a great improvement over previous methods and did indeed create a symmetrical cupid’s bow when the operation was well executed. As LeMesurier admitted himself:

> Not all results have been as good as those in the photographs shown [in my book] but the high proportion of what could be called really good late results makes it seem justifiable for us to continue to do the same operations and to try to persuade others to do them.

Apart from its excessive tissue sacrifice, the theory of the Hagedorn-LeMesurier principle assumes the same dubious suppositions as did the Mirault principle: first, that the defect was actually in the lower portion of the lip and, second, that the main flap should be taken from the already deficient cleft side. Both suppositions are unsound.

From a practical viewpoint, the two most commonly expressed complaints of this approach over the years have been outlined by Washio in Stark’s *Cleft Palate*:

1. The scar in the midline of the upper lip is unnatural and therefore noticeable; 2. as the child grows, the lip on the cleft side becomes longer than on the normal side.

DeHaan also outlines the drawbacks:

Measurements made from the cleft side are arbitrary. Even a slight miscalculation in the size of the quadrilateral flap can make the lip too long or too short on the cleft side. . . . Yet we know of no other repair in which a greater amount of tissue is sacrificed. . . . Finally, what appears to be a good primary repair may later be disappointing since unequal growth on the two sides may cause the lip on the cleft side to be too long vertically.

Musgrave also admits this same unpredictable development
of excess vertical length on the cleft side and gave me several examples to prove it.

In 1970 A. A. Kolesov of the Moscow Stomatological Institute dismissed the method of Hagedorn and LeMesurier with

The lengthening of the lip is obtained by the transposition of a quadrilateral flap, patterned on the cleft side. LeMesurier suggested a series of calculations for determining the length and width of the flap, depending on the degree of deformation of the tissues of the lip caused by the cleft. The method is anatomically inadequate. A quadrilateral flap is not very mobile and is inconvenient for an incomplete unilateral cleft, when great lengthening of the lip is not required.

Reichert of Germany noted in 1971 his and Widmaier's observations:

At our plastic surgery department in Stuttgart we used the LeMesurier's Technique because of its accuracy in producing a nicely shaped cupid's bow. But after a few years' follow-up, we nearly always observed a lengthening effect of the rotated square-angled flap at the lower border of the lip, which was rather difficult to correct.

MORE RADICAL MODIFICATIONS OF LeMESURIER

Trauner

In the old university town of Graz, Austria, which enjoys the charm of having a mountain rise out of its center capped by the remains of a nineteenth-century castle, there is Professor Richard Trauner, a poetic, sensitive, warmhearted man skilled in both oral and plastic surgery. He admitted:

I saw elder patients dreadfully disturbed because of their cleft disfigurations. It is natural that one should enjoy to do such work making lovable young creatures happier and to see them growing up joyous and not full of complexes.

Trauner, like most European surgeons, used Veau's lip procedure for many years. About 1940, discontented with the shortness of this straight-line closure, the drifting of the ala and the
shortness of the columella, he first developed his "Z-plasty at the entrance of the nose" as a corrective secondary procedure. The Trauner flap was cut along the vertical axis lateral to the cleft scar with its base superior and transposed horizontally across the nasal floor and columella base.

At the International Congress in Stockholm in 1955, Trauner presented his primary cleft lip method, which incorporated his transposition flap across the entrance of the nose plus the Hagedorn-LeMesurier principle in the lower portion of the lip.

There were assets in this radical tissue shifting, but these seem outweighed both by the completely unnatural position of the many scars and by the destruction of the normal vestige of a cupid's bow.

Grignon

There is one Frenchman still infatuated with the quadrilateral flap of LeMesurier in the lower portion of the lip. Jean-Lucien Grignon of Hôpital St.-Antoine, Paris, calls this the inferior lock in his "double lock" technique. At the 1973 Copenhagen Cleft Palate Congress he presented his modification after 12 years' evaluation noting that changes between the time of lip closure and puberty in the area of the septum and alveolar border had precipitated variation in design.

This brought us to mark the lip and the ala of the nose a little higher on the cleft side, creating a hypercorrection of the rolling-up of the nostril during the first operation. . . . Disconnect the ala base with nasal mucoperiosteum from the maxilla at the pyriform fossa. . . . This technique could be summarized as a "disinsertion" with a hyper rolling-up of the
ala, fixed in a notch at the base of the columella, associated with a transposition flap for the lower portion of the lip. . . . Moreover, the variable depth of the sub-columella notch would allow to change upon request and without any previous geometrical calculations the desired height of the white lip.

Grignon in all honesty does admit:

It solves not all our problems and we experienced disappointing results in some cases . . . [15%].

His valiant effort to correct the flaring alar base shortcoming of the LeMesurier method is commendable and would be even more so were the quadrilateral flap worth the effort. Although his zealous “overkill” advancement of the flaring ala in the final diagram may appear slightly reminiscent of a Grand Guignol theatrical, his later results shown after puberty revealed reasonable symmetry with only a minimal overcorrection of the cleft-side nostril.

Wunderer

Siegfried Wunderer of the Vienna University Clinic, in 1963 at the Washington International Congress, grouped all Z-plasties under the Hagedorn principle, including Tennison’s triangle, Skoog’s double interdigitation and the rotation-advancement, which is the same type of trap into which others have fallen. Yet Wunderer, with his interest in etymology, subdivided clefts in an unusual way: narrow lip clefts (A), wide lip clefts (B) and those with rudimentary cupid’s bows (C). He then proceeded to report six years’ work on 170 cases using his modification of the Z-plasty adapted to his three varieties of clefts.
An interesting reversal of the LeMesurier plan was developed by Darrel Shaw over 20 years ago in Cleveland. In 1971 in Melbourne, Maes, Li, Richey and Shaw projected diagrams of Shaw's design and noted:

In LeMesurier's method, the cupid's bow was surgically reconstructed, not preserved.

This is the basis of their design, and, according to them, a quadrangular flap from the medial side of the cleft containing the cupid's bow is rotated into the lateral side of the cleft—a reverse LeMesurier. They noted less amount of tissue discard than in the LeMesurier procedure, utilization of preexisting cupid's bow, height of the peak of the cupid's bow on the cleft side not influenced by the incisions, natural pouting of the vermilion border, avoidance of droop of the cleft side of the lip and avoidance of contracture by stepladder scar.

Actually, Shaw's ingenious approach is a sophisticated rendition of the original quadrilateral flap that Gustav Simon cut from the medial side. In its reversal it does offer improvements over the LeMesurier design in that it preserves the bow. Yet the line of the scar is unnatural, showing little regard for philtrum columns or dimple, and after 20 years with so few case results published, evaluation must be confined to theory.
11. Preservation of the Cupid’s Bow

TENNISON

In the summer of 1951, while a plastic surgery resident in Houston, I drove up to San Antonio to the Battle of the Flowers. San Antonio was the hometown of Charles Tennison, a disarming and seemingly easygoing “country boy” who had been operating on a number of lip clefts. He kindly invited me to his home and explained how he had been plagued by the upward contracture in the Negro of the more or less straight-line lip closure of the Blair-Brown method, because of which he had resorted to a Z-plasty and “some little ol’ stitches.” To facilitate the Z markings, he showed me his trick of bending a wire but made no mention of preserving the cupid’s bow. In October 1951 at the meeting of the American Society of Plastic and Reconstructive Surgeons in Colorado Springs, Tennison presented his stencil method and demonstrated how the wire should be bent in three equal arms and placed on the cleft side of the lip for marking. Only half of the stencil was necessary to mark the medial side. It is reported that the results he showed, although quite good, were not a lot better than previously demonstrated by surgeons using the Hagedorn-LeMesurier principle.
Kerwin Marcks of Allentown, Pennsylvania, realized the true value of Tennison’s Z immediately and was excited about this preservation of the cupid’s bow. After the meeting, while en route to Honolulu, Tennison and Marcks had an absorbing discussion on cleft lip.

Later, in his 1952 publication, Tennison outlined the important factors:

1. Adequate muscle approximation with muscle of the lip brought into as nearly as possible the normal transverse alignment.
2. Good skin coverage of the lip with the suture line placed in such manner that subsequent contracture of the scar is reduced to a minimum.
3. The production of approximately normal anatomy of the lip with preservation of the “Cupid’s Bow.” Any minor residual deformity should be easily corrected.
4. A full red border of the lip with normal “Pouting” protrusion of the lower portion of the lip.
5. Adequate floor of the affected nostril and correction of as much of the nasal deformity as possible at the primary operation.
6. Elimination of as much undermining of the face as is consistent with good closure.
7. A simple means of arriving at the locations of incisions so that standardization of the procedure is possible.

Independently and simultaneously with that of Tennison came the work of Duarte Cardosa, innovator and boatbuilder of São Paulo, Brazil. He also described a method for preservation of the cupid’s bow and noted:

In a remarkable number of cases, the so-called cupid’s bow is fairly individualized in the medial margin of the fissure. The usual techniques for repair of harelip disregard the preservation of the cupid’s bow.

His method was less sophisticated in its design. In fact, this
general approach is slightly reminiscent of a method credited to M. Jalaquier as early as 1880.

Plessier published a result of the Jalaquier method which revealed the surgeon’s failure to place the cupid’s bow correctly. This sometimes happens even with the Tennison markings when the surgeon does not understand the design.

**MARCKS’S REMARKS**

Tennison made no further effort to promote his method, to modify it or to give a later follow-up of his cases. Marcks, however, carried his banner in 1953 and did much to popularize the new principle for he felt the approach was "so different and so much more practical." He advised beginners to use the stencil to avoid inadvertently reversing the Z. Once “the pattern becomes mentally automatic” he preferred to measure and mark with calipers. He first noted an important landmark that is essential to the marking, cutting and fitting of the lip elements:

The mucocutaneous juncture of the normal lip is accompanied by a skin prominence running less than 1 mm. above and parallel to it. In the cleft lip it runs along both elements but disappears near the cleft, even though the mucocutaneous border continues for a variable distance more. For want of any name known to us, we choose to call this the "mucocutaneous ridge."
This ridge, or "white roll" as Gillies termed it, has become more important as the sophistication of this surgery increases. Marcks also noted:

The scar which enters the peak of the cupid's bow serves to accentuate this peak. Scar contracture at this point, within reason, is not objectionable. In the first several postoperative weeks, this point is sometimes rather markedly drawn up by scar. All of our cases have dropped to a normal level within several months, however, excepting those in which the variable flap was made too thin.

Marcks marked the Tennison-type Z-plasty and then varied the angles of the Z until they almost resembled those of the quadrilateral flap of LeMesurier. Like Brown and McDowell, Marcks considered the lip deficit a triangle at the inferior border of the lip which he felt was corrected by a triangular flap placed at the inferior position. His most recent diagrams clarify his markings for complete clefts.

**Medial element**

Point 1 is placed at the termination of the medial mucocutaneous ridge and point 2 in the skin of the columella ridge. Marcks calls the distance between 1 and 2 "caliper distance" (CD). Point 3 falls on an imaginary line between 1 and 2 and perpendicular to it, pointing off a triangular flap based superiorly. The length of the base of this flap he calls "base caliper" (BC).

**Lateral element**

Point 1' is placed at the termination of the lateral mucocutaneous ridge and point 2' on the extension of the alar ridge as close to the mucocutaneous border as possible. "Caliper distance" is arced from point 2' and "base caliper" is arced from point 1', and where these arcs cross is point 3'. The flaps are marked, then incised and finally fitted together with interdigitation of the mucous membranes.
If the distance from $1'$ to $2'$ is longer than caliper distance, a superior lateral triangle may have to be excised. If the distance from $1'$ to $2'$ is less than caliper distance, the lateral paring will have to be extended laterally.

In 1972, Marcks summarized:

For the past few years we have utilized equiangular flaps to simplify the markings. Some lips look very good and some are a trifle short, but none are long. Any angulation greater than a right angle could readily produce a longer lip or the extension beyond the normal philtrum ridge could be responsible for a longer lip. This should never be done.

Here are two excellent cases by Kerwin Marcks which show the best that this approach can achieve. The cupid's bow is down and reasonably well balanced. The nose has been improved. The only possible objection is the unnatural position of the fine scars, which do not imitate the philtrum column of the normal side as they encroach on the philtrum dimple.

OBUKHOVA

Several years after Tennison, Cardosa and Marcks, Lidiya Maksimovna Obukhova, highly respected by her colleagues and honored by her country with the Order of Lenin, pioneered the inferior triangular flap and preservation of the cupid's bow in Russia. In 1957 she published a report of an operation similar in principle to that of Tennison but adding an enlarged Collis-Blair type of lip flap for reconstruction of the nasal floor. In
the 1958 scientific works of the Samarkand Medical Institute, Obukhova reconfirmed her faith in this method and mentioned its correction of the nasal ala and the important double closure of the nasal cavity and alveolar cleft.

Today, at the age of 75, L. M. Obukhova, whose early work continues to influence some of the younger Soviet cleft lip surgeons, is still an active operator in Samarkand and has a doctor daughter who is carrying on her work.

ANOTHER RUSSIAN RENDITION

A. A. Kolesov of the surgical division of the Pediatric Department of the Moscow Medical Stomatological Institute in 1970, for a handbook put out by the U.S.S.R. Ministry of Health as a standard textbook for students of stomatology, divided modern lip methods into three groups: linear closures, triangular flaps and the quadrilateral flap. He dismissed the first and last groups. In his expression of preference for the methods of Tennison and Obukhova, he noted the possibility of obtaining any lengthening needed, depending on the size of the triangular flap borrowed from the cleft side, and the potential for precise planning which simplifies its adoption by young specialists. He did acknowledge that, in interrupting the philtrum,

The transverse direction of the post-operative scar lessens the cosmetic result of the operation.

He nevertheless recommended this type of operation for incomplete clefts without nasal deformity.

For clefts with nasal distortion, Kolesov used Limberg’s
method of measuring, which is sound for almost any lip operation.

He then combined Obukhova’s inferior triangular flap with Limberg’s superior triangular flap to the nasal floor. In actual priority, this is merely a marriage between Tennison’s principle and Collis’ flap, which Obukhova combined in 1957 and Randall simplified in 1958.

Kolesov’s excision and discard of a triangle of valuable lip tissue (lined transversely), as he described, “between the triangular flaps of Limberg and Obukhova,” is uneconomical, and the scar interruption of natural lines presents the same objections already applicable in earlier cases with similar methods.
HAGERTY

Robert Hagerty, in spite of his Bostonian brogue, after training with Peer and remembering southern hospitality at Duke University School of Medicine during his student days, turned south and settled in Charleston. In 1958, at the University of South Carolina, he described an inferiorly placed lip flap similar to Tennison’s which interdigitated a small triangular flap from the cleft side to dovetail into an inferior cupid’s bow releasing incision on the medial side. His plan was a little complicated, with the normal side $A$ to $B = A''$ to $B'' + \text{width of flap} \ X' = A' \text{ to } B' + \text{width of the dart} \ X$. He dropped a dotted line from the mid-columellar base to the center of the bow and joined this with a second dotted line extending perpendicularly from the height of the bow on the cleft side. The position of the dart was determined by bisecting the distance from the intersection of the vertical and horizontal dotted lines to the center of the bow. Actually, Hagerty is a great fellow, both in stature and in person, and more uncomplicated than the intricate planning of this design would indicate.

RANDALL

Peter Randall, at the University of Pennsylvania in 1959, did to the Tennison-Marcks principle what Brown and McDowell did to the Mirault-Blair: He simplified and reduced the size of the triangular flap. As he said,

The flaps used by both of these surgeons (C. W. T. and K. M.) are quite large and although these are shown to produce excellent results in children with wide defects, in narrower clefts it would seem that a much smaller flap could be used to better advantage.
Randall, the master of measurements, reduced this lip design to a mathematical pattern and was awarded an Honorable Mention prize in the Foundation Essay Contest for his work and numbered markings.

1. Marking the superior peaks of the cupid's bow on the cleft and the non-cleft side (3,8).
2. Measuring the vertical height on the non-cleft side from the base of the columella to the superior peak of the cupid's bow (4-2).
3. Measuring the vertical height of the medial flap (5-10).
4. Determining the difference between these two measurements (4-2 minus 5-10) which will be the distance across the lateral triangular flap (11-8)—or the distance the cleft side of the cupid's bow must be brought down to bring it into normal position.

Points 2 and 3 mark the peaks of the bow, and 4, 5 and 6 are the same as in the Brown-McDowell design; 5-3 is marked, and then 3-7 is extended about at a right angle but never past the line 4-2. The difference between 4-2 and 5-10 should equal the distance across the lateral triangular flap 8-11. Point 12 is picked so that 12-8 equals 12-9. The position of 12 is determined by the tissue available. Tissue medial to 8-12-9-6 is discarded. A small triangular flap at the base of the ala, similar to that of Collis and Blair, is fitted into an incision inside the base of the columella.

Randall noted in 1971:

After 14 years of use the only change has been that the triangular flap is made no wider than 4 mm. in the infant.

For his example Randall chose and sent me what appears to have been an incomplete (halfway) cleft which is somewhat difficult to evaluate because of the photographic shadows. It is a case he first published in Plastic and Reconstructive Surgery in April 1959. After 14 years, a submucous resection and a vermilion surgical touch-up, the case exemplifies an excellent result of the small inferior triangular flap. One cannot but be concerned that the design plans such a large amount of tissue discard. The zigzag scar across the normal philtrum column may catch the eye under certain lighting, and its low insertion tends to smooth out the
dimple, but because of the reduction in size of the flap the unnatural effect seems to be less noticeable. The nose, which was not severely deformed, is improved but still retains some of its original asymmetry.

Recently Randall presented me with another incomplete cleft with an eight-year follow-up. Although the flat lighting hides half of the fine scar in a result that is quite pleasing, the zigzag across the philtrum is discernible.

In 1971 I learned several of the secrets of Peter Randall’s success. In the backyard of his Georgian home, built by his father in the Chestnut Hill area of old Philadelphia, he has two important landmarks most useful in summer. One is a large smokehouse apple tree in the shade of which he can contemplate numerical lip points. The other is a horse trough which he and Posey fill with beer and ice for friends who come to help her distract him from his numbers racket.

And so, two Pennsylvanians not only embraced the Texan Tennison principle but improved it, each in his own way and not without discourse between themselves. Kerwin Marcks, of
Dutch descent, short of stature, large of heart, is always game for a joke. He called up Peter Randall one night and, in an attempted change of voice, said:

"Dr. Randall, this is Dr. Schniggelfritz and I have a baby with a cleft lip. Do you do this type of case?"

"Yes, Doctor ... er ... Schniggelfritz, I am very interested in cleft work."

"Well, Doctor, that is interesting. Have you heard of a Dr. Kerwin Marcks? Is he any good?"

"Why yes, I know Dr. Marcks and he is very good."

"But Doctor, he's getting on in years. I've heard he may be a bit senile."

By now, Randall was on to Marcks' ruse and answered:

"Dr. Marcks is mature but all the more experienced, Dr. Schniggelfritz!"

And they both had a good laugh.

**TRAUNER CHANGES**

Meanwhile Trauner, who combined his "Z-plasty at the entrance of the nose" with the LeMesurier method, began to find the lip on the cleft side often becoming too long. With the introduction of the Tennison Z principle and later Randall's reduced version, Trauner, appreciating the value of preserving the natural bow, substituted Tennison-Randall for LeMesurier in the lower portion of the lip. In his diagrams $AB = A'B'$ and $BC = B'C'$. He also overlapped the non-cleft side with vermilion from the cleft side and turned a larger septal flap across the floor of the nose to maintain the release of the alar base from the maxilla.
This patient operated on by Professor Trauner shows the early healing phase and the result at eight years.

In 1972 in Miami, Trauner noted that this change did not produce as strong a cupid's bow but the one preserved was more natural. He also reported to us that 50 percent of his noses, after his primary surgery, resulted in a symmetrical nasal tip. His many years of experience prompted him to conclude that scars improve so much with time that secondary corrections should be postponed for years.

**A Z FRANÇAIS**

The gentle Professor Pierre Petit of Hôpital Saint-Vincent de Paul, Paris, was one of Veau's favorite students and carried on the master's great work. In 1961, with Borde and Malek, he described his rendition of the Tennison triangular flap procedure, claiming it to be "*une solution mathématiquement parfaite.*" Two designs were presented. Design A marked the medial flap 7-3-5 with an angle of 60 degrees and the base above, while the lateral equilateral flap 8-10-9 had its base below. The transposition of these two flaps lengthened the cleft edge to equal the normal distance from 2 to 4.
To improve the position of the alar base design, B reversed the position of the bases of the two flaps. Here again, the sum of the width of the two flaps’ bases equaled the normal distance from 2 to 4.

In 1972 Petit wrote me of modification C, which combines Trauner and Tennison somewhat as Skoog combined them. He explained it this way.

If the hypoplasia of the lip is too marked then two triangular flaps on the lateral border of the cleft are determined geometrically as with the other designs. The double Z provides a double advantage—it gives a good inrolling of the nose and a good release of the lip "avec un très bon arc de cupidon."

He also explained that he continues to close the anterior palate at the time of lip closure as Veau did but using only the naso-vomerine layer without the overlapping mucoperiosteal flap.

This method for Petit offers the security of geometric accuracy but as in all Tennison-type Z’s, the cupid’s bow is positioned at the cost of scars crossing natural lines and destroying or encroaching upon the philtrum dimple.
**SIMPLE Z**

Some surgeons varied their use of the Z-plasty principle by paring the cleft edges first and then marking and cutting the Z in the primary operation, preserving the cupid's bow in the process.

Perseu Castro de Lemos of Recife, Brazil, in 1956 and again at the Congress in Rome in 1967, advocated freshening of the cleft edges, preserving the residual cupid's bow plus a Z-plasty which he called cheilo "Z" plasty.

![Diagram of Z-plasty procedure]

Victor Spina of São Paulo, with O. Lodovici in 1960, also designed a straight-line paring of the cleft edges, and they too had the sophistication to preserve the residual cupid's bow. Then they lengthened the vertical height of the short cleft side with a Z-plasty. An interesting aspect of their plan was the denudation of the excess vermilion flap from the cleft side used to bolster the non-cleft side.

![Diagram of Spina's modification]

**MANY JOIN THE RANKS**

The obvious value of preserving the cupid's bow was responsible, along with the many minor modifications, for the gain in popularity of Tennison's principle. Lewin's study in 1962 revealed that the Hagedorn-LeMesurier method was used by 42.8 percent of American and Canadian surgeons and that the Tennison-Randall was coming up fast with 37.4 percent.
Ohmori of Japan in 1963 expressed appreciation for the Z as an improvement over the straight-line closure:

In the past the surgical treatment of primary cleft lip consisted of hand massage to the cleft lip area to bring elongation of the cleft lip and then the defect was sutured in a straight line. The results of this procedure were, in almost all cases, very poor. Today we usually apply the triangular flap method to repair the cleft lip.

Boston Brad

Some surgeons were so overjoyed to get a bow that they accepted the zigzag scar with a cavalier attitude. Bradford Cannon of the Massachusetts General Hospital discounted this disadvantage in the Medical Intelligence section of the New England Journal of Medicine with

The angular scar is inoffensive.

Inoffensive to whom?!

Wang

Mark Wang, at the Albany Medical College in 1960, tried to combine the best of LeMesurier and Tennison. He claimed:

The normal cupid's bow is preserved and, by the use of a quadrilateral flap, the advantages of accurate predetermination of the final length of the repaired side, stepladder suture line and, finally, the central protrusion of the upper lip are retained.
According to Wang:

The measure of a successful congenital cleft lip repair is not in the immediate result but how well cosmetically and functionally it keeps pace with the growth of the patient.

He has saved the cupid’s bow, which is good, and his broken-line closure reduces contracture but presents an unnatural line. Of greater concern to Wang must be the threat of his quadrilateral flap’s simulating that of LeMesurier with gradual unattractive elongation of the cleft side of the lip with growth.

Soon after Wang combined LeMesurier and Tennison, two British plastic surgeons, Joss and Rouillard, in 1962 gave their criticisms of the LeMesurier, Tennison and Randall procedures:

Randall has described a modification of Tennison’s method whereby the lip markings are drawn and equated mathematically, but this is not felt to be an advantage over the simple but effective bent wire technique. . . . Whatever the operator’s preference in regard to skin marking, the incisions once made are irrevocable (particularly with the LeMesurier repair) and mistakes become magnified as the child grows. One major criticism which seems justified in both LeMesurier’s and Tennison’s methods is that the nasal deformity is only partly corrected, the Z-plasty being essentially in the lower half of the lip.

DAVIES

In Cape Town, South Africa, nestled on the other side of Table Mountain from the harbor, is Groote Schuur Hospital, the site of Barnard’s first cardiac transplant. Here also, and at the University of Cape Town, is the dashing David Davies, son of another plastic surgeon, David Davies, Sr. In 1965 Davies presented a simple method for utilizing two equal flaps of a pure Z-plasty to give a predetermined height of the lip on the cleft side. He advocated the use of various-sized steel triangles with handles attached to aid in the systematic marking of the flaps. Having done so many operations, he now seldom bothers with metal flap markers but measures first the height of the lip on the normal side (2–4). He then marks two equilateral triangles,
5-3-9 and 6-7-8. On the basis that a Z-plasty made with 60 degree angles will cause an increase of length along the main axis of 75 percent, each limb must be four-sevenths of the normal (2-4) distance in order to achieve a final lip length on the cleft side exactly equal to that on the normal side. In other words, if the two flaps are marked with an angle of 60 degrees with a length of 1 cm., the final lip length will end up 1.75 cm. Or when the lip is operated on at three months, the length of the normal side is usually about 1 cm., which calls for triangles of 0.58 cm.

Of course, more tissue has to be discarded in incomplete clefts to ensure perfect lip length.

Davies prefers the full Z-plasty for the complete cleft. In 1971 he admitted that the most common criticism has been that the horizontal limb of the Z-plasty crosses the area of the philtral ridge on the cleft side. He feels that the ascending Z-plasty limb is rarely noticeable and often mimics a philtrum ridge. The horizontal limb often fades well, he claims, but he admits:

The most troublesome and noticeable part of the scar is the point and superior ascending limb of the Z-plasty. It sometimes has a tendency to form a miniature trapdoor or bridle scar.

One case forwarded to me by Davies had been photographed with strong crosslighting, revealing a good lip even without preservation of its philtrum dimple. The light exposure had softened the effect of his obviously excellent scar crisscrossing the philtrum column line. His accompanying comments were pertinent:
However, there is still flattening of the nose on the affected side and the indirect lighting across the lip brings out an annoying facet of the Z-plasty which often manifests itself no matter how careful one's technique and that is the slight raised prominence of the tip of the upper flap. I make a point now of snugging this tip well down into the apex of the V with a subcuticular stitch in order to prevent this rising up postoperatively.

In spite of his own criticisms, he produces, in my opinion, lip results as good as if not the best of those achieved by any variation of the Z-plasty. Perhaps because he is a bit closer to the rotation-advancement in the placement of his scars?

**CRONIN**

Concerned about the unreliability of getting a good join across the cleft at the mucocutaneous line, Thomas Cronin in 1966 made a slight modification in the Tennison-type lip closure. He lifts his medial transverse incision, CB, 1 mm. above the potential peak of the bow on the cleft side from E to D. On the lateral side again he raises his flap 1 mm. above the edge from E’ to D’. Then a vertical cut is made across each mucocutaneous ridge to facilitate the alignment of the vermilion border. In essence, the slightly elevated lateral triangular flap is let in slightly above the mucocutaneous ridge on the medial side in a short straight-line join. Brauer subsequently joined Cronin in this 1 mm. jog.
POPULARITY OF THE Z

In 1959 Raymond Brauer, after having previously embraced and modified the LeMesurier method, concluded that Tennison's method was superior in unilateral primary clefts for the following reasons:

1) It saves the cupid's bow, the medial half of which is sacrificed by LeMesurier's incisions as indicated by the stippling.
2) It relieves vertical shortness of the lip on the cleft side in the body of the lip, rather than merely in the lower third.
3) The scar falls laterally where it is far less noticeable than is a central scar which distorts the cupid's bow and displaces laterally.

On the bus to the teaching sessions at the American Society of Plastic and Reconstructive Surgeons meeting in Las Vegas in 1972, I challenged Brauer:

"Ray, I think you persist in cutting a Z-plasty in the lower portion of the lip out of some old resentment from my residency days in Houston."

He laughed and said:

"No, but if you have a contracture at the elbow a Z-plasty placed directly in the antecubital space gives easier release than one higher on the arm."

Easier maybe, but ease is not our most important factor. An entire displaced component, it would seem, should be moved as a whole and not be "drawn and quartered."

It has been said that Brauer's lips rank among the best. I asked him to send me examples, preferably complete clefts with long-term follow-ups. Here is an example which shows Brauer's markings on an incomplete cleft, the early result and a later follow-up of the Z.
Another fine example is used to demonstrate an important point. The photo of the original deformity reveals not only a complete cleft but a predictable longer-than-ideal vertical lip length on the normal side. Brauer executed his neat inferior triangular interdigitation without transgressing or affecting the normal side. He achieved good positioning of the bow, but, as could be foretold, the total vertical lip length eventually appears longer than ideal. This is not the fault of the method but the result of matching the cleft to the long normal side.

The question arises: Should we shorten the long normal side rather than knock ourselves out lengthening the short cleft side in those rare cases with a predictable long lip future?!

**CLIFFORD AND POOL**

In Detroit in 1957, with the aid of a blackboard in a small room on the thirteenth floor of the Henry Ford Hospital Clinic, Drs. Robert Clifford, Pool, Kelly and Kislov hotly debated the pros and cons of the various popular cleft lip techniques. They measured hundreds of infants' lips in the adjacent clinic and sketched and erased thousands of drawings in a constant blackboard battle. Finally, in 1959, young Pool presented their findings to the American Association of Plastic Surgeons in Boston. Included was a probing comparative analysis of the LeMesurier and Tennison methods illustrated by a *composite* drawing. He commented on

the tissue used in the triangular [Tennison] flap repair [dotted line] and sacrificed in the square [LeMesurier] flap repair [dark line]. Square *versus* triangular flap: the square flap technique sacrifices vermilion and remnant of cupid's bow on the cleft side of the midpoint. Likewise, when the oblique incision is past the midline or through the philtrum, the lip will be made
long and tight. The only tissue sacrificed in triangular flap repair is the skin above this flap. . . . One definite disadvantage in the use of the quadrilateral flap repair is that it is generally planned from the cleft side with a preconceived idea of lip height. When an error is made it is usually in the direction of excess length with concomitant horizontal tightness and sacrifice of the useful normal remnants of cupid’s bow, midline dimple and midline tubercle.

Pool recalls now with nostalgia how, during his presentation, six authors of plastic surgery textbooks, with much experience in cleft lip surgery, sat in the front row. Although the previous papers had been vigorously challenged, when he finished and waited in anticipation for discussion, the audience got up, turned around and left the room for intermission without one word. As he says today,

It was rather like a nightmare and I left the room feeling that I had laid a colossal egg.

To add to this blow, only 36 hours later Robert H. Clifford, his chief and friend, died. Actually, their analytic study stands as an important landmark in cleft surgery.

Although more conservative of landmarks and tissue than the square flap, the triangular flap is by no means as simon-pure as Clifford and Pool indicated.

Musgrave in 1964 felt that the Tennison technique is easy to teach, easy to perform and best suited for the severe degree of incomplete cleft lip and for most complete clefts. He suggested:

In the complete unilateral cleft lip, when possible, an attempt is made to plot the triangular flap on the lateral elements of the lip, as long as the markings can be maintained within the lateral nasal crease where the ala joins the lip. When this is not feasible and it appears that the incision would extend too far laterally, the Tennison method is not used and instead a quadrilateral flap is planned.

INCREASE IN VERTICAL LENGTH

Surgeons have noted, as with the quadrilateral flap of LeMesurier, that the triangular flap of Tennison also results in increase in
vertical lip length on the cleft side in certain cases. Pool attributed this outcome to a vertically long lateral element. Brauer and Cronin purposely made the lip shorter by one or two millimeters initially to compensate for the subsequent increase in vertical height.

Musgrave with Garrett for Goldwyn’s 1972 book, *The Unfavorable Result in Plastic Surgery*, noted:

The surgeon who chooses to use one of the lateral flap methods, i.e., either a rectangular or triangular flap introduced just above the vermilion border, should be aware that in the patient with a wide cleft, this rotated tissue which originally was cheek tissue has been turned downward and medially to be inserted into the medial border of the cleft. With time, the lip may well become too long. It behooves the surgeon, therefore, who is considering use of such a flap method (LeMesurier, Wang, Hagerty, Randall, Tennison) to be alert to such potential lengthening and to plan a lip that is approximately 1 mm. on the short side.

**SIMPLIFYING THE DESIGN**

Chandler Sawhney of Chandigarh, India, considers the increase in vertical lip length to be due to faulty design rather than abnormal growth. He does admit that a small error at time of operation is likely to become more apparent as the lip grows and the scar stretches. In 1972 he proposed a simple, logical way to design and measure the Tennison method. A transverse incision across the philtrum which stops at the midline will drop the cupid’s bow into symmetry. Taking the difference in height of the peaks of the bow on the cleft and normal sides after pushing the columella into straight position determines both the amount of drop on the medial side and the width of the triangular flap on the cleft side. Of course, these two are equal to each other.
CRITICISM BASED ON PRINCIPLE

The Tennison principle and all of its subsequent modifications made one important advancement, the preservation of the cupid's bow and its placement into normal position. This had been accomplished by taking a triangular flap from the cleft side to insert into an inferior releasing incision on the non-cleft side. In fact, this means does not justify the end; too many proved principles are being ignored.

1. Like the Mirault modifications this method also bases its logic on the false supposition that the actual defect in the cleft is in the lower one-third of the lip. This, of course, is not the case.

2. The main triangular flap is taken from the deficient cleft side, and in principle it is unwise to borrow from Peter to pay Paul when Peter can ill afford it.

3. There is already missing tissue so that further discard of tissue is unsound in principle. It is particularly extravagant in incomplete clefts with the Tennison approach.

4. Nasal correction by this approach is not simultaneous but requires a separate action. The straight-line scar of the upper portion of the closure runs directly into the floor of the nose, a telltale sign of cleft lip. The short-sided columella remains short, no nostril sill is created and, in order to move the alar base far enough medially, more excision of tissue is necessary.

5. Probably the most important flaw in this approach is the Z-plasty in the lower portion of the lip. It crisscrosses Langer's lines, violating the potential vertical philtrum column and disrupting the philtrum dimple. Even when the scars heal superbly, the result is unnatural. When the scars are poor, the effect is unacceptable. Photographs of results in which flat lighting has wiped out the scars completely are misleading.

Of the cases that come through our clinic, those that have been treated according to the Tennison design often are reasonably good. The unnatural zigzag of the scar is the only aspect
that is universally offensive. Of course, when the surgery has not been carefully executed, the secondary correction can be exceedingly troublesome.

Or, as paraphrased by Professor R. L. Last:

Seven times seven turn your knife in your hand
Ere you cut the skin of a fellow man.
Seven times seven and go out to dine
Ere you cut across a Langer’s line.
III. Rotation-Advancement Conception
12. Personal Approach to Cleft Lip

The fascination of cleft lip surgery is primed with a double-barreled charge, the pathos of the deformity and the artistry of its correction. This combined appeal was directly responsible for my entering the specialty of plastic surgery. My early training in cleft surgery provided a preamble to the rotation-advancement approach.

As a surgical intern at Boston Children’s Hospital in 1944-1945, I was introduced to cleft lip surgery while assisting the fastidious and meticulous “Blue Bonny Donnie” MacCollum to mark and do Rose-Thompson and Mirault-Blair procedures. The more primitive curved-angled paring seemed simple enough, but even with Hance’s diagrams from Blair’s 1930 article it took me six months to figure out the logic of the Mirault-Blair principle, and by that time I began to be suspicious of its merit.

While at Rooksdown House, near Basingstoke in England, from 1948 to 1949, as a trainee under Sir Harold Gillies I discovered that every other Saturday Professor Kilner and Eric Peet had a cleft lip and palate operative schedule at Lord Mayor Treloar Children’s Hospital in Alton. This was a two-hour ride on a red double-decker bus through Hampshire countryside which was rewarded by superb technical demonstrations of straight-line lip closures. Then, during my last few months at Rooksdown House, Bill Holdsworth, an amiable Australian, took me on his lip and palate service. Holdsworth was then writing his book, Cleft Lip and Palate, which Gillies later reported to be “so bursting with solid common sense.” This offered me the opportunity to do half a dozen straight-line lip closures.
Dissatisfied with the results, I began experimenting with a rectangular flap from the cleft side in an attempt to produce a cupid's bow. When I sketched an outline of my plan for John Barron, he asked if I had seen the new method recently described by a Canadian, LeMesurier. I was disappointed until I saw how cleverly LeMesurier had mastered the cupid's bow construction. In my attempt I had not had the imagination or the courage to use the non-cleft side to cut and drop half a bow. This was indeed an exciting concept.

Six months with Brown and McDowell was excellent exposure to their simplified triangular flap. Then a visit to LeMesurier and six months with Straith put me definitely in the quadrilateral flap camp. While a resident in Houston I carried out the LeMesurier method on two unilateral clefts which prepared me to demonstrate and promote the technique in Gillies' clinic in England in 1952-1953.

GUIDANCE FROM GILLIES

As a student I had been extremely fortunate to have been exposed to so many pioneers and craftsmen in cleft deformities. I was thus provided not only familiarity with a variety of approaches but an awareness of their discrepancies.

Superimposed on this specialized background was Gillies' teaching of empirical principles. So pertinent were these principles to all phases of plastic surgery, a cleft or a contracture, a hole or a distortion, that in 1949 I condensed them into 10 commandments. As it turned out, commandments 3, 4, 6 and
9 were to have, and still do have, a guiding influence in my personal struggle with the cleft problem. By way of review, briefly they are:

3. *Honor that which is normal. Return it to normal position and retain it.*

4. *Thou shalt not throw away a living thing until it has been proven absolutely useless.*

6. *Thou shalt never steal from Peter to pay Paul unless Peter can afford it. Thou shalt not commit tension.*

9. *Thou shalt not have a routine or make any graven image or any likeness of routine that is at East Grinstead or even St. Louis. Thou shalt treat each case individually.*

Upon my return to the United States in 1953, I volunteered for naval duty and somehow ended up in the First Marine Division, in the field, Korea.

**ROTATION-ADVANCEMENT CONCEPTION**

The arrival of a plastic surgeon in the U.S. Marine camp caused a Korean working for the Americans to bring in his seven-year-old son, who had a rather severe unilateral cleft lip. The LeMesurier method was used and, although the family was pleased, the more I studied my result the less I liked it.
Disturbed by this dissatisfaction, I kept going over and over the problem. An obvious priority was a method that would end up with a respectable cupid's bow. LeMesurier seemed to achieve this, but by taking the main flap from the weak cleft side, already deficient in tissue. This was the hang-up for me and while I was trying to reverse the process, George Brusseau, the division photographer, made up a number of 8 X 10 matte prints of the "before" picture of my first Korean boy and a couple of other children who had been seen around camp earlier but had not returned. The camp carpenter, when presented with an orange crate, constructed a drawing board. With the cessation of hostilities, except for the officers' bar and an occasional old movie, after sunset there was absolutely no distraction. Many an hour was spent pondering over and marking on the photographs. In my quest for a flap from the strong non-cleft side, I began to concentrate on this portion of the deformity. As I recall, one night I had been restudying the cleft deformity in a group of Brusseau's photographs which were propped up on my orange-crate drawing board. Evidently my eyes had closed for a moment and then I had fallen asleep. The bed light must have awakened me an hour or so later, and as I opened my eyes, they focused by chance on the photograph that was standing askew. The angle of its position suddenly made me aware that what we had been searching for had been there all the time! Two-thirds of the cupid's bow, complete with tubercle, white roll of the mucocutaneous junction, one column and the dimple of the philtrum were all present but had not been accounted for previously because of their distorted position. To get this non-cleft component down into the correct position—that is, move what is normal into normal position—was merely a matter of releasing it from its abnormally high attachment to the columella base. The best method seemed to be a rotation incision which, while dropping the entire cupid's bow, philtrum and dimple into normal position, would leave a triangular gap in the wake of the rotation. Thus, the main flap now became the entire non-cleft component, which had to be rotated to form two-thirds of the lip, leaving
the true defect as a triangle in the upper one-third of the lip. The next logical move was to maintain the rotation by supplying a filler for this triangular gap. A horizontal relaxing incision on the cleft side, extended laterally just under the alar base, would allow medial advancement of the lateral lip element into the rotation gap to complete the remaining one-third cupid’s bow and lip. This advancement promised an extra bonus, that of correcting the flare of the alar base. In principle it sounded promising and on paper it looked pretty good, but only by actual application could the value of the theory be proved. This required a unilateral cleft lip patient!

FIRST ROTATION-ADVANCEMENT

While riding in an open jeep through many a Korean village, I had noticed children with cleft lips hiding in the shadows of their huts. Yet how to entice even one into our native outpatient clinic proved to be quite a problem. Repeated appeals to the clinic interpreter were rewarded with a smiling “Ahhh, so!” but never a cleft. Finally, one day out in the rice paddies, I spotted a 10-year-old Korean boy with a unilateral cleft lip.

During earlier days in Texas I had spent numerous free after­noons roping calves. I carried a rope coiled in my footlocker for it can serve as a quiet, lethal weapon at night at close range in an emergency. Actually, I had been playing catch with a group of Korean youngsters several days previously. In desperation I dashed up the hill to my tent, grabbed the lariat, opened the loop on the way down and, on the flat run along a paddy path, lassoed the little lad. He seemed to get into the spirit of the game and allowed himself to be herded over to “A Med,” our quonset hut hospital. There, with two favorite corpsmen, Texan B. L. Parker, as shown, and Dakotan Richard Ward, I marked the planned incisions on the patient.

Then, under general anesthesia and without parental permis­sion, the first rotation-advancement procedure was performed.
Once the stitches had been removed, the boy was turned loose, and soon other clefts began to appear. Eventually they came from all over Korea, on foot, in oxcarts and in crude baskets called “A frames” carried by shoulder straps.
Then, after only four months, there was a change of command, and suddenly all Korean native surgery was discontinued at the main hospital. This event forced me to shift my site of operation to Kum Chon Hospital, which was little more than a local Korean first aid station. As a matter of fact, on a clear day a dry paddy had about as much to offer. The hospital had no electricity, so the operating table had to be moved about the room to follow the sun coming through a window. On cloudy days or after sunset, Dr. Kim very kindly held a flashlight. When the temperature dropped down around zero, we tried the pot-bellied stove, but the smoke only added to the low visibility. It became routine for corpsman Parker and me to wear parkas, fur-lined caps and Mickey Mouse boots with our masks and gloves. Here is a day when it was warm enough and light enough for an easy rotation-advancement under local anesthesia and Dr. Kim could devote his entire attention to the surgery.

In the beginning, I was reluctant to use local anesthesia, feeling certain that after one needle an entire village, grass huts and all, would disappear down the dusty road. Such was not the case, for these people possess a stoical grace and even their
young children often accepted a needle without a whimper. As it turned out, following our shift to Kum Chon Hospital, of necessity rather than choice, the major part of the work was carried out under local anesthesia, and especially the cleft lips, whether infant, child or adult.

Most of the patients operated on in Korea were children from 5 to 10 years of age and an occasional adult. This was a fortunate eventuality as it offered an opportunity to develop the method under exceedingly favorable circumstances with robust patients presenting ample lip tissue. The results were promising, and, although the Oriental often shows a tendency toward keloid, the scars with this design healed happily.

IGNORANCE IS BLISS

With the Marines in the field there was seldom a chance to peruse up-to-date medical journals. It just happened that one appeared in our tent which had an abstract about Cardosa’s method for cleft lip. Although the abstractor was vague, this approach seemed to have similarities to what I was doing in Korea. Having been on the move for years in England and now in the Orient, I had not been able to keep abreast of cleft lip developments. Sometime before I had had a quick talk with Tennison about his stencil method but was completely distracted by the bent wire. Marcks’s “Further Observations” were not
known or available, so actually I came onto the vestige of the cupid's bow independently. The same course of events has happened often in history and was a boon in this instance. Diversion by the advances of Tennison, Cardosa and Marcks toward the tempting inferior placement of a triangular flap might have caused me to bypass the more complete shifting of all normal structures into their rightful position.

My return to the states in 1955 from Korea was routed through Hong Kong, Delhi and London. It was great fun seeing familiar faces, and when the rotation-advancement method was outlined and diagramed at the London clinic at 149 Harley Street for Sir Harold Gillies, he snapped it up like "a trout on a dry fly." He insisted it be presented at the "first" International Congress of Plastic Surgery, to be held in Stockholm in August of that year, and wrote the Congress secretary, Tord Skoog, a letter requesting that my paper be added to the already overcrowded program. Skoog courteously replied to me:

The Committee has reserved five minutes for your paper on "Cupid's Bow Vestige in Harelip" and hopes you will be able to give the members the essential information in that short time.
In the air on my way to Stockholm I went over my slides and the text of what was essential to describe the rotation-advancement approach. It just was not possible to condense it into less than seven minutes at the least. I had to get two more minutes somehow.

The program distributed at the Congress registration set the cleft lip and palate session at 2-5 p.m. Tuesday, August 2, in the concert hall. T. P. Kilner, with whom I had spent many a day at Alton, was designated as the session chairman. The vice-chairman was R. Trauner of Austria, who had visited Gillies during my time at Rooksdown House. The secretary was H. Schjelderup of Norway, an old student of Gillies. Still no chance was seen for getting extra time, but at least there seemed to be a friendly head table.

Fogh-Andersen was listed as the leadoff speaker with “Remarks on Etiology of Harelip and Cleft Palate with Special Reference to Heredity.” I dropped a couple of beats when I saw that my paper, “A Primary Camouflage of the Unilateral Harelip,” was set for second. Marcks was to follow with “Secondary Cleft Lip Repair” and Potter with “Nasal Tip Deformities Associated with Harelip.”

During the morning session I noted the strict timing on each speaker with a white light on the rostrum for the two-minute warning and the red light for the end. Even from the back of the great hall with its high ceiling the acoustics proved to be remarkable, and, as soon as the crowd left for lunch, I voice-tested to make certain one could speak anywhere in the hall and be heard by everyone.
By 2 p.m. the concert hall was full, and Kilner, with gavel pounding on the table, called the cleft lip and palate session to order. I sat in the back of the enormous room near the center aisle. When my name was called, I rose and started slowly down the aisle addressing the austere audience. In unison all heads turned toward the center aisle as I proceeded while saying:

Ladies and gentlemen, one of the principles of plastic surgery taught me by Sir Harold Gillies, the Honorary President of this Congress, is "Never throw away a thing until you are certain you do not need it." With your permission I will make use of the time it takes me to get to the rostrum, as I may need it. Many surgeons have tried to camouflage the harelook, but the multitude of techniques actually being used today is indication enough that surgeons are still not satisfied. Then too one cannot help but be impressed at the number of papers being given at this Congress which are devoted to the secondary correction of the harelip deformity. One thought has been echoing in my mind for some years, "Make the strong side produce the major flap," but it was not until I was surrounded on all sides by grinning Korean harelips that a method crystallized. In my quest for a flap from the strong side I began to focus on this element and realized that here was two-thirds of a cupid's bow complete with tubercle, philtrum column and its dimple. They are merely in a distorted position.

By this time I was backing up the stairs to the speaker's platform.

For those who say "Only God can make a cupid's bow" it might be added that if God gives us a good portion of a bow, for His sake, it should be used as such.

Upon my arrival at the rostrum I turned to Professor Kilner, who in solemn officialdom started the clock, but not without the barest perceptible twinkle over his half-spectacles.

First I paid brief homage to the straight line of Rose, Thompson and Kilner, then to the flaps of Mirault, Blair, Brown and McDowell and of Hagedorn and LeMesurier and finally said:

We are in a new era which was spearheaded by Tennison's Z, soon followed by Cardosa and Marcks' further observations. Now I want to get into the act!
My first slide was a crude drawing of the rotation-advancement incisions sketched in Korea on the orange-crate drawing board.

**INCISION X**

\[ \text{IN INCOMPLETE CLEFTS} \]

\[ \text{USE SIMONART'S BAND} \]

\[ \text{IF IT IS STRONG ENOUGH} \]

**INCISION Y**

Then followed slides of the results on a series of Korean children such as this little girl and other earlier ones, later published in the First International Transactions by Williams & Wilkins in 1957.
It was suggested:

If the method produced these results for me in a Korean field camp without the aid of general anesthesia (sometimes), modern facilities, adequate lighting and post-operative nursing care, just think what you can do with it!

The lights were out during the showing of slides and just in case there would be a need for a “lifeboat,” I draped a black handkerchief over the rostrum light. As it happened, I was able to complete the slides, reemphasize the cupid’s bow, philtrum and dimple, natural position of the scar and simultaneous nasal correction and then pocket the black handkerchief before the red light began blinking. As I descended the stairs to my seat, I remember that Gillies, Aufricht and Denis Browne in the front row nodded approval.

Yet this unorthodox performance by an unknown was considered brash and even impertinent by many present and no doubt was responsible for setting back their acceptance of the method for a number of years.

Recently, in February 1973 during a visit to Miami, silvery Skoog with a puckish gleam recalled this presentation in the Stockholm concert hall 18 years before. In his retelling of the tale to my residents, he generously added that during the walk down the aisle I had held up *placards* of the operation, describing the method as I strolled slowly along, so that by the time I reached the rostrum, my paper was almost finished. This improvisation is rather nice, and an attempt to perpetuate it will be made.

**REACTION TO ROTATION**

The immediate and the delayed reaction to *rotation* and *advancement* was mixed. In general, the method seemed to arouse interest. The following afternoon was free for a boat trip to Drottningholm Palace, the royal summer residence. As we docked, Milton Adams, determined to get a Soviet visa for a visit behind the Iron Curtain, disembarked with a Russian plastic surgeon
under each arm. As he passed me on the gangplank, he called over his shoulder,

Good results but I couldn’t see your plan. Your diagrams were not clear and did not show up well.

In fact, those diagrams are still the bane of the method. They were not intelligible enough at the Congress presentation, and they have been resurrected by others too often since, as they have long been obsolete.

In Drottningholm Palace courtyard, after a performance in an eighteenth century theatre, MartinEntrin told me he would be more interested in the method after five years when the results could be better evaluated.

On the bus ride to Uppsala the following morning I had the good fortune to sit beside Professor Karl Schuchardt. His comment was encouraging:

The best cupid’s bows I have seen.

He invited me to visit his clinic in Hamburg after the Congress. His invitation was accepted and, along with the renowned Arthur Barsky, I observed his concise execution of a LeMesurier lip procedure. During the operation and the accompanying discussion, Barsky made the offhand comment that after all it was only a matter of whether the surgeon chose to use “a triangular or quadrilateral flap,” and I disagreed with him. After the operation, Professor Schuchardt asked my opinion, and I answered by saying that I thought he would like the rotation-advancement approach. He agreed it was possible and promised to try the method. It has been one of my disappointments that in all the years that have followed he has never tried it. Many of his students have, but as far as I know, never the professor.
A l l previous patients had been Oriental. Although it seemed logical that the same general design would work for any race, until it had actually been done there was no way to prove it. In 1956, about one year after starting plastic surgery practice in Miami, Florida, I did my first rotation-advancement on a Negro infant with a complete unilateral cleft. The method worked well.

The next rotation-advancement procedure was used in a white Marine sergeant's son who had an incomplete unilateral cleft. The incorporation of any salvageable tissue in Simonart's band to add to the advancing tip of the lateral advancement flap, of course, provided more filler for the rotation gap and faithfully followed the fundamental principle of throwing nothing away. This band portion of the deformity heretofore had been scrapped by all methods. The result with the white baby also was most encouraging.
In 1958 Neal Owens of New Orleans, who had trained in England in 1937, dedicated one complete issue of the *American Journal of Surgery* to honor Sir Harold Gillies and called upon many of his old students to participate with papers. Mine was entitled "A Radical Rotation in Single Harelip" and using these two cases as examples, black and white, it began:

Sir Harold Gillies has long taught the principle of avoiding routine by treating each case individually.

The underlying theme of this first American rotation-advancement publication was *not to force a rigid method into the mouth of every cleft*.

The act of constructing or repairing facial features is in its very nature artistic and, as in all art, depends on freedom for its vitality. No two cases are exactly alike; not even two harelips of seemingly equal degree of cleft can boast this identity. In general, one cleft lip with its nasal distortion may be reminiscent of another; they may even be similar but never quite identical. Hordes of patients are run through the A, B, C blue-dot routine because of the temptation to latch on to a reasonably satisfactory method and drift merrily along mesmerized by a memorized blueprint. Yet the simple fact that no two lips are identical seems to demand a surgical solution for each, with a personality all its own.

With the normal as our goal we need only be guided by fundamental principles:

In the harelip deformity both the lip and nose have been short-changed. Not only has nature left out a portion but she has allowed distortion of
what remains. This distortion can be relieved by moving normal tissues into normal position and retaining them there . . . With tissue actually missing we must throw away nothing, guarding what little we have jealously for use to its utmost advantage. The presence of a cleft necessitates the formation of a scar and this scar, if not hidden, more often than not will give away the secret. It would be well, if possible, to maneuver it into hidden crevices or use it to simulate natural landmarks.

To show improvements in the design and to rally from my orange-crate sketches, Neal Owens lent his fabulous artist, E. Freret, to illustrate the method in incomplete and complete clefts for the *American Journal of Surgery* article. The incomplete cleft drawings were excellent except that B advanced too far into normal lip.

As so often happens when an artist tries to portray a surgeon's idea, the design as drawn would never work. This discrepancy was apparent in the diagrams for the complete cleft and probably explains later fears by other surgeons of this method in complete clefts.
Freret's lovely drawings did facilitate the description:

With no effort toward making a routine procedure or pinpointing a rigid A, B, and C, let us proceed along a logical sequence. As suggested by Blair, there is no better measure than the human eye; this type of art is not strictly mathematical.

A, B and c were used not as strict points but as labels for flaps. Flap A with cupid's bow and dimple was rotated down. The description here as to how far the rotation incision should go could be misleading.

Usually it will extend slightly past the midline so that the rotation is radical and ever so slightly overcorrects the original distortion.

As shown in the diagram for complete clefts, the rotation incision would never have achieved normal position, and subsequent shortness or contracture would have been inevitable.

Yet, in the cases presented of the Negro and white babies, the rotation had been successful. This outcome possibly spurred surgeons to extend the rotation past the midline of the columella base and even further across into the lip on the normal side, producing an unattractive lip of abnormal vertical length.

A second misleading point in the diagrams and the description was in reference to little flap c.

In the process of rotating this main lip component the incision leaves a small triangular flap c attached to the columella. Flap c is destined to form the nostril sill and absorb a part of the pull at the tightest point in the closure.

Actually, flap c in the early cases was used to cross the entire nasal floor, but gradually this action was used less and less, and, as seen in the diagrams for complete clefts, flap c did not extend all the way across the top of the advancement flap.

The description of creating flap B noted use of any muscular Simonart's band in incomplete clefts and in complete clefts advised that the lateral incision start high and curve down and out under the alar base. It is well to extend this incision cautiously and "cut as you go" so that by repeated trial flap B advances until it amply fills the gap and maintains the primary rotation.
The nasal bonus was noted:

One of the most satisfying after effects of advancing the lateral triangular flap B across into the gap between columella and flap A is the natural positioning of the flaring alar base.

This simultaneous nasal bonus is rather vividly demonstrated in this patient operated on at Princess Margaret Hospital, Nassau, Bahamas.

For those who were questioning tension at this key point of advancement into the rotation gap, it was admitted:

It is at this point in extremely wide clefts, however, that a moderate amount of tension is created. Yet if there must be tension this is the point of greatest advantage. Not only does this tension provide a reduction in the abnormally wide nostril floor but any relative tightening across the upper portion of the lip produces a pleasant protrusion of the lower portion resulting in the semblance of a pout. Another advantage is that tension high in the lip . . . is splinted by the maxilla beneath and distortion of the soft free border of the lip, as seen in other methods, is avoided. . . . Thus the general effect of this final scar is a [scar] line running from the peak of one bow along a natural philtrum line beside the dimple and matching the opposite normal column. The scar proceeds obliquely up toward the columella swinging under and breaking into a zigzag, all of which is hidden in the shadow and crease lines of the nostril sill and alar base.

**DISCREPANCY IN DESCRIPTION**

From the first presentation of this method there had been some who feared the long oblique line of the lopsided Z because of the possibilities of its contracture. Some reported a notching. Advice in the 1958 paper had been:
If the primary rotation is radical, the advancement flap full-bodied enough to fill the gap adequately and the muscle approximation across the cleft thorough, the ultimate result can be nearly perfect. There may be a slight contraction during the first weeks of healing but as months pass the scar will soften and the lip smooth out. This sequence of events has been observed in numerous cases. A persistent notch merely indicates inadequate primary surgery and must be corrected simply as any other notch.

At the time I was irritated that others continued to complain about contractures and notching. Yet, as I look back, it is quite obvious that the original diagrams, if emulated as rigidly as points A, B and C had previously been followed in other methods, would lead to inadequate rotation, immediate shortness along the scar line and permanent contracture and notching.

Take, for instance, Professor Frantisek Burian’s Czechoslovakian 1968 diagrammatic interpretations of the rotation-advancement method in complete and incomplete clefts. They were similar to my original sketches, but if copied literally as he diagramed the procedure there would be no way to achieve matching sides or an artistic result.

Such glib phrases as “cut as you go” and “treat each case individually” did not explain how to get the last bit of rotation that made the difference in many cases. It was years before I realized that I had been responsible for allowing a “blind spot” that was acting as the main hang-up. It had been taken for granted that any rotation incision, when necessary, can be further rotated by a cut-back. This was hinted in 1964 and finally emphasized in Rome in 1967.

TEMPORARY CONTRACTURE

Whereas there was considerable concern with the inadequate rotation and the subsequent contracture, this was never a major problem. Many cases showed an early lift on the cleft side as the scar healed. This will be shown in several cases later. Yet, if the skin distance from the alar base to the height of the cupid’s bow on the cleft side was equal to that of the normal side at the termination of the operation, all would end well. In spite
of a temporary contracture, by six months to a year the lip would have settled down to a symmetrical bow.

EASE OF SECONDARY REVISION

One of the advantages of this approach has been the ease of correction. Seldom is it necessary to take the lip apart for more rotation and advancement, but when indicated it can be done without difficulty. No bridges are burned, and revisions can be executed along normal lines while continuing to preserve natural landmarks.

A CHALLENGE

The second American publication was a challenge to stop irreversible damage and to go for the ultimate potential.

Irreversible damage

In 1959 an appeal was made to all doctors in the Journal of the American Medical Association entitled "Preservation of Natural Landmarks in Unilateral Cleft Lip." It began:

The harelip deformity, with its twisted distortion of the nose and gaping cleft of the lip, utterly disfigures the center of the face and destroys any chance of normal expression—even a smile is grotesque. So horrible is it
that whatever the surgeon does will be an improvement [and will gain the parents' eternal gratitude]. Yet mere improvement is not enough and should not be accepted as a triumph... It never ceases to be a thrill that two simple incisions [rotation and advancement] can set up such a consecutive chain of happy actions.

Then came the punch line:

Several popular methods in use today ignore one or more of nature's landmarks and, what seems even more tragic, by actually destroying them in the primary repair cause them to be lost forever.

**Ultimate potential**

Many surgeons have discounted the importance of a method by saying that a surgeon should use whatever procedure he personally believes will work best for him. *This attitude can lead to mediocrity.* It is true that most experienced surgeons have their favorite lip method, and with this their results are better than with any other. Yet, no matter how skilled a surgeon may be, his best results are limited by the ultimate of the method he favors. A method's merit must be measured by the closeness of its approach to a natural looking and acting result. Cleft lip surgeons must be perfectionists, free to aspire and willing to work in millimeters. If the method scraps the cupid's bow, violates the dimple or allows the scar of union to cross natural lines, then no matter how fastidious the surgeon is, he can never make up the handicap. There is, however, one essential factor which influences the outcome of any method. Before a technique can be made to attain its greatest potential, the surgeon must not only be familiar with it and believe in it but actually woo it to its ultimate.
SKOOG

Among those surgeons attracted by the rotation but evidently unable to get the desired result was the dynamic and precise Tord Skoog of Uppsala, Sweden. Inadequate rotation forced him into a combination of the rotation-advancement and the inferiorly placed triangular flap of Tennison. It is best explained in his own words, appearing in the same 1958 *American Journal of Surgery* honoring Gillies, under the title "A Design for the Repair of Unilateral Cleft Lips."

In 1952 Tennison published a modified design for repairs of single hare-lips. . . In 1955 Millard presented a new design for this type of repair. . . I have used these two methods in cases of unilateral cleft lips with varying degrees of deformity, and the operative results with both methods have been very satisfying, particularly in incomplete clefts. The former method, however, involved considerable sacrifice of tissue in complete clefts, and using the Millard technic I found it difficult to avoid retraction of the scar line at the vermillion border. Based upon this experience a repair was designed which used two flaps for elongation of the cleft side.

Actually, in 1958 Skoog finally chose for his upper flap a vertical one based above, which he transposed horizontally at the columella base. This portion of the design was similar to Trauner's earlier method. His lower flap was a Tennison type which achieved a double darting of the cleft edge.

As noted by Skoog, Trauner of Austria had also described closure of single cleft lips using two flaps:

Trauner combined a modified Hagedorn-LeMesurier technic with his original Z-plastic procedures for secondary correction of the nostril floor and upper part of the lip.
One adequate rotation incision can position the non-cleft element into normal position better than two small releases and at the same time avoid discard of tissue as well as inferior violation of the philtrum column and the dimple. When the healing produces a good scar, Skoog can show what many consider to be excellent results in spite of the unnatural position of the scar. Nevertheless, I feel in principle this modification is a step backward.

It is interesting to see why Joss and Rouillard in 1962 preferred the rotation-advancement "cut as you go" approach over the methods of Trauner and Skoog:

In this respect Skoog's method, which incorporates a Z-plasty resembling Tennison's, may be described as an advance over Trauner's method wherein a modified LeMesurier technique is used. However, the scar in Skoog's repair does not correspond to the philtral column and his design lacks the great merit of simplicity.

In 1969 in the Scandinavian Journal of Plastic and Reconstructive Surgery and again at the Melbourne Congress in 1971, Skoog added a modified Reynolds-Horton type of alar lift as a primary nasal procedure along with his periosteal repair for the alveolar and maxillary deformity and advanced the cleft side lip muscle toward the midline. He also revised his unilateral lip method, making more of the lower triangular flap and less of the higher vertical-to-horizontal nasal floor flap, which he by now had moved farther back into the nasal vestibule, like Collis and Blair, than in his earlier design, which was more like that of Trauner.

There is an interesting story in relation to this switch. While on his Foundation Award study trip in Europe in 1959, Peter Randall visited Tord Skoog in Uppsala. One evening after smorgasbord and a series of "skoals," Skoog asked Randall why he put his little superior flap inside the nostril and not at the base of the columella where it was needed for release. Randall explained that in his opinion it did as much good inside and the scars were hidden. A few more "skoals" and Skoog suggested a bargain: that Randall try placing the upper flap at the base of the columella and he try placing it inside the nostril. In Melbourne in 1971 Skoog's upper flap was shown disappearing.
back into the nostril, but Randall admits "welshing" on his part of the deal.

Also in Skoog’s 1971 design he emphasized sliding the attenuated orbicularis muscle of the cleft edge under the medial edge and, in addition, acknowledged his use of my "white roll" flap at the mucocutaneous junction.

Yet, in spite of all the minor variations, it seems that Skoog’s 1971 unilateral lip method has become finally a slightly refined Randall design, 1958 vintage.

MEYER

In 1966 Rudolf Meyer of Lausanne, who can maneuver skis down the highest alp with the greatest of ease, evidently had more difficulty getting adequate rotation and reposed a modification of the double flap that Skoog originally designed. He presented this approach at Schuchardt’s Second Cleft Palate Symposium in Hamburg, stating that he had the same experience as Trauner with my method. He added:

We need an additional break of the suture line on the level of the vermilion border in order to get this ridge more prominent. So we add a very small LeMesurier quadrilateral flap.

WYNN

Sidney Wynn of Milwaukee, whom I personally saw become a 10-second man in the 100 during a Peruvian earthquake, did some quick lip flap shifting in 1960 when he abolished the LeMesurier portion of Trauner’s design and the Tennison portion
of Skoog’s design. He actually did a type of rotation with his advancement being a vertical flap transposed horizontally as already used by Trauner and also described by both Skoog and me in 1958. Actually, this could be said to be a reversed Giraldes. The 90-degree transposition creates an unnatural kink which lacks the natural flow of advancement as the gaping cleft is narrowed simultaneously. The Wynn design has limitations, and the results, although good in certain cases, fall short of the possibilities.

KAWRAKIROV

Bulgarian Von W. Kawrakirov in 1964 described a lateral vertical triangular flap based upon the inside of the alar base to be transposed transversely into a releasing incision behind the columella in spirit similar to Trauner, Marcks and Skoog. He closed the rest of the lip in a straight line with results that did not seem better than others.

MUSTARDE

Jack Mustardé, a jolly fellow, an innovator and an honest bandit who could have drawn a bow in Robin Hood’s band, was once an ophthalmic surgeon in Nottingham, not far from Sherwood Forest. Enticed into plastic surgery by Gillies and later trained by him and Kilner, he finally became a consultant in Glasgow where his early experience in eye work shot him off like a rocket into orbit. As he is indeed a shrewd chap, few have ever caught him short. This little section may do so, and then there was another time . . .
Mustardé had constantly commented on the beauty of tree and bush reflections on the water surface of a painting by Sir Harold Gillies of an old mill with its stream and weir. He was finally presented with the painting and promptly stored it in a drawer until time and finances would allow its elegant framing.

About a year later he invited Gillies to his home for dinner and, suddenly remembering the painting, scurried off to the local antique shop, bought a frame and hung it in an important position in his home. Gillies came along, spotted the painting and requested: "Musty, do you mind terribly if I borrow this rather nice painting for my exhibition in London?" Mustarde, of course, agreed and in due course went to London to see the exhibition in Foyle's Gallery. He bought a program and eventually came upon his painting, which was tagged with a small red dot in the bottom right-hand corner. Assuming this mark to indicate "privately owned," he questioned one of the ladies in attendance to find it actually meant "sold" and in fact had been purchased that very afternoon by Lord Harmsworth. He never even got a refund on his frame.

Mustarde and I have been friends since our early days with Gillies and evidently because of his loyalty to me and to LeMesurier through Matthews, the author of the cleft section of his book, *Plastic Surgery in Infancy and Childhood*, he felt a compulsion to combine us. These are his words in 1971:

I for one have often felt that some sort of combination between a Millard operation and a LeMesurier would combine the best of both worlds. Other surgeons have obviously been thinking along similar lines and in 1969 Ciarpella and DeLongis, in Italy, reported a series of children with cleft lips in which they had used a technique combining a Millard operation with a LeMesurier quadrilateral flap.

Mustarde, pleased with the LeMesurier pout but disenchanted by the immediate lateral drift of the cleft ala, came up with a vertical flap from the lateral element to be transposed across the entire columella base and even into the opposite nostril in an attempt to *tie* in the delinquent ala once and for all. As he later discovered, Trauner had been thinking along this line 16 years before, as had Marcks and Wynn later. Mustarde's tie flap is
longer and his relaxing incision more extensive, but this does not seem to improve the principle. He adapted this approach to incomplete and complete clefts and has followed his cases for a year, reporting no drift of the ala. Yet, as the original LeMesurier lip "grew" too long on the lateral side in time, then the same criticism should apply here. Regardless of lip length, the nightmare of crisscrossing scars is unacceptable even if they all heal perfectly, and this outcome is not invariably assured even in Glasgow.

**TALAAT**

Samir Talaat, from Cairo University, presented a Z-plasty modification in Rome in 1967 which he described as similar to the Millard procedure, differing only in that the line BF is not at the base of the columella but follows an oblique line in the philtrum.

There were other differences, but the results shown did not seem to warrant the changes.

**ORTICOCHEA**

Then there is an even more "far-out" design by Miguel Orticochea of Bogotá which "outflaps" Trauner, Skoog or Mustardé. He presented this approach at the Congress in Rome and further
complicated a complex problem. He gets off to a deceptive start:

The basic principle of cleft lip surgery is: once the normal structures of the medial lip side (Cupid's bow, affected philtral line and its hemi philtrum) have been properly repositioned, the lateral side is adapted to the new orientation and location of these structures. **Hence the lateral side acts as a satellite to, and instrument of, the medial lip side.**

Except for this satellite metaphor, many of us have been chanting this refrain for years. Orticochea continues by drawing a line AA' and indicates that as long as nothing crosses this line to affect the non-cleft side, “anything goes” on the other side. "Anything” includes “a Giraldes sub-alar horizontal incision” plus a subcolumellar incision and a mid-medial horizontal incision. He concludes that these incisions plus a vertical splitting of the alar base afford the best alar rotation, enabling the surgeon to bend and manipulate the ala with the same facility and ease that a South American farmer bends a divining rod when looking for underground water.

Finally, he continues,

At the end of surgery the cutaneous lip suture forms a zig-zag and has four segments shaped like an M or a W on its side. This suture produces a less noticeable scar.

It is tempting to suggest that the unnatural quality of having one column of the philtrum look like an M or a W sitting on its rear, depending upon which side of the cleft it is viewed from, might please a South American farmer even after he had found water! Although Orticochea mentioned a 10-year experience with cleft lip, his published results either still had sutures present or were only a few months postoperative without definite evidence of justification for such complicated maneuvers.

While visiting Miami in August 1971, he informed us that of all his contributions he was proudest of this lip method. Yet from the slides he showed of his palate procedure it was possible to judge, in part, the lip results in the periphery of the pictures, and there did not seem to be sufficient justification for such radical lip surgery.
This last example prompts the suggestion to us all that any surgeon obsessed to climb and cut his way to *identity* must make certain that he does not inadvertently over-scar his patients during the ascent.
16. Early Proponents of the Rotation-Advancement Principle

Along with the criticisms and modifications of rotation-advancement occasionally came enthusiasm. Sir Archibald McIndoe wrote a personal note:

This is the best method yet devised for the cleft lip deformity.

Sir Harold Gillies, who had taught all the principles involved in the rotation-advancement method and had looked at many a cleft through the years, never quite saw it. Yet once it was called to his attention, he became its most enthusiastic booster. At age 75 he married his wonderful theater sister, Sam Clayton, and whisked her off to India on a honeymoon. During this trip he taught surgery and, in spite of an occasional distraction, even took time to demonstrate the rotation-advancement method to the surgeons of India.

For instance, after a surgical demonstration in Bombay he and his party set off for Poona, ordinarily a three-hour journey. Seven hours later, when they finally arrived, it was explained that Sir Harold had enjoyed four hours painting a water buffalo. Yet Gillies, typically late, faithfully proceeded with his surgical demonstration. This is a quote from a letter from an Indian surgeon present in Poona at the time:

It was in 1958 when Sir Harold Gillies first visited India that he performed the Millard operation for the first time in Poona. After finishing it he took me aside and said: "Dr. Maneksha, try this operation and you will not regret it!" Ever since that day I switched over from the quadrangular flap
method to the rotation-advancement procedure—both for primary and secondary clefts. It is thirteen years now and the results speak for themselves.

It is because of Gillies that the rotation-advancement principle has long been the method of choice throughout most of India. In fact, in 1959 Rusi Maneksha sent an exciting Christmas card from Bombay to Miami. Under a small before-and-after photograph of an Indian baby, who had greatly benefited by a rotation-advancement procedure, was written

"Merry Christmas from the children of India."

His first paper was read by title "Experience with the New Millard Principle in Harelip Repair" at the Second Congress of the International Society of Plastic and Reconstructive Surgeons in London in 1959. In 1963 he published his experience with the method.
FREE HAND

Many surgeons have been attracted to the rotation-advancement method because of its freehand design. George Joss of Norwich, England, with Rouillard stated it succinctly:

His method is simple; it demands that the skin markings be drawn by eye, which is at least as accurate as caliper measurements of landmarks and the potential cupid’s bow can be readily defined. The incisions are not irrevocable; Millard recommends a “cut as you go” technique, but if there has been slight enthusiasm with the blade the unwanted addition to the incision can be sewn up without detriment to the result.

GRADUAL ACCEPTANCE

In 1961 Michael Lewin completed a survey of American and Canadian plastic surgeons and found, among other facts, that the rotation-advancement principle had been accepted by 19.6 percent. He concluded:

Almost 20 percent of the surgeons have adopted Millard’s technique, which is remarkable in the light of its very recent introduction into the literature.

FROM THE CANADIAN SIDE

Fred M. Woolhouse of Montreal, former football halfback at McGill University and ardent teacher of Canadian plastic surgeons, was trained by A. B. LeMesurier and “Doc” A. W. Farmer in cleft lip surgery at Toronto Sick Children’s Hospital. Upon discharge from the Navy, Woolhouse introduced his own modification of the LeMesurier method to the Montreal Children’s Hospital, where the Mirault-Blair procedure was still in vogue. As Woolhouse wrote to me in 1972:

This being a teaching hospital several other repairs which seemed to possess some merit of their own were tried, i.e. Tennison, Randall etc.

We had for a long time been dissatisfied with the residual nasal deformity remaining after an otherwise satisfactory LeMesurier lip repair. Conse-
quently, when the Millard repair was introduced it was principally with a view to improving the nostril sill and the "set" of the alar base—which it did—that we changed. In our early Millards, however, we sometimes had to cut back on the lateral side to achieve enough length at the tip of the cupid's bow on the cleft side and this took away the natural pout.

Another dissatisfaction with the LeMesurier repair was the occasional overgrowth of the cleft side. We never found this to occur as consistently as Brauer and others had suggested but at the same time recognized that it happened too often. In an attempt to have the best of both worlds we even, on one occasion, combined a Millard "advancement" (nostril sill creation) with a LeMesurier lip repair—but this was complicated beyond all reason.

Finally we learned to do the Millard repair consistently well—particularly after the introduction of some refinements by yourself and possibly one or two of our own.

We now use the Millard rotation-advancement almost exclusively. Our procedure is as follows:

The lip is repaired when the baby weighs ten pounds—under general anesthesia. We close the alveolar cleft (with a nasal and oral closure) and the remaining cleft in the primary palate. We then use the Millard lip repair with the small back cut (as a rule) at the columellar end of the rotation flap; the columellar advancement with the small unilateral forked flap; freeing the attachment of the posteriorly displaced base of the medial crus of the alar cartilage on the affected side from the anterior nasal spine; increasing the advancement component by extension into the excess skin of the stretched vestibule, and occasionally extending the upper lateral incision around the alar base; freeing the lateral element from the maxilla and the nasal vestibule to release the alar base from the maxilla; occasionally also freeing the posterior end of the lateral crus and closure with a "V to Y" or "Z"-plasty when the web persists in the nostril following all of the preceding. Finally we use the mucocutaneous interdigitation with your 1 x 2 mm. flap to preserve the "white reflex."

TESSIER

I had heard of Paul Tessier of Foch Hospital, Paris, but missed a visit with him during my European peregrinations in 1948-1949. The failure to meet him is understandable because at intervals during this time Tessier joined Jacques Cousteau's second underwater team as physician and could be found only in the waters off the coast of southern France and 50 meters
below the surface, the limit for that era.

It was in 1961 that Tessier first started using the rotation-advancement method. Some might suggest that accepting this method that early was an omen of his courage later to be displayed in the treatment of hypertelorism, Crouzon’s disease and Apert’s disease. I prefer to think it was rather the same principle of moving displaced parts into normal position that pleased him. Anyway, at Christmastime 1971, in a personal note he added:

I still use it, almost every time on unilateral cases.

And I hung the letter on our Xmas tree!

**Nordic Approval**

Henrik Borchgrevink reported that the rotation-advancement method had been the routine approach for primary clefts since 1960 at the Rikshospitalet University Hospital in Oslo, Norway, and that he himself had used it for all primary unilateral clefts, complete or incomplete, without exception since 1962. His 1970 endorsement is quite convincing:

The rotation-advancement principle in primary cleft lip repair has been adopted by an apparently ever increasing number of surgeons throughout the world . . . and the reservations against the method are gradually expressed with less enthusiasm. The advantages usually mentioned are as follows: the method offers good possibilities for simultaneous lip and nose correction, for preservation and positioning of natural landmarks, tissue saving, non-conspicuous scars, and less difficulty for secondary corrections.

**Lintilhac**

In 1966 Jean Paul Lintilhac with J. P. Cochain of Paris wrote that they had shifted to the rotation-advancement method in 1960, expressing it in a rather charming manner:

Besides the pleasure in operating which one cannot help feeling when everything comes together perfectly and which for a plastic surgeon already speaks in favor of this technique.
Ivo Pitanguy and I have always had a camaraderie probably partly based on his having antagonized almost as many surgeons over the years as I have. Yet his great personal charm usually wins most of them back again. In spite of being an old friend from our bachelor days in London in the early 50’s, or because of it, he acknowledged graciously in 1963 in one of his seven languages:

La technique de Millard, employée dans la phase initiale, permet une reconstruction intéressante du plancher narinaire et une rotation de l’aile du nez ne nécessitant aucune manipulation du cartilage alaire. Les premiers résultats observés sont très satisfaisants et permettent d’augurer que ladite technique occasionnera moins de séquelles dans l’âge adulte. Le temps en jugera.

He not only used the method and suggested extending the lateral advancement incision farther around the alar base but also adapted its use to secondary cases and allowed me to demonstrate my procedure in his fabulous Brazilian clinic in Rio in 1969.

Joseph Galambos of Budapest, Hungary, defended the rotation-advancement principle at Schuchardt’s Second Cleft Palate Symposium in Hamburg in 1964. I was there and was encouraged by the sagacity of his stand. He opened with

The variety of the harelip, the different developments of the lip stumps, the variations in the height of the lip, the discrepancies in the severity of the deformity and occlusion obviously require methods of correction which can be flexibly adapted to the given conditions.

The great variety of methods published in the literature since World War II shows characteristically that there is an increasing endeavour towards perfection in this field. . . . If we consider that the methods of Z plasties, which in spite of their large-scale similarities differ very much from one another, are used in different patients, after the methods of various surgeons, at different ages, the significance of the statistical figures diminishes immediately.
Galambos proceeded to condemn such methods as LeMesurier with

The upper-lip portion on the cleft side grows unproportionally,

and Giraldes with

obviously destroys the philtrum harmony in the cupid’s bow,

and Récamier’s method with

The postoperative scarline however is of an entirely vertical direction.

He concluded with remarkable insight for this time:

The advantages of the Millard operation are as follows:

1. The normal position of the alar base will be automatically retained, the nostril sill is arched, the nostril floor is not depressed or flared and the nose requires only rarely intranasal manipulation.

2. The scar runs as a philtrum column on the side of the cleft and shows no tendency to contract because the incision is radially branched out in its upper portion.

3. A natural cupid’s bow is formed with a central dimple and normal philtrum associated with a straight columella.

In 1968 at a Yugoslav Symposium at Maribor, Galambos praised the rotation-advancement method’s revolt from established doctrine.

Millard (1955) disregarding any skin excision broke from the dogma of Veau where the soft tissue above the peak of the cupid’s bow is unfitted for plastic aims.

He recalled that Ingelfrans, Poupard and Lacheretz in 1963 criticized the rotation-advancement with the following points:

1. The procedure is difficult to perform.
2. In the case of a total cleft the curved incision is placed below the columella and this may result in a conspicuous scar formation.
3. The maximum transverse tension is below the nostril instead of the middle or the lower third of the lip for bringing about a pleasing profile line and avoiding pressure upon the alveolar arch.

Then Galambos countered incisively,
According to our opinion Millard offers more than LeMesurier and Tennison in this point. Through the very fact that the transverse tension is in the maxillary region the upper lip is placed loose, soft and without scars in front of the maxilla . . . the physiological pressure upon the maxilla simultaneously exercises a slight pressure upon the dental arcade and . . . may be regarded as a surgical procedure of orthodontia. Regular examinations of our patients (687 operations) through many (10) years prove this opinion of ours.

Late in 1972 I wrote Galambos inquiring about his present stand and was answered with a reminder that since Stockholm he had been fascinated with the rotation-advancement, not only because it terminated the century old misbelief that the tension must not be placed on the area of the maxilla but because the artistic freedom without numerical scheme entrusted the operating surgeon with the solution. . . . Then too I am in possession of several illustrations of patients operated on by other methods which clearly demonstrate the wrong principles of past methods. In Hungary I am recorded as an expert in Millard’s technic and have published papers in Hungarian and German and presented films on this method in West and East Germany, Yugoslavia and at the Hungarian Academy of Sciences.

PROOF OF THE PUDDING

In 1964, just prior to our Society of Plastic Surgeons meeting in San Francisco, dapper Ed Brown, trained by Albert Davis, invited me to a cleft lip clinic on Post Street and demonstrated
some very lovely rotation-advancement results. It was exciting to see how well he had mastered the principle.

HONORABLE ORIENTAL ACCEPTANCE

As the method was conceived in the Orient, it was poetic justice that some of its early acceptance occurred in Japan. Ohmori said in Honolulu in 1962,

Lately, Millard's method is also being applied as one of many valuable procedures.

ODA

One of the earliest proponents of the rotation-advancement principle was the late Kentaro Oda of Osaka City. He sent me a colorful Japanese geisha doll and then one day in 1963 arrived in Miami to observe a cleft lip surgical demonstration. He reported having used the method for years with superior results and explained that it had been responsible for many patients' traveling to him from all over Japan, amounting to at least 100 new cases each year. The results he showed were impressive. He was a frail, gentle, charming man, and we became good friends. One day I hope to visit his clinic and give a lecture in his honor.

Another important proponent following the rotation-advancement method and publishing results in 1965 was Professor Shojiro Takahashi of Tokyo Dental School.

MOTOMASA SASAKI

Motomasa Sasaki, professor and Chairman of the Department of Oral Surgery, Sapporo Medical College, Hokkaido, Japan, was a student of Oda. Between 1961 and 1968 he did 282 cleft lip operations by the rotation-advancement approach. Since 1964 he has been grading the results of the various aspects of the unilateral cleft deformity after surgery:

Labial deformity: cupid's bow, mucosal tubercle, vermilion,
mucosal margin, philtrum dimple, philtrum column, vestibule of the nose.

*Nasal deformity:* nasal tip, nasal alar base, columella, septum, nostril, nostril floor, alar web.

*Profile:* nasal tip, lack of pout, mucosal margin of upper lip, proportion of upper to lower lip.

*Scar:* extent, form, shade, tension, consistency.

A grade of 10 was a bad result; a grade of 0 excellent. Sasaki reports that most of his rotation-advancement results range from 0 to under 2 points.

**EVEN IN WAR-TORN SOUTH VIETNAM**

I am particularly proud of the work of Tran Van Khang, a 30-year-old Vietnamese medical student from the University of Saigon, who wrote a 100-page thesis for his Doctorate of Medicine in 1967 entitled "Étude de la Technique de Ralph Millard dans le Traitement des Becs-de-Lievre." In a charming Oriental manner he dedicates his work to his professors, parents, relatives, friends, acquaintances and even his battle comrades of the 31st Regiment serving southwest of Mekong in 1963–1964. His thesis is based on 118 cases operated on by Professor Dang Van Chieu using the rotation-advancement method at La Clinique Chirurgicale A from May 1962 to May 1966. Of the 118, 47 were unilateral incomplete clefts, 59 unilateral complete, 4 bilateral incomplete, 7 bilateral complete and 1 bilateral asymmetrical. One hundred were from 1 to 18 years of age while 73 of these were from 5 to 18 years old. This work was written without knowledge of the later publications on *refinements* and *extensions* and was a most complete and encouraging report. Khang wrote:

Les résultats le plus souvent excellents, quelquefois stupéfiants, nous laissent plein d'admiration tant pour la dextérité de notre maître que pour l'ingéniosité de cette technique.

He outlined with clarity the many advantages of this approach and explained that failures were not due to the technique but
probably to the inexperience of the operator. He acknowledged that early scar contracture did occur but subsided in a short time if the method was executed correctly and the "suture musculaire" accurately applied. For wide total clefts, he emphasized that the difficulty is no greater than with other methods and that a tight lip was rare. He did warn that there is less chance of danger from tension if the patient is at least three months of age and if the lip is dissected quite free from its attachments to the maxilla.

**ONIZUKA**

Takuya Onizuka, Professor of Plastic Surgery, Faculty of Medicine, Showa University, Tokyo, in 1972 stated:

I have been using the rotation-advancement method or its modification for several thousand cases during the past ten years. Now I suppose the operative method for the primary case is near the final goal. Therefore the most progress should be in philtrum plasty, functional muscle alignment and rhinoplasty.

He continues to practice what he preached by proposing new methods of philtrum construction and columella lengthening.

**OTHER EASTERN PROponents**

Charles Pinto of the Bai Lerbai Wadia Hospital for Children, Bombay, trained with Barrett Brown in St. Louis and with Eric Peet at Oxford. H. S. Adenwalla of Trichur, India, student and friend of the late Pinto, wrote to me in 1972 soon after Pinto's untimely death. He reminisced about his teacher's exploring mind and the dexterity of his craftsmanship:

Nothing seemed difficult when you saw him execute it . . . he had a certain old world concept of chivalry, charity and supreme magnanimity. . . . He splashed the canvas of life with bright colours taking a puckish, schoolboyish delight in everything he did.

Another excerpt from Adenwalla's letter was pertinent:
In our country, patients do not return for secondary corrections which a straight repair on a complete cleft so often requires, and so he started looking for an answer in one stage. He did extensively try out Barrett Brown's modification and to a lesser extent LeMesurier's and Tennison's operations. He however came to the conclusion that the rotation advancement method was the answer. I quote from one of his publications, "The Millard repair, in our experience is a great advance—it produces a nice nostril sill, the height obtained on the cleft side is of good length and the scar produced by this operation looks like a philtral line. We have been extremely pleased with the results obtained by this operation.”

Adenwalla also noted:

With the rotation advancement method he often mounted a small "Z" on the web that forms on the inner surface of the roof of the nostril.

H. S. Adenwalla is chief consulting surgeon and principal medical officer to the Christian Jubilee Mission Hospital, Trichur, Kerala, South India. In the hospital's twentieth-year report, which recorded 9,000 operations in the year 1971 with cases coming from as far as the state of Madras, Adenwalla commented:

Plastic surgery was therefore really born in our country... the clay potters of Satara near Poona... and Charak talks of reconstructing a cleft lip some nine hundred years ago... has now come back to us through the West.

In the 1972 hospital report Adenwalla presented two lovely results of the rotation-advancement method in complete unilateral clefts. He noted:
Excellent nostril symmetry as you can see in Nadesa’s pictures.

He also pointed out:

Dayalal’s is a wider defect and here I mounted a small “Z” on the web that forms on the inner surface of the nostril roof as Charles Pinto suggested in 1965.

This Z of Pinto’s must be similar to that described as a secondary procedure by Straith. In the lip of this case, a posterior mucosal transposition primarily would have filled or a V-Y posterior mucosal roll-down still will fill out the weak free border on the cleft side for better symmetry.

As much poet as “potter,” Adenwalla philosophized:

A plastic surgeon is really a general surgeon with a hobby and this hobby lies in the aesthetic realm of a refined reverence for tissue and true appreciation of the dignity and beauty of the normal human form. . . . Thus he has taken the clefts of lip and palate from the paediatric surgeon. . . . His art would be quite meaningless if he reconstructed a face but failed to put a smile on it. The true plastic surgeon must always hope that the skill of his surgery will help towards the healing of all the internal scars that external wounds can cause.

OUT OF A FORTUNE COOKIE

In January 1974 the first symposium on reimplantation surgery was held at McGill University and the team of Chinese surgeons made Montreal the first stop of their North American
tour. Gaston Schwarz asked them what method they used in cleft lip and they explained that as orthopedic surgeons they did not do clefts but would have one of their plastic surgeons answer. This is a translation of a letter dated February 28, 1974 from the Division No. 3, Plastic Surgery Department, The Peking Medical College:

Since 1963, we have been using the Millard method for repair of unilateral harelips . . .

This is quite exciting as the Chinese did the first recorded cleft lip operation over 1,500 years ago, adding quite a bit of credence to their present judgement!

**ALSO GAINING IN THE WEST**

Twenty questions were sent to the approximately 200 members of the California Society of Plastic Surgeons, and the result of the questionnaire was presented at their Annual Meeting in April 1969. To the question “What kind of cleft lip repair do you use?” they answered: ”Millard 60 percent; Tennison 20 percent; LeMesurier 12.5 percent; other 7.5 percent.” And, as everyone knows, how California goes is important.

**THE LATEST RATINGS**

A survey by resident John Osborn, of John Kelleher’s unit in Toledo, was begun at the plastic surgical chief residents’ conference at Duke University in April and completed in June 1974. Response from a total of 80 residency training programs in the U.S.A. and Canada recorded the various methods being used in these units:

Usual unilateral cleft lip repairs:

- Straight line repair 1 (1%)
- Triangular flap 30 (37.5%)
- Quadrilateral or rectangular 6 (7.5%)
- Rotation-advancement 71 (89%)
IV. Progress by Analysis
17. Benefits of a Mathematical Blueprint

It gradually became apparent that, although many were accepting the rotation-advancement method, others were being scared off by the “cut as you go” quality of freedom. From the beginning it had been suggested:

For a start let’s set aside AA’, BB’, CC’, bent wires and other blueprints. Caliper addicts may cling to their crutch but as in all art it is usually the freehand “fiddling” that creates the best work.

In *Plastic and Reconstructive Surgery*, June 1960, in an attempt to win over those requiring a more exact charting of the incisions, I outlined a numerical plan:

For those who are mathematically minded a set of points can be measured and marked to guide the incisions. The distance from 1 to 2 is measured from 2 along the mucocutaneous junction line and mark 3 is sited. From point 3 mark along the edge of the cleft curving under the base of the columella and extend to point 4 which will allow point 3 to drop to a level which lengthens the distance from 3 to 5 until it is equal to the distance from 1 to 6. Point 7 is to be the leading point of the advancement flap of the lateral lip element. In incomplete clefts point 7 will be in Simonart’s band, and in complete clefts will be marked up in the nasal floor on the cleft side. To develop the lateral flap a transverse incision extends across under the alar base to point 8 until, with the aid of lateral undermining, point 7 will advance to point 4. The distance from 7 to 8 does not necessarily equal the distance from 4 to 5 nor does 5 join 8 in most cases. Usually 5 stops short of 8 in its nostril sill formation. The lateral cleft edge is freshened from 7 to point 9 which should equal the distance from 4 to 3.
FLAWS APPEARING

The rotation-advancement principle had more art than science in its original design. Numbering set points and lining these up with exact measurements to provide a semblance of a mathematical pattern made it apparent that certain discrepancies were present. Once noted, they then could be corrected by relatively minor logical adjustments. These were outlined in detail, first as "refinements" in 1964 and later as "extensions" in 1968. All refinements, extensions and more recent improvements will be described in this book.

RUSSIAN AID

Alexander A. Limberg of Leningrad, a grand premier plastic surgeon of Russia, whose early fundamental contributions have been somewhat shaded from the outside world by the Iron Curtain, wrote a handbook for surgeons in 1963. This work was a mathematical dissertation on local plastic operations, demonstrating with paper models the movement of flaps and the reaction to their action in the adjacent tissue by the production of standing and lying cones. One of his simpler diagrams, portraying an aspect of the principle and including a little Z wizardry, elucidated:

Geometrical selection of symmetrical forms of convergent triangular flaps shows decrease in width and growth in length at the ends of the diagonals.

My feeling about this exacting treatise was:

And all along I thought I had a clear idea of what I was doing!

Limberg's reaction to my "cut as you go" approach was:

For example Millard and Skoog use triangle flaps without a geometrical plan.

He then proceeded to try to make geometry out of my operation.

The horizontal portion of the rotation incision frees the medial part of the lip and permits flap A to be turned downwards. For the filling of the
gaping open angle of the medial part of the lip, a lateral incision frees up the advancement flap B, filling in the gaping angle. Flaps B and C correspond to the opposed transposition of two triangular flaps, in which one can determine the short and long diagonal.

Unfortunately for the strict mathematicians, there is just enough art in rotation and advancement to prevent geometry from being able to tell the whole story.

\[ Y E T \ 2 + 2 \ \text{S T I L L} = 4 \]

The same basic mathematical logic that Randall and Sawhney have applied to the Tennison procedure can be useful in the rotation-advancement execution. In other words, the difference in the height of the two peaks of the cupid’s bow on the medial element is the exact distance the higher peak must be lowered into normal position, which is also the distance the cleft edge of the medial element must be lengthened or the exact width of the gap that the releasing incision must measure or the amount of opening below the columella that the rotation incision must achieve. This, in turn, is also the exact distance that the interdigitating flap must measure across its widest point so as to supply a mathematically sufficient amount of tissue to maintain completely the release. It is possibly true that a rotation with its variable “back-cut” and the advancement are slightly more ethereal than a transverse gash and a transposed flap, but the principle of measurements is the same and can be made into a mathematical equation.

The difference in the vertical height of 2 and 3 = amount of release necessary from incision 3-5 + \( x \) = the width of the point of flap 8-9-10 necessary to fill the rotation gap.

It must be acknowledged that measurements increase the chances of accuracy. The latest sketches of Operation Rotation-Advancement, therefore, will be measured, marked and numbered in Chapters 27, 28, 29, 37 and 38 so that very little but the final millimeter is left to the eye and the imagination.
AN EARLY HANG-UP

O V E R the 20 years since its conception the rotation-advance­ment principle has maintained its two fundamental actions, of rotation and of advancement. Any changes that have been instit­uted have merely been adjuncts facilitating the same funda­mental actions. The most important of these is the back-cut. The original description did not show a back-cut; in fact, according to the original sketch of the rotation incision adequate rotation would be almost impossible. Subsequent diagrams were more likely to guide to sufficient rotation but still did not ensure it. This is the reason for early complaints from other surgeons. Personally, I obtained adequate rotation in 98 percent of cases. The value of a technique, however, is judged primarily by the results of the original designer and secondarily, but everlastingly, by the results of others. Evident in the photographs of those submitting records of their cases to demonstrate their difficulty to achieve a balanced lip was a common criticism: failure to rotate radically enough, so that the cupid’s bow, being raised on the cleft side, sat slightly askew. The “giveaway,” as revealed by a study of their scar, was the failure of their rotation incision to cross the midline under the columella base. This was not contracture, as accused, but actual failure in the original posi­tioning by the rotation. As I look back to try to see how without a back-cut adequate rotation was achieved, it seems that I was carrying the incision well past the mid-base of the columella.
Then if the release of the non-cleft side still did not bring the cupid's bow component into normal position, the rotation incision was carried further across toward the normal side as suggested in 1960:

The actual extent of this rotation incision can be misleading because of the slant of the columella and the deviation of the sepsrum. What seems to be an adequate incision, and past the midpoint of the columella base, actually may be found short of the mark when the rotation component is brought down and over sufficiently to straighten the columella. Simple proof of the inadequacy of the rotation is seen if the cupid's bow and philtrum dimple component will not come down easily into normal position. Extend the incision across the midline through full thickness lip until it does.

This final bit of advice turned out to be quite deceiving, as is reflected in comments by Joss and Rouillard on inadequate rotation:

There is a tendency to be too conservative with the upper end of the long curved incision, mainly because of the difficulty in recognizing the midpoint of the base of the columella. Millard himself has stated that this part of the incision may extend horizontally past the midline into the uncleft side, if this is necessary to achieve adequate rotation.

This statement is misleading and was due to the vagueness of my description: past the midline, yes, but never into or beyond the normal philtrum column. This lack of understanding caused some surgeons, in their frantic effort to obtain adequate rotation and to avoid the "pull-up" of the scar, to transgress the normal column. Then, of course, they began to produce abnormally long total lip length in the vertical dimension and immediately decried the method because of this sequela.

OBLIQUE SCAR

Less serious sequelae occurred in rare instances in which the non-cleft component was particularly short along the edge, deficient in its upper part and high in its distortion. Here the radical rotation incision was responsible for an oblique line of the long scar, which presented a disturbing asymmetry with the
normal philtrum column of the opposite side. Just such a phenomenon is seen in this 17-month-old boy who had the rotation-advancement operation at age two months in 1957.

THE BACK-CUT

The trick that expedited adequate rotation without causing obliqueness of the scar or abnormal vertical lengthening of the lip was the "back-cut." It was being used in varying degrees by 1962 and was first suggested as a refinement, but only in the fine print of a label for an illustration in *Plastic and Reconstructive Surgery*, in January 1964.

The rotation incision starts at the potential height of the cupid's bow on the cleft side of the medial element. It ascends along a line symmetrical with the philtrum column on the opposite side and curves directly under the base of the columella. This incision is extended as far as necessary to drop the dimple-cupid's bow component into normal position and the rotation is facilitated by a tiny cutback if necessary.

The addition of this subtle little cut came too late for inclusion in ensuing publications such as the 1964 book from West Berlin, *Hasenscharten und Wolfsrachen*, by Joachim Gabka. Although we had enjoyed Gabka's Wagnerian charm earlier during his visit to Miami, unfortunately we had not developed the back-cut well enough for him to take it back and incorporate it in his German text. Since other books in other languages were in the same situation, the more recent facilitating modifications were slow to become recognized.
Finally, in Rome at the Fourth International Congress of Plastic and Reconstructive Surgery, within sight of the ancient Coliseum, the back-cut was given front billing while I discussed radical rotation and was illustrated for me by Ron Pigott for the Transactions:

From this point 3 the rotation incision begins through full thickness of the lip, skirting the edge of the cleft and proceeding up to the base of the columella. At this point it takes a curve medially just under the columella base and extends horizontally past the midline of the columella base. At this point the position of the rotated cupid's bow-dimple element should be tested and if not down far enough for symmetry further release is necessary. It is here that a common mistake is made. If the rotation incision is extended straight across horizontally into normal lip element on the opposite side the total vertical length of the lip will be increased beyond normal. This must be avoided. The rotation incision must not cross the philtrum column on the non-cleft side. Only a relative lengthening of the edge is desired. Thus the rotation incision, once it has passed the mid-columella base, must either stop at point 5 or change its direction. If the rotation is adequate then point 5 is the rotation end point. If not then the incision must turn down in a “back-cut” procedure which will render further release. This part of the incision is extended by trial in a “cut as you go.”

In 1968 in “Extensions,” the sharp turndown referred to as the back-cut was again stressed:

This maneuver is emphasized for, although it may not always be necessary, it can make an important difference in those having difficulty with vertical lip shortness.

Since then, the back-cut has become an integral part of the rotation incision and is required to some extent in almost every degree of cleft. In principle, any rotation flap, to increase its pivoting potential, must have its semicircular incision checked in the sweep of its arc with an abrupt dart backward a short distance into the actual base of the flap. The basic action is well illustrated here (A). After the usual curved incision has freed the rotation flap, if there is still tension resistance to advancement (B), then the acute-angled back-cut (arrow) will change the
direction of the incision, release the tension and allow the rotation to speed up toward its ultimate destination (C).

For those familiar with football patterns, this "back-cut" is the pass receiver's "buttonhook" with the defensive back (X) in the columellar position.

For those who are golfers, the rotation incision is a curved 30-foot putt which hits the pin and spins away from the cup in a "back-cut."

**INADEQUATE BACK-CUT**

Inadequate rotation because of an insufficient back-cut release can affect the result. In one severe cleft operated on during the relatively early days of rotation-advancement, the rotation was not quite radical enough. As this was quite unusual, I went back and reviewed my operative note of 3/13/63 on the case. It read,

> Rotation of the medial component carried a little too far, then brought back with one stitch . . .

which reveals the original cut was right and the revision missed the mark. This error could have been corrected simply by scar
excision, more back-cut in the rotation, nasal floor wedge resection and an increase in lateral lip and alar base advancement. The patient was a migrant worker's son, more concerned with survival than lip perfection. Although recalled for increased rotation toward a symmetrical result, he never returned. Maybe one day he will.

**CUT BACK ON THE BACK-CUT**

Too much back-cut is as objectionable as too little rotation. *It is important, however, to get the maximum release out of the standard curved incision, depending on the back-cut for only the last millimeters; otherwise the scar of union will appear too low in the lip.*

Here is an example in which a surgeon either made his rotation incision too low and too far down from the base of the columella or used too much back-cut, producing an unnatural oblique scar crossing just above the middle of the lip.

**INHERENT LENGTH**

Crossing into normal lip with the rotation incision ensures increase beyond the normal in the vertical length of the lip. There is another way to get a long lip in spite of limited extension of rotation and an adequate back-cut. Even when the measurements have been set with mathematical accuracy, if the lip is potentially long in the vertical axis, it will end up long. As noted in the anatomy chapter, the normal Negro female upper lip tends to be the longest. Here is a Jamaican girl in whom the rotation incision, without crossing the philtrum column on the normal side, lowered the medial element with the cupid's bow into a balanced position. The fact that the patient ended up with a longer lip than average is not the fault of the method.

**BACK-CUT DIVIDENDS**

The back-cut offers many advantages. It effectively increases the relative edge length of the non-cleft side without extension across
into normal lip. It also avoids the tendency toward the lopsided effect of an oblique scar. Speeding up the rotation with the back-cut to give a quick pivot nearer the midline of the lip makes it possible to have the scar of union more symmetrical with the gentle, convex curve of the opposite normal philtrum column. Then too, this nick in rotation further reduces the need to worry about insufficient drop of the non-cleft element or fear of a permanent lift of the bow peak on the cleft side. It negates any necessity for small, frantic, inferior flaps subsequently proposed by Skoog, Onizuka, Meyer, Sasaki, Lintilhac and Bernstein.

EVEN THE MUSCLE FIBERS ARE HAPPIER

Another vote of confidence for adequate rotation with a back-cut comes from the muscle fibers of the medial element themselves, as first pointed out by Pennisi, Shadish and Klabunde and also confirmed by Fara and our own dissections. Changing their direction from oblique to horizontal enables them to present their ends to the muscle of the lateral element. Wide undermining of the muscles of the non-cleft side is not only unnecessary but actually contraindicated as such action will destroy the natural philtrum dimple and column. Freeing the muscle a millimeter or two from its skin and mucosa along the edge offers an advantage in the three-layer suturing.

SO IS THE NOSE

An important dividend of the back-cut is its benefit to the nose. This extra release of the lip presented little flap c a better chance to rise into the short side of the columella as a one-sided forked flap and still leave room for the medial advancement of the tip of the lateral flap.

THE FUNCTION OF FLAP c CHANGES

From the beginning the size and importance of flap c were misinterpreted. It was first advertised as nostril sill and used to
take part of the tension of the upper lip cleft closure. Then flap c was sketched too large in complete clefts by Freret, and the artwork was so beautiful that I missed the error of proportion. When such a design was followed literally, it could be responsible for results like this one produced by a young surgeon trying to work out the new method from misleading diagrams. Cutting flap c "too big for its breeches" causes numerous serious sequelae. It acts as a trapdoor in an area where it is out of place and actually blocks adequate advancement of the flaring alar base. It also forces the upper scar, that should run in the alar base-labial crease, down into the actual lip like other Z's—an unnatural, unattractive and unacceptable outcome. Then, too, if flap c is taken too wide, it shears off too much of the non-cleft component, leaving it without a convex border in its upper portion. This is responsible for the oblique effect of the union scar, made more obvious by the relatively overbearing lateral element, and results in asymmetry of the new philtrum column.

Finally, in the 1968 Christmas issue of Plastic and Reconstructive Surgery, with these illustrations by Ron Pigott, the actual size and action of flap c was clarified (A). After the back-cut is made, if a hook is placed in the flattened alar rim on the slumped side and lifted to make the rim equal its opposite alar mate, several interesting changes take place. The actual shortness in the cleft side of the columella becomes apparent as a raw gap opens up and flap c rises out of the lip in an attempt to fill this defect (B). It is aided in its advance into the columella with a membranous septal incision on this side (C). It has become apparent that the best action for flap c is not pure advancement. There is an aspect of rotation as the medial side and tip of flap c swing into the back-cut gap to wrap around this portion of the column of the columella base. Flap c is then fixed in its new position with a 5-0 catgut to the membranous septum and to the skin of the columella with two or three 6-0 silk sutures (D). This introduction of flap c into the short side of the columella adds length and contour, bringing a better symmetry to the central column. The lateral side of flap c still will serve as a portion
of the nostril sill to join eventually with the advancing tip of the alar base.

A R O T A T I O N  I N T O  T H E  R O T A T I O N
F O R  S T R A I G H T  S C A R

Heinz Reichert, a charming Bavarian from Stuttgart who is keen on scuba diving and happy in deep water, admitted in Melbourne in 1971 that he had been tempted by the anatomical logic of the rotation-advancement principle. He went on to say:

In our opinion Millard’s technique combines the simplicity of Veau’s method with the advantages of the Z-plasty, but avoids the disadvantages of both. . . . The slightly curved scar crossing the upper third of the philtrum has far less tendency to pull up the vermilion border than Veau’s straight scar. In addition, since the advancement-rotation flap adds tissue where it is most needed, above the short side of the downward swung probablum, Millard’s technique produces a philtrum. Or, to say it better, this technique does not destroy the original pattern of the philtrum. The cleft lips closed in this method certainly do have charm.
Always in search of improvement and stimulated by Schmid and Widmaier, Reichert published in 1969 a modification of the rotation-advancement principle which seemed to be a rounding of the tip of the advancement flap matched to a rounded defect at the columella base.

At the Fifth International Congress in Melbourne in 1971, Reichert clarified his modification as a design with the goal to be a scar placed in the vertical line of the margin of the philtrum and not transversing it. His approach to this is slightly complicated but of definite interest. The prolabium is rotated downward as in my original rotation. He then takes a rounded flap from the side of the columella base (reverse flap c) based on the philtrum tissue and to become part of it. This flap fills the gap between columella and prolabium where the lateral advancement flap originally inserted. Thus, he ends up with a circular scar and a slight skin excess in the upper philtrum and a straight-line scar of union from the inside base of the columella to the height of the cupid’s bow. Reichert also does a Z-plasty of the vermillion.
Over a five-year period of experience, Reichert admitted the straight-line disadvantage and showed it in one of his cases for, as he said,

Like Veau's scar, there is a tendency to lift the vermilion border by contracture.

Although intriguing in principle, certain points come to mind. First there is a tendency indeed for contracture of the straight-line scar. Yet, as in this very nice case by Reichert, it appears that achievement of adequate rotation or maintenance of this rotation, once obtained, may be a problem when only the philtrum-pedicled flap is curled into the rotation gap. Then too the act of rolling the little transverse flap onto itself into the rotation gap, as demonstrated by another of Reichert's fine cases, produces extra scarring that may be noticeable in the upper portion of the lip.

Of equal importance, it seems, is that Reichert must take the tissue of the original c flap for his philtrum maneuver, thus robbing it of its essential use in unilateral columella lengthening. This columella discrepancy appeared to be borne out in the cases shown by Reichert in Melbourne.

Reichert's design is based on the supposition that the scar of cleft union better imitates the philtrum column if set as a straight line. My original 1955 rotation did produce an oblique scar in certain cases without perfect balance with the philtrum column of the normal side. Reichert used the outmoded diagram
as part of his defense, and I attacked him in Melbourne on this point because up-to-date diagrams after 19 years of refining have taken the obliquity out of the scar. In fact, the back-cut crossing takes place in the upper quarter and, indeed, much as many philtrum columns do, curves quite naturally into the columella. Thus, in my opinion, the rotation-advancement scar line is much more anatomically accurate than a straight-line drop from the medial nasal floor to the height of the cupid’s arch.

THE PHILTRUM POSITION OF THE ROTATION SCAR

Here are two examples which show how naturally and symmetrically the scar of union in rotation-advancement can be maneuvered to simulate, in the beauty of its curve, the normal philtrum column. Of course, the scar camouflage is increased by the philtrum dimple, happy in its integrity. One is a handsome Haitian boy.

The other is a fiery little Jamaican lady.
WITH two-thirds of the lip, including two-thirds of the cupid’s bow, one philtrum column and the dimple, rotated down into normal position, the remaining one-third of the lip and bow must be produced as a flap from the lip element on the cleft side. Besides completing one-third of the lip, the flap must be fashioned to fill the high rotation gap in order to maintain the corrected position of the non-cleft element. The early description of making the most natural and effective use of the weak side emphasized two points. A high horizontal relaxing incision just under the alar base would release this component for medial advancement. In incomplete clefts any portion of the skin bridge referred to as Simonart’s band with muscle in it could serve as the leading point of the advancement flap and thus conserve tissue usually discarded.

AMOUNT OF LATERAL LIP ELEMENT

In complete clefts there is a varying amount of tissue in the lateral lip element. Pool in 1966 pointed out that the deficient lateral lip element with a “drop-off” from the alar base offered a problem in the rotation-advancement and, in fact, all methods. In some complete clefts there is an apparent deficiency of lateral lip caused by a contraction of the disappointed orbicularis oris. If this element is stretched gently, it will be found to have more tissue than is immediately evident and, consequently, is able to
supply the necessary piece of lip as demonstrated in this Jamaican case.

Yet there are some lateral lip elements which have actual deficiency to a severe degree. Then the tip of advancement flap B has to be taken from the nasal vestibule.

**EXTENSIONS OF FLAP B INTO VESTIBULE**

In wide clefts the stretch of the lateral vestibule of the flared ala is usually excessive, and when cleft closure is accomplished there is a bulging of redundant tissue blocking the nasal airway. This often necessitates wedge excision. Rather than excise, it is occasionally possible to incorporate some of the excess in the advancing tip of the lateral triangular flap B, as shown in this modern (1973) sketch. The amount available for this adjunct depends on the height of skin extension into the vestibule but is seldom as much as is shown here (1964).

**PARING THE LATERAL CLEFT EDGE**

The free border of the cleft element has to be pared a distance to match the opposing rotation edge. The length of this paring I described as
a matter of judgment and best fashioned by trial and error for each case.

Musgrave and Garrett, for Goldwyn in 1972, decried vagueness in the description of setting marks:

Unfortunately for the new surgeon, there are several techniques which start out their recipelike instructions with “Locate the point on the white line where it fades out.” While this point can sometimes be found accurately, it is frequently so vague that the surgeon has great difficulty locating it.

Then too, this may not be the exact point for the termination of the lateral paring of the lateral flap B. A better guide is now available. Actually the limit of lateral paring can be set at a point on the mucocutaneous junction ridge from the cleft side commissure which is equal to the distance from the opposite commissure to the normal peak of the cupid’s bow on the medial component.

Thus, a triangular advancement flap has been created with its greatest motion taking place in the upper portion of the lip. In fact, the high advancement of the cleft element renders it a “triple threat” to three vital problems: rotation maintenance, lip completion and correction of the abnormal flare of the alar base.

The next step was to free the nasal and lip attachments to the maxilla on the cleft side. The extent of this freeing depends on the case and must be quite radical in wide complete clefts so that there is less tension in the advancement.

Through the past 10 years certain adjustments have been made to facilitate these basic maneuvers. The horizontal incision and the freeing of the maxillary attachments for incomplete clefts are still much as described. In complete clefts, modifications in the advancement have been instituted. The upper horizontal incision varies and in the wider clefts is extended to curve around the alar base, as drawn by Pigott for the December 1968 Plastic and Reconstructive Surgery. This has been adopted as it allows more tissue to feed into this lip element and frees the alar base to allow it to be rotated medially. Of course, the key maneuver in the advancement campaign is the muscle suture which sets point 6 well into X.
SHAPING THE HIGH HORIZONTAL INCISION

Although extension of the high lateral relaxing incision into a more radical circumalar direction was first presented formally at the Rome Congress in 1967 and published in *Plastic and Reconstructive Surgery* in 1968, one of my early Korean cases had an interesting diagram attached to it. Recently, while rummaging through old records, I came upon this postoperative rotation-advancement photograph with these diagrams. They date back to 1954 when I was first using a cleft side vermilion flap for overlap to the midline to accentuate the bow. A circumalar incision had been marked and the alar base cut free so it could move as a free agent into the side of the columella.

It took 13 years to come back to this general action. Also of interest is the fact that the measurement of the normal height of the lip (N) from the alar base to the height of the cupid’s bow on the non-cleft side was used for designing a matching length on the cleft side with rotation and advancement.

Although the upper horizontal circumalar incision is curved, I suppose it might be undulated even more to fit the columella base. This thought was stimulated by a recent letter.

Gerald O’Connor, a student of Gillies in 1929–1930, wrote me in June of 1972. His last suggestions are food for thought.

Maybe I’m “Gilding the Lily” but that is what our work is all about . . . even to defeat the abnormalities that time, trauma or “Mother Nature” have presented to us . . . to create a functional, cosmetic and artistic structure, the so-called perfect norm, as best we can . . .
1. I do not believe there is a straight line per se in the body skin.

2. The lines are curved convex or concave or any straight line is broken either at the end or in the middle.

The base of the columella is curved in one direction or another. I'm talking off the top of my head but it seems to me that the upper part of your joining scar at the base of the columella is a straight line. If it exists as a straight line after your surgery I believe it can be improved by 1 or 2 small Z's.

This is a possibility in an occasional case, and thank God Gerry was not talking about Z's for the philtrum line! Actually, the flowing curves of flap c and the alar base flap above eventually seem to cause the curving upper horizontal incision line of the lateral lip element to conform to an undulating crease join between these nasal and labial elements, somewhat as O'Connor indicated when he wrote:

If a surgeon draws a straight line with a ruler for an incision—even in the body midline—both sides of the body being different by bone structure, fat, muscle pull etc. after healing has taken place the so called straight line will become curved to some degree.

LENGTHENING THE LATERAL VERTICAL AXIS

Another axis of the lateral lip element which may be deficient is its vertical height from alar base to mucocutaneous ridge. When the distance is shorter on the cleft side than the normal (point 2 to point 4), there is a trick which satisfies the O'Connor curving principle but in a different plane. Raising the upper horizontal relaxing incision for the lateral advancement flap to include a bit of alar base lengthens the vertical height of the lateral lip element and shortens the elongated ala to the mutual benefit of both. This raised incision is shown with a compass marking in a complete cleft and with an arrow in an adhesion. Then, as the lateral flap B advances medially into the rotation gap, the prominence of residual alar base, still on the upper edge of the lateral flap, shifts into the nostril sill position in incomplete clefts and even to columella base in complete clefts, providing a natural outward swell somewhere along the nasal base.
DEFICIENT TIP

Occasionally the tip of the lateral advancement flap has a deficiency in tissue bulk which later will be reflected in a depression in that area of the lip construction. This can occur in a wide incomplete cleft with an attenuated Simonart’s band or in a complete cleft with a small lateral lip element which necessitates the extension of the tip of the flap up into the nasal vestibule. Excess subcutaneous tissue and muscle along the edge of the cleft is often present and has to be trimmed to allow neat cleft edge-to-edge approximation. Recently this tissue has been salvaged as a flap to bolster any adjacent thin areas. If taken from the lateral element, it can be folded up under itself and tacked with a catgut suture to fill out the tip of the advancement flap.

If taken from the edge of the medial element and based superiorly, it can be turned laterally to lie under and serve as extra backing again for the thin tip of the advancement flap.

If there is a depressed groove in the lateral lip element which sometimes exists and must be incorporated in the advancement flap, dissection of a pocket beneath the groove will lift the skin free to present a smooth external surface. Then the same medial muscle edge flap based superiorly can be actually plugged into the pocket to maintain the contour. This approach has been added and is predicted to be the most common use of the muscle edge flap in incomplete clefts.
ALIGNING THE LATERAL MUSCLE FIBERS

The advancement flap actually has a bit of both rotation and transposition in its action so that when it is cut free from the alar base and shifted into the rotation gap there is partial alignment of the muscle fibers. It is true, however, that the rotation component is not quite enough for end-on approximation to the fibers on the rotation side. Especially in those cases in which the lateral element has a definite muscle bulge, usually associated with some attenuation in its upper part near the nostril sill, an effort to improve alignment of fibers may be indicated. Leave the upper edge and tip of the lateral advancement flap intact for purchase of the key stitch to guide flap B into the rotation gap. One-half centimeter from the upper edge, the muscle can be divided transversely (broken line) so that after being undermined free from the skin and mucosa it can be brought down with its fibers in horizontal alignment. This maneuver leaves a muscle gap above which often is already deficient. A muscle edge flap taken again from the non-cleft side and based above can be transposed across the cleft and inserted into the upper muscle gap of the lateral element. This may turn out to be a sound and valuable use of the muscle edge flap.

Evidently, when the cleft is incomplete, the direction of the muscle fibers is less devious because postoperative incomplete clefts treated without radical undermining of the lateral lip musculature show excellent function by observation, palpation and electromyography. The extensive muscle dissection probably is best reserved for complete clefts and certain incomplete clefts with an exaggerated muscle bulge in the lateral lip element.
Early postoperative results have shown excessive reaction in the lateral lip element, indicating that such extensive muscle surgery for so slight a gain may not be justified.

**FREEING THE ALAR BASE FROM THE MAXILLA**

In wide clefts, it is important to divide abnormal muscle attachments to bone by extensive freeing of the lateral lip element from the maxilla. This dissection, in severe cases, may be continued up into the vestibule with a scalpel to incise the nasal mucosa along the pyriform margin. The division of the alar adhesions to the retroplaced maxilla on the cleft side allows the recessed alar base to come forward. The resultant raw area in the lateral nasal vestibule has been left to heal, but recently the Muir-type mucosal flap has been found easily available. This is seldom necessary in incomplete clefts and so will be described in relation to complete clefts.

When the point of the advancement flap enters the depth of the rotation gap easily without tension, then the quintessence of the rotation-advancement principle has been satisfied. The rest is a matter of detail—but never underestimate the value of just such detail!

**MATCHING EDGES**

Take, for instance, the matching of the rotation edge to the pared edge of the lateral advancement element. Both have convexities which, when they meet, refuse to fit together, presenting a diamond-shaped divergence in the lower portion of the closure.

This had caused me and others much aggravation. The discrepancy had been overcome by sutures under slight tension, but tension at this point invariably resulted in a spread of the scar of union. Its strategic position at the peak of the cupid’s bow on the cleft side produced a red area which by running into the red of the vermillion gave the effect of an asymmetrical contraction lift to the bow. Finally, two refinements were designed to reduce or prevent this blemish.
MAKING THE CLEFT SIDE CONCAVE

The curve of the philtrum column is convex on the dimple side but concave on the lateral side. Thus the convexity of the rotation incision is ideal. This then justifies paring the lateral cleft edge to a slight concavity to fit the convexity of the opposite side and reduce the tension of approximation, resulting in a better scar. Also achieved is an increase in length of this edge, which reduces slightly the distance of paring required and sets up the edge for a "white roll" interdigitation. Of course, if necessary, the amount and angle of concave excision can be increased to lengthen further the cleft edge.

WHITE SKIN ROLL

Even when there is no spread of the scar, there is a small section of absent "white skin roll" which otherwise trims the entire normal vermilion border with a highlighted ridge. Thus the red of the vermilion "bleeding" vertically without a break into the pink of the scar is eye-catching and suggestive of a contracture; it needs an interruption. This effect has been achieved by salvaging a bit of the white skin roll during the lateral paring and transposing it as a skin flap 1 to 1.5 mm. wide by 2 mm. long across the mucocutaneous junction line. It should be as wide as the specific white roll it is bridging.

There are other advantages to the white roll flap crossing the cleft at the mucocutaneous junction line. It assures more perfect alignment of that landmark and avoids discrepancies such as may be seen in this boy, who did not have the advantage of the flap.
It also tends to *soften* the arc of the cupid’s bow curve, which can be a bit abrupt when the two cleft edges are merely approximated.

The white skin roll interdigitation, conceived to camouflage the continuity of the mucocutaneous ridge, was first created in 1961 and reported in *Plastic and Reconstructive Surgery* in 1964. When it was first presented, astute Richard Webster of Brookline, Massachusetts, commented to me, “Say, that’s a good one. Wish I had thought of it,” which made me realize this little trick might be more important than was originally thought. Although it is possibly the smallest flap in plastic surgery, the deception it affords in some cases—certainly in the one shown below—has been rewarding.
20. Primary Handling of the Free Border Vermilion

Another worrisome detail is the closure of the vermilion edges, and in spite of great care, because of the treacherous hypertrophy of lip mucosa and the contracture of adjacent scars, this aspect of the closure often requires minor secondary corrections.

In the late 20's Vilray Blair became cognizant of the effects of scar contracture on the free border of the lip and advocated a mucosal Z-plasty in the cleft closure of the visible vermilion. This prevented contracture, but the dividend nibbled away at the capital with irregularities that spoiled the natural curve of the lip free border.

In 1952 Limberg of Leningrad proposed one of his many Z's for interrupting the posterior mucosal portion of his straight-line lip closure. This was particularly sound as it was placed out of sight and did tend to discourage distortion contracture of the visible lip border.

In 1961 T. M. Obukhova of Samarkand, following the method of L. M. Obukhova, explained in Russian:

To remove the pulling in on the mucous membrane and vermilion border of the lip, converging triangular flaps, after A. A. Limberg, at angles of 40 degrees and 70 degrees, are widely separated and transposed with the larger angle transferred to the central position. The mucous membrane and vermilion border of the lip become even after suturing.

Careful handling and minimal discard of vermilion is impor-
tant during the primary closure. In Plastic and Reconstructive Surgery, June 1960, I suggested the following variations:

If the cupid’s bow component is weak in vermillion then it can be bolstered from [the] lateral lip vermillion either as an onlay flap (A), as a central tongue into a dart (B), or as a posterior interdigitation (C). If the lateral lip segment is weak in vermillion then the mucosal flap [being pared] from the medial cleft edge can be used to interdigitate laterally (D). If both are weak in vermillion then each will welcome the other’s flap, at least in part.

Several overlaps from the cleft side (A) were used in the early cases from 1958 to 1960, as shown in this example, and the results were quite good actually.

Eventually the repeated occurrence of excess vermillion in an unnatural position requiring subsequent revision, as in this 1958 case, caused me to discontinue this mucosal overlap.
STRAIGHT ANTERIOR CLOSURE

In the ensuing 12 years there has been a change in the handling of the vermillion. In general, the visible vermillion up front is approximated as a full-bodied straight line from the "white skin roll" to the free border. What goes on behind depends on the case. There are four and more possibilities.

SECONDARY REVISIONS

When the lip element on the cleft side is minute and the vestibular extension of flap B is not sufficient after its advancement into this rotation gap, there may persist an attenuation of the vermillion along the cleft side. In 1964 this was being corrected secondarily by various maneuvers which were described in my article on "Refinements."

1. An incision along the upper labial sulcus on either side of the cleft with wide undermining and medial advancement of the mucosa was presented as one general method of evertting the free border vermillion.

2. A pure V-Y of posterior mucosa in a roll-down was proposed as the most direct and effective method of relieving secondary notches and thinned areas along the free border.
PRIMARY REVISION

By 1968 this attenuation of the vermilion on the cleft side was considered correctable during the primary procedure. Relative tightness in the upper portion of the lip during the closure can result in an excess in the lower portion. This can be used, in part, as a posterior vertical mucosal (and muscle if desired) flap based inferiorly (Z). When let into a relaxing incision just posterior to the attenuated free border, it will balance the thickness of the lip vermilion along its entire extent.

While reviewing my cases recently, I have been interested to note that secondary revisions most often involved minor vermilion free border reductions. A number of these revision excisions seem to be required on the cleft side some years after the posterior mucosal flap (Z) has been transposed, suggesting that the procedure may not be as necessary as it looks at the time of the primary surgery. The case shown is an example. It is also possible that by this method we achieve more fullness than is evident early, suggesting that a less radical release may be sufficient. The principle and the method, however, are still found of value in certain cases.
A HIDDEN BREAK

There are any number of ways of using interdigitations in the closure of the posterior mucosa, but the important point is to make at least one interruption in the long through-and-through curved line of the scar. The flap need not be a big or long one, just a mucosal zigzag, but out of sight.

SPINA'S TUBERCLE

An interesting principle for bolstering deficient vermilion was first described by Victor Spina, the dynamic bantam Italian from the University of São Paulo, Brazil. With Orlando Lodovici in 1960 he proposed straight-line paring of unilateral clefts broken with a Z-plasty. The excess vermilion parings were preserved as two flaps. The one from the cleft side was denuded of epithelium and introduced “tongue in tunnel” across the cleft into a subcutaneous pocket dissected into the opposite side to increase the bulk in the general area of the midline tubercle. The vermilion flap from the opposite, non-cleft side was overlapped across the cleft as a “tongue in groove” external interdigitation.

As would be expected, and as demonstrated by their illustrations, although the vermilion border was bolstered, an artistic dead-center tubercle flanked by bilateral notches of the natural cupid’s bow was not consistently achieved. Nonetheless, this method is sound in principle, “using what is available in an attempt to achieve what is desirable,” and was soon championed and modified by others.

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Similar bolstering of a deficient cleft edge with the mucosal cleft paring was described by José Guerrero-Santos of the University of Guadalajara in 1962. Guerrero-Santos, self-trained, bright-eyed and innovative, has developed a plastic surgery residency with American College of Surgeons' standards. Unaware of Spina's work, he had espoused this principle since 1958 and advocated denuding the mucosa of a longer flap from the cleft side and introducing it as a submucosal and muscular tongue into the lower portion of the opposite side. At that time he used it in conjunction with a Z-plasty type of lip closure.

Several years later, at the Second Hamburg Cleft Lip and Palate Symposium, Pfeifer described a similar procedure for secondary correction using a denuded flap of scar tissue which he buried medially in the vermilion.

It was reassuring that in 1971 an astute band of Mexican surgeons, Ramirez, Castaneda and Torres, led by Guerrero-Santos again, changed to the "good" side and suggested that the crossed denuded flap be used with the rotation-advancement method. It had been their experience, as they said, that

A simple edge-to-edge approximation of an unbalanced vermilion border may result in an unattractive join, the central labial tubercle partially or totally absent, asymmetry in the lateral portions of the vermilion and notches.

To prevent these complications they have employed, with some success, the denuded flap. As they noted:

Initially, we combined it with a z-plasty in the primary correction of cleft
lips and we mention the use of the crossed-denuded flap as a complement to the Millard technique. This combination is our routine procedure now.

The results they showed were excellent, as is their Mexican acceptance of the old Scots principle of never throwing anything away. Needless to say: If it is needed, use it. I have found this principle of value, especially when using the medial mucosal paring for insertion into the lateral vermilion.

Because of the shape of the flap and the point of its insertion, there usually will occur a mucosal swell in the wrong position, but as they said,

Redundant tissue can be removed in a secondary cleft lip correction by a lens-shaped extirpation.

Other methods to achieve the same effect have been described. As Guerrero-Santos noted:

Randall describes a procedure similar to ours, calling it a triangular muscle flap and combining it with the Millard technique.

RANDALL

Randall, in his typically sportsmanlike manner, expressed it this way in 1971:

The occasional poor result with the Millard technique has shown shortening of the scar with peaking of the cupid's bow on the cleft side.

He gives three possible explanations for this discrepancy:

1. Not enough rotation and not enough lateral paring.

2. Tendency for "nearly straight scar" to contract.

3. Fara's direction of orbicularis oris muscle fibers tending to sweep up along the cleft margins.

Thus, Randall reasoned:

There would be an advantage in combining the rotation-advancement skin incisions with a transposition of a flap of orbicularis oris muscle as in the triangular flap technique.
This little adjunct has appeal as it intertwines muscle fibers. It can do no harm except that it is taking a muscle flap from the weaker side to bolster what is often the stronger element. In those occasional cases, also referred to by Davies, in which the tubercle is weak on the medial element, the additional tissue may be welcome. As the muscle flap enters lateral to the midline tubercle and is triangular in shape, an off-center vermilion bulge may result; this problem has also been noted by Guerrero-Santos.

**REVERSE THE MUSCLE FLAP**

The principle of inserting a muscle flap across the cleft into the muscle of the opposite side is sound and tends to improve the muscle fiber alignment. This maneuver must be adapted, as needed, to each case. It seems far more logical to reverse the action suggested by Randall. Take the muscle flap from the strong medial side and introduce it into the lower border of the weaker side to bolster its contour. This procedure may reduce the need for the previously described posterior mucomuscular flap transposition.

As will be shown later, the true tissue deficiencies exist in the upper portion of the upper lip in the subnasal area on the cleft side, and the best use of any muscle edge flaps probably should serve this area primarily.
SALVAGE OF THE VERMILION PARINGS

The vermilion border of the cleft edges, which over the years has been cut off and thrown away like butcher scraps, is no longer being treated so negligently. The principle of "never throwing anything away until you know you do not need it" has finally won out. When cleft edges are freshened, the vermilion parings are being salvaged as flaps based on the mucosa of the alveolus. Various surgeons have found uses for this mucosal tissue.

Muir

Ian Muir of Aberdeen, a gentle, astute "Mr. Chips," was finely tempered during training with Mowlem. True to the thrifty character of the Scots, in 1966 he advocated the ingenious use of the salvaged cleft edge vermilion. He has diagramed the application of his flap as he utilizes it when closing a lip with the rotation-advancement method. As Muir explained in 1972:

On the lateral side the mucosal flap is raised from the margin of the cleft. On the medial side the tissue at the free margin of the lip is discarded. The mucosal flap is pulled backward preparatory to making the incision for the rotation advancement flap. This needs to be done so that the mucosal part of the incision does not encroach upon the base of the flap. . . . The nasal layer of the extreme anterior end of the palate, the alveolar gap and the floor of the nostril are sutured, leaving two stitches which are passed through the mucosal flap and tied thus anchoring the flap over the nasal suture line.
No scar band in Samarkand

The Russian city of Samarkand (150 miles from Afghanistan) was captured by Alexander the Great and destroyed by Genghis Khan. From the time of Marco Polo it served as the junction of trade routes from China and India to Europe (the “silk-road”). About 1400, Tamerlane made it the capital of his huge empire and, being no “choirboy” himself, subdued riots in Persia and other possessions, leaving behind, as reminders, towers built of the skulls of the revolutionaries. While cognizant of its violent past, we must pay tribute to Samarkand and the Obukhovas, mother and daughter, for ever taking an interest in cleft lip at all and especially for caring enough to salvage cleft edge mucosal scraps for a two-layer non-contractile closure of the alveolar and nasal floor defect. Tamara M. Obukhova wrote in 1961:

All authors, in describing their particular method, generally stop with a description of the skin incisions, and do not describe the particularities of the incisions in the mucous membrane. Only A. A. Limberg (1952) speaks of an incision shaped like a “poker” on the mucous membrane of the vestibular space by a peripheral incision of the upper lip.

She cited the article by her mother, L. M. Obukhova, “A Correction Plasty for Harelip and the Nasal Ala,” as the method she herself uses but noted the vagueness of its description.

It is stated that the anterior portion of the nasal cavity and the region of the cleft of the alveolus is doubly closed, both by skin covering and by mucous membrane, but it is not shown in what direction the incisions are made, nor what follows.

In 1961 in the Russian journal Stomatologiya, as translated by resident S. A. Wolfe, T. M. Obukhova, using the lip method of L. M. Obukhova, turned mucoperiosteal flaps from the medial (K) and lateral (I) edges of the cleft within the vestibule and in wide clefts also used medial cleft edge vermilion of the lip (L). The translation continues:

After the incisions of the mucous membrane on the columella side and at the edge of the nasal ala, along the line of the pear-shaped aperture, there are two mucoperiosteal flaps formed, I and K, which fold together
and rotate into the oral cavity where they are sutured together with catgut beginning posteriorly. These flaps are adequate in narrow clefts. For closure of wide clefts the lack of mucous membrane is filled with a flap of mucous membrane taken from the cleft edge of the medial side (L). In narrow clefts this piece of mucous membrane is resected.

Other uses of the cleft margin vermilion

John Tondra, with Bauer and Trusler in 1966, apparently was the first to suggest covering the raw premaxilla in bilateral clefts with edge mucosa:

The lateral mucous membrane of the prolabium is usually discarded due to the small amount, as well as an inherent abnormality of tissue, although it may be used to cover the exposed premaxilla.

Energetic Charlie Horton, with Adamson, Mladick and Tadeo of Norfolk, Virginia, in 1970 extended this principle to unilateral clefts also and actually advocated salvaging the vermilion paring to cover the raw area of the premaxilla to improve the labial sulcus. They stated:

We believe it is important to construct a sulcus early to allow unrestricted growth of the lip.

This is an important and practical suggestion and is being used by many of us today, when no better use can be found, particularly in incomplete clefts.

Another surgeon intrigued with the use of “in-between” and cleft margin flaps is Cesar Arrunategui of Peru, who bears a striking resemblance to Rudolph Valentino. He has been working at the Barsky Plastic Surgery Unit, Saigon, South Vietnam, and in 1971 described denuding the epithelium from the “in-between area” of an incomplete cleft and burying this for bulk under the floor of the nose.

In 1972 he sent me diagrams to be presented at a Congress in Cologne, showing uses of what he refers to as a “variable flap” of mucosa and muscle from the lateral cleft edge based on the gingiva-labial sulcus. As one use, he proposes inserting this mucosal flap as nasal lining between the upper lateral and
alar cartilages, a procedure I have also found valuable for some time.

He proposes using this flap in complete clefts as a second-layer closure of the nasal floor similar to the Muir maneuver.

His third use denudes the central portion of this flap to allow it to be folded upon itself and tucked under the alar base.

It is interesting that surgeons all over the world have progressed in sophistication to the extent that they are saving the parings and using them to their advantage. Recently I have been using the medial mucosal margin to bolster the nasal floor and alveolar closure in the spirit of Muir but reserve the lateral vermilion margin as a mucosal flap to fill the raw area created when the alar base on the cleft side is freed from the maxilla and extended along the intercartilaginous line. The alar base is thus allowed to come forward and, of even greater import, to stay forward! The details of this maneuver will appear in Chapter 37.
21. Primary Nasal Correction

Nasal Floor

The most opportune time to reconstruct the floor of the nose is, of course, just before the lip is closed when the surgeon has direct access. Veau was the first to develop primary closure of the nasal floor and anterior palate. Ivy in 1934 promoted it in the United States and Kilner popularized it in England to such a degree that it is commonplace today. Waldron set many surgeons at ease when he pointed out that developmental arrests did not occur, for growth centers were not involved in this dissection.

This portion of the cleft closure is achieved with septal mucoperichondrium and mucoperiosteum from the lateral nasal wall. The flap on the septal side is hinged with its base above and is mobilized in continuity with the posterior aspect of the columella. This flap is mattress-sutured to the flap from the lateral nasal wall. Veau’s second-layer flap of palatal mucoperiosteum is seldom used today.

Veau’s mucosal flaps still serve well for the nasal closure, but several surgeons have described methods of supplying the second layer of mucosa. Burian used a flap from the upper labial sulcus which in the primary lip closure, in my opinion, cannot be spared. T. M. Obukhova described cleft edge mucosa as an adjunct in wide clefts. Ian Muir has been responsible for having surgeons in the West turn to the cleft edge mucosa for a flap to serve as oral covering to the Veau-type nasal floor closure. The advantages of primary nasal floor and anterior palate closure are many and obvious, but most important is the physiological
division of the nasal and oral cavities with suitable mucous membrane which avoids difficult anterior fistulae, reduces maxillary distortion and presents a less awkward palate cleft for later closure.

DIFFICULTIES

The width of the cleft may render anterior alveolar cleft closure too difficult. Poor alignment of the alveolar segments is another contraindication as the closure will fix the segments in this malposition and make later orthodontic correction more difficult. The ideal time for nasal floor closure is when the alveolar segments are in near approximation without being in actual contact, provided they are in good alignment, but before the final lip closure. This is probably best achieved by a retainer plate and an early lip adhesion procedure.

COLUMELLAR LENGTHENING

Except for minor provisions of small skin flaps for aid in nasal floor reconstruction, the rotation-advancement principle was the first lip method that simultaneously benefited the nose. The curved rotation incision released the unilateral tethering of the columella as little flap c at first was elevated to create the nostril sill; it is now advanced even higher to lengthen the short side of the columella and to provide cover for the medial half of the nostril sill.

In Bratislava in 1965, Bill Holdsworth and I got into a discussion about the rotation-advancement and, specifically, the unilateral lengthening of the short side of the columella with flap c. He suggested a scissors dissection between the medial crura of the alar cartilages to free the cleft side cartilage so that it can advance upward as flap c is advanced into the columella. I have used this maneuver to some advantage and noticed in his book's fourth edition that he has diagramed the scissors dissection. Undoubtedly, this is an adjunct not generally used but that may prove of significant value.
ALAR BASE

The greatest economy of tissue shifting for nasal benefit has always been the medial advancement of the lateral lip element, not only to create the missing one-third of lip and bow but also to correct the flaring alar base. This also tends to straighten the slant of the columella and the deviation of the anterior septum. Even when the alar rim has slumped down into the cleft so that the tongue can readily lick it, a crude rotation-advancement set the elements into a position from which they could be revised to refinement.

In a number of cases, in spite of the aggressive medial advancement of the upper tip of the lateral flap deep into the rotation gap, the alar position proved to be undercorrected. There was a tendency for the alar base during healing to migrate out and, instead of curling like a court jester's boot around into the sill toward the columella, to turn out splayfooted toward the nasolabial line.

Yet when the alar base is not positioned correctly in relation to the lip advancement flap and to the columella base as compared to its opposite normal alar mate, a secondary transposition is necessary. Such an example is shown in this seven-year follow-up.
A constant repetition of alar creeping prompted a primary extension of the high horizontal incision of varying degrees around the alar base. This not only fed more lip element into the advancement but set the alar base free both to rotate and to advance on top of the advancement flap to meet flap c and complete the nostril sill. This action enables the surgeon to get the alar bases lined up symmetrically, as shown in Plastic and Reconstructive Surgery, December 1968.

**K R U G E R**

Concerned about the raw undersurface of the lateral lip element in the region of the alar base after dissection from the maxilla, Eberhard Kruger of the University of Bonn, Germany, modified the use of flap c of the rotation-advancement method. At the Melbourne Congress in 1971 he described retaining the rotation of the medial element and using a large flap C, which he marks X and transposes as a Z-plasty of the nasal opening. This larger flap C(X) is introduced further posteriorly than my original flap c, which formed the nostril sill. Kruger sutures his X to the anterior base of the lower turbinate to complete the lateral nasal lining as well as the nostril floor.
This modification reverts to the crude early rotation-advancement design and thus loses some of the later refinements such as columella lengthening and less obliquity of the lip scar. It does bring out the need for coverage of the raw area in the lateral nasal vestibule.

Recently, I have been using an even more satisfactory solution to the problem. In the spirit of Mir y Mir and Muir, the vermilion paring of the lateral cleft edge is left attached superiorly to the alveolus. After radical freeing of the alar base from the maxilla, this mucosal flap is transposed into the raw area to maintain alar base freedom and reduce subsequent retraction.

Then, denudation of the epithelium of the tip of the alar base flap will enable it to be pulled under flap c and sutured to the septum at the nasal spine for permanent fixation in symmetry with the normal side. This will all be described in Chapter 37.

ALAR WEB

In most cases, a satisfactory nasal result for childhood has been achieved by symmetrizing the alar arches with the excision of the alar web in the form of a crescent skin excision.

If, as in some cases, there was a moderate excess of vestibular lining which buckled into a fold just proximal to the rim within the nostril, this was reduced as a V wedge excision of mucosa in continuity with the skin crescent, resulting as a T closure with improvement of the patency of the airway. This approach is not used any more. The inside fold is formed of cartilage in abnormal position and is not excess mucosa. When the alar cartilage is elevated with a lifting procedure either primarily or secondarily, the buckling smooths out, relieving the obstruction.

WYNN ROUNDS IT

Wynn evidently has more faith in the old Blair-Brown alar cartilage undermining and mattress suture technique than most
of us, as he has resurrected it, adding a modern touch, and called it the "round nostril" technique. He uses a right-angled scissors through his lip-freeing lateral buccal sulcus incision to dissect the skin from the entire alar cartilage on the cleft side, coming out at the transverse incision at the columella base. He then rolls the skin under the alar rim, sliding the cartilage up and back and fixing the new position with through-and-through sutures tied externally. He also sutures the cleft alar cartilage up to the normal cartilage with 4-0 catgut. It is more the release of the short side columnella and the advancement of the alar base that achieve the major nasal correction.

**REALIGNING THE LINING**

The fascinating work of Boo-Chai and Tange in 1970 with origami paper models seems to offer a strong argument for the freeing of the nasal skin from the underlying cartilage and mucosa of the cleft side. From their models they made certain observations:

1. There is very little difference between the perimeter of the nostril of the cleft and non-cleft side.
2. The ala and, more so, its hair-bearing vestibular skin on the cleft side appear to be stretched.

In 1972 Boo-Chai wrote to me concerning the fold blocking the nasal airway in many cases of repair:

Surgeons have noted this without attempting to explain the underlying cause. In the adult, Uchida of Tokyo uses multiple "Z." In my opinion this is due to the inner vestibular skin being stretched more than the overlying alar skin, especially in very wide complete clefts of the lip and palate. In one of your refinements you separate the ala into two layers by sharp dissection and re-align the inner hairbearing skin layer. I think this separation gives the vestibular skin a chance to shrink and regain its proper surface area relationship with alar skin. The ultimate relationship of alar and vestibular skin is the same as in the opposite side i.e. $R'/R = L'/L$. 

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Maybe the wide ala undermining of Blair and Brown offered an unsuspected dividend, allowing the lining to shrink and the skin-to-lining relationship to adjust, avoiding intranasal folds. At least "on paper" such seems to be a possibility.

**ASYMMETRY OF NASAL TIP**

The one remaining nasal flaw has been the asymmetrical flattening of the alar bulge at the nasal tip, depending on the degree of dislocation and inferior positioning of the alar cartilage spanning the cleft. Some lip surgeons like LeMesurier and Denis Browne admitted complete nasal abdication. Many surgeons procrastinated along the mythical line that growth would improve the deformity. Blair and Brown were pioneers in attempting primary nasal alar cartilage correction at the time of lip closure. They advocated wide undermining of the skin from the
cartilage and the use of through-and-through mattress sutures tied over a bolster on the external skin. As far as tip alignment was concerned, the improvement was usually temporary and mediocre.

MORE RADICAL PRIMARY NASAL SURGERY

When Steffensen began using the LeMesurier method in 1945-1946, he adapted it to the cleft lip nose procedure of his preceptor, Ferris Smith. Through an alar incision 2 to 3 mm. within the nostril and carried down the membranous septum, he dissected the skin from the alar cartilage over the tip. Then with scissors hugging the septum, he divided the lateral chondromucosal lining flap from its attachments to the septum along the bridge on the cleft side all the way back to the nasal bone. He then packed the nostril to match the normal side. Having heard that Steffensen tried this primary nasal correction and later gave it up, I was prompted to write a letter of inquiry. His answer arrived in July 1972:

My nasal modification in cleft lip repair was like the method Ferris Smith described. I used it for several years only to learn how difficult it was to do nasal revisions at a later date, if necessary. I then abandoned the procedure and did nothing with the nose at the time of the cleft lip repair.

NASAL CONSERVATISM

Gustav Aufricht of New York, longtime student and assistant to Jacques Joseph of Berlin, for many years emphasized what he wrote in 1946:

The operation to correct skeletal asymmetry of the nose in association with harelip should be deferred to the age of sixteen or seventeen.

In 1972 he reconfirmed his conservative stand:

I have seen too many perfect primary closures of lips and noses in infancy flatten out during adolescence. The more material is available at age 16-17 the better final correction is possible.
As the great "Gusty" has long been acclaimed King of Noses, his stand undoubtedly deterred many from more radical primary nasal surgery.

**A FEARLESS SEPTAL SURGEON**

For those who quake at the thought of any septal surgery before the nose is fully grown, J. P. Reidy's Hunterian Lecture of 1948 must have come as somewhat of a shock. Yet if anyone can speak with personal authority on the influence of trauma on the septum, it is certainly "Pete" Reidy who boxed and played rugby for Cambridge University, was heavyweight boxing champion and captain of Rugby at the London Hospital and has the nose and ears to prove it.

In a series of 800 septal resections over 25 years, Reidy found no case of diminution of nasal growth as a result of partial or total removal of the septum. In his opinion and experience, preservation of the septal cartilage in children is of less importance than the relief of nasal obstruction. He set the seventh year as a reasonable time, which, of course, was contrary to the popular and conservative belief that this type of surgery should be postponed until age 18.

This was the position that Gillies and I took in 1953:

During the primary unilateral lip closure it is quite evident that there is an inherent shortness of nasal lining on the cleft side. The nasal attachments to the cleft must be divided when the lip is dissected off the maldeveloped maxilla before the nose will come forward into a relatively normal position. Even then it is rare to get it perfectly placed for there is some shortness of skin as well. . . . The deflected septum is freed from its vomerine groove, straightened, and held in position by suturing it to the upper edge of the lip muscle from the cleft side. This manoeuvre also positions the alar base and supports the nasal floor. Care in these fundamentals will produce a reasonable nasal result following the primary operation. Undermining the alar cartilages from the overlying skin is an advantage, but the attractive immediate result, while the through-and-through stitches are in position, is deceiving and likely to slip when the sutures come out. The danger of affecting cartilage growth by early surgery seems overshadowed by the fact that deformed cartilage without correction will continue to grow.
deformed. On the whole, nasal corrections are easier when the child is older.

**RADICAL PRIMARY TIP CORRECTION**

Bill Berkeley of Charlotte, North Carolina, in 1959 made a daring departure from nasal precedent. He said:

Primary repairs of the nose should reach a state much like the lip with no need or prospect for secondary repairs.

In reference to unilateral clefts, he stated his reasons:

The cartilaginous septum is almost always displaced toward the normal side with the lower margin presenting in the normal nostril affording no support to the cleft side of the nose. The nasal spine presents in the floor of the normal nostril. . . . The columella is not in the midline. It is directed away from the cleft side at its base. The alar cartilage on the cleft side is out of balance with its neighbor in all three planes.

The medial crux sits below the opposite medial crux in the columella. The entire cartilage is rotated forward and downward from normal. Because of incomplete rotation of the premaxilla, the nasal spine is lateral to the midline on the unclefted side. The tip of the medial crux rests on the opposite side of the midline adjacent to the nasal spine. The lateral crux is based at the angle of the pyriform sinus lateral to its normal position on the cleft side.

To correct these deformities, Berkeley suggested straightening the septum, resection of the displaced nasal spine and rotation of the cleft side of the nose. Few would argue with this procedure in theory, only with his method of approach.

Access to the area is obtained through a midline vertical columella-nasal-tip incision.

He excuses this external incision by condemning the incision of Rethi and Heinz Gelke as bizarre and deforming. Through his incision Berkeley gains access to the septum with a submucous dissection. Vertical, parallel, partial-thickness scoring on the concave side of the exposed cartilage facilitates its positioning in the midline without rebound action. The spine is resected.
This brings balance to the tip, symmetry to the nostrils and centralization of the columella.

After correction of the septum and resection of the spine, Berkeley then achieves a heminasal rotation.

Through the midline incision the skin and subcutaneous tissues are freed from the underlying cartilages, alar triangular cartilages and lower nasal bones on both sides. The medial crura are separated from each other in the midline. The medial crux on the cleft side is freed from the side of the nasal spine and the septum to allow for upward glide. . . . Fixation is accomplished by direct horizontal mattress sutures between the two cartilages, using 5-0 chromic catgut.

The inherent shortness of the lateral wall of the vestibule from the nasal tip to the alar base is treated with a Z-plasty by Berkeley. His lateral cheek mobilization is accomplished through the buccal sulcus incision for he does not incise the mucosa widely. He says:

Extending the incision up and around the pyriform margin produces a loss of anchorage of the mucous membrane along the lateral wall of the nasal passage.

This has not been my experience, and wide freeing in severe clefts seems to aid in the closure. It is now 14 years since Berkeley first proposed the primary tip cartilage correction through an external incision, and very few surgeons have dared to follow his lead. The obvious action was to study some of his late results. On the following pages are three cases he kindly sent in 1973 with accompanying labels for our evaluation.
1.

a. Born 12-26-56. b. Repair of lip (Tennison), nose (Berkeley) and anterior palate (Veau); local with sedation (Straith) 3-20-57. c. Wardill repair of palate and realignment of mucocutaneous-ridge 3-12-58.


2.

a. Born 3-26-60. b. Repair of lip (Tennison) and nose (Berkeley); local with sedation (Straith) on 5-2-60. c. Wardill repair of cleft palate 5-22-61. Photo taken July 1970. No surgery contemplated before age 17 years.
3.

a. Born 2-3-57 with cleft lip without cleft palate plus interventricular septal defect. b and c. Repair of lip (Tennison) and nose (Berkeley); local with sedation (Straith) 4-11-57. Photos taken 10-18-57.

d, e and f. March 1966; no interim work has been performed. Revision of nose and straightening of septum to be performed at age 16 to 18 years.
Several points can be noted. The nasal correction is impressive and not only will serve to get the child through the early years of school but reduces the amount of secondary work required later. Secondary nasal work, however, is required. As claimed by Berkeley, the external nasal scar does not seem to be particularly noticeable in these photographs. Yet it is slightly difficult to evaluate as few scars are noticeable under direct strong lighting ($1b,e,f$ and $3d$) or when slightly out of focus ($3c$). As to the lip, Berkeley will deal with this later . . .

During the middle 60's Berkeley stimulated and irritated me to the point where the asymmetry of the alar bulges began to loom more and more grotesque. No longer content to wait, as most sound surgeons would do, until the minimal rhinoplasty age of 16 years and then use the numerous previously described secondary procedures, I began to focus on shifting the slumped alar cartilage into a better position. Hesitant at the thought of external nasal tip incisions or the elliptical excision of Joseph and somewhat impressed with the soundness of the "underground alar lift" approach by Reynolds and Horton, I began experimenting with ways to move the alar cartilage into better position. With paramarginal and intercartilaginous incisions, a chondromucosal strap flap was undermined from the overlying skin and cut free at its lateral extremity during the dissection of the lip from the maxilla at the pyriform opening. The flap was advanced medially toward the opposite alar cartilage and septum and fixed with two white nylon 4-0 sutures. This helped to balance the alar cartilages and, at the same time, tended to take up some of the slack of the vestibular lining, presenting a more patent airway. Yet, during the postoperative healing phase, the circular paramarginal incision seemed to show a disconcerting tendency to contract, even though it appeared to correct itself in time.
This approach was presented in the Congress in Rome in 1967, but its popularity with me soon waned.

Then a less extensive design was used in those cases with severe nasal distortion. During the freeing of the lateral lip from the maxilla at the pyriform opening, the incision in the nasal mucosa was extended along the intercartilaginous line and carried toward the tip to join the membranous septal incision used to advance flap c. The upper edge of the alar cartilage was freed from the skin and the mucosa. It was then advanced medially and upward and sutured to its opposite mate and the septum with two buried nylon sutures. The potential contracture of the circular vestibular scar can now be reduced by the insertion of the lateral lip vermilion paring flap into the gaping lateral alar release well up into its intercartilaginous portion.

Such action can be effective and offers advantages over the previous more radical strap flap as demonstrated by this case.
Yet the baby alar cartilages are friable, and access for suturing the lifted ala is difficult. Also, it must be remembered that in the majority of clefts the fundamental actions of rotation and advancement, especially including the refinements, produce a respectable nose which will serve honorably until age 16. In certain cases, however, this primary alar lift seems quite justified.

It is of interest that Limberg of Leningrad, a conservative cleft surgeon, had also been influenced and indicated this in Gibson's 1966 *Modern Trends*. In his extensive discussion of secondary nasal correction in reference to "the tip of the nose in the typical alar deformity of harelip cases," Limberg sanctioned primary nasal surgery generally but without benefit of descriptive detail. He said simply:

Today, of course this asymmetry should be corrected at the primary operation in infancy without any skin incision of the columella or nasal tip.

Although Bruce Williams of Montreal Children's Hospital has incorporated a nasal correction into the primary rotation-advancement lip method, he still has reservations. He wrote me in 1973:

I continue to be concerned over undermining the cartilages at such an early age and I hope to further review our results in 3-5 years. The thick fold or web in the lateral portion of the vestibule is a minor problem and complete symmetry of the nostrils is not maintained in all cases.

Blair, Brown, McDowell and their disciples have undermined thousands of alar cartilages without stunting nasal growth, so this aspect need not be a deterrent.

Another to agree with early nasal and septal correction is D. M. Llewelyn of the University of New South Wales, Sydney, Australia. At the 1973 Copenhagen Congress he touched upon the importance of primary freeing and lifting of the deformed alar cartilage and two-layer construction of the nasal floor. Yet his emphasis was directed at early treatment of the often neglected but usually deformed septum. He noted:

Visible posterior bony septal deformity is present in 80% of cases of complete cleft lip and palate and also in some incomplete clefts. . . . After closure of the palate cleft, the angled inferior border of the bony septum
restricts the height of the nasal passage on the uncleft side, but more importantly the convexity seriously occludes the cleft side airway. . . .
Defective aeration of the maxillary sinus occurs, as well as a tendency to infection and oedema of mucosa. . . .

Cartilaginous septal deflection is more obvious anteriorly and the inferior border of the septum often intrudes into the uncleft side nostril. Restoration of good airways bilaterally is important by the age of 6 years. A conservative bony spur resection is performed posteriorly. The cartilage is freed, replaced and fixed into its groove in the maxillary crest. Scoring or incision of the cartilage is often all that is required. . . .

Prevention of cartilaginous deformity may be possible by freeing the septum and replacement on the maxillary crest at primary lip surgery through a columella root incision.
The conception of rotation-advancement was based on fundamental general principles. It has preservation and positioning of all landmarks plus economy of tissue discard in its favor. Many have called it another Z-plasty, which reveals a partial lack of understanding of the basic principle. Some have sniped with generalizations, such as "It is difficult to see how this method in itself could do much to improve results," or by acknowledging the "precision and artistry of execution" have underrated the value of this principle in achieving the "beautiful early results."

Then in 1961 came a strange and disturbing statement by Berkeley:

Z-plasty repairs limited to the upper third of the lip and modeled after the Giralde [sic] technique as described by Thompson seem upside down in character. Blair and Brown pointed to the lower third of the lip as being the deficient zone. With Millard's remarkable success with the Giralde technique, it may be necessary to revise our thinking concerning the lower lip segment and the proper position of the "Z."
Stark was quick to repeat this mistake in 1962 with

Giraldes' operation, in essence a Z plasty at the nasal base with a vertical scar, was the forerunner of Millard's procedure,

and

Millard adopted Giraldes' Z plasty in his operation.

As so often happens, one who is a partial authority makes a "snap" statement which, as there may be few true authorities on that particular subject, is taken up by others almost "parrot fashion." (I have done so myself.) The only trouble is, it is almost impossible to arrest the subsequent chain reaction, though sometimes it can be deflected and finally stopped. In order to check this misconception, both Berkeley and Giraldes were awarded a couple of pungent paragraphs in Plastic and Reconstructive Surgery, November 1961.

To call the rotation-advancement method the Giraldes technique is inaccurate. Berkeley's only basis for grouping these two techniques together is that they are both supposed to involve the upper part of the lip. Any identification of the two in the literature is unfortunate, as Giraldes' conception did not incorporate any of the principles vital to the rotation-advancement approach. A casual observer unfamiliar with either method might at first glance think he sees a vague similarity. Yet when comparing equivalent diagrams of the two techniques he will see a fundamental difference in principle and multiple variances in detail. It will be even more obvious, of course, to those who have a working knowledge of either or both methods. Giraldes annihilated the cupid's bow-dimple component with a straight vertical incision which extended only a part of the way up the lip. He used no rotation whatsoever. Any advancement employed was directed in the opposite and unphysiological direction as a transposed flap which extended laterally in the lip below and out beyond the alar base. Thus a vital portion of the cupid's bow and dimple component not only has been destroyed but shifted to an unnatural upper lateral lip position. A result by this approach would fall far short of modern standards. It is humbly suggested that any happy results that are achieved by the rotation-advancement principle can be attributed to the fundamental differences between it and Giraldes' technique. And as the good Giraldes himself might have put it, "vive la difference!"
As Berkeley drew his conclusions from diagrams in Thompson's 1912 article, which in turn were but copies from Binnie, who got his information from Von Esmarch and Kowalzig, it seems only fair to old Giraldes to go back to what he really published in his 1869 book. First the diagrams,

then the sketches of his personal case emphasize the true disparity.

Although McDowell in 1966 suggested that the rotation-advancement "had some elements of a reverse Giraldes" (whatever that means), by 1968 Stark in his book, *Cleft Palate*, made no further effort to perpetuate the odious association. It would have been so much easier if our modern surgeons had let James Thompson settle the issue in 1912 when, after pointing out its various discrepancies, he dismissed the Giraldes operation with one simple sentence:

The result is a grotesque travesty of Nature.

The rotation-advancement is neither the reverse, a mirror image
nor any distant relative of M. Joachim Giraldes' 1869 misdemeanor.

And that is not the end of the trouble with this fellow Giraldes. Born in Portugal, he was small of stature, being called "Petit Piccolo" by his colleagues. While performing an autopsy in 1856 he lost an eye and because of such a disfigurement evidently refused to be portrayed in any manner. In spite of great effort, no photograph, painting or statue of this famous Parisian surgeon serving at l'Hôpital des Enfants Malades could be found for you.

Several surgeons have associated the rotation-advancement procedure vaguely with an aspect of Veau’s operation. McDowell expressed it this way:

The operation [Veau], a rather ephemeral one, entailed separation of the red from the white on both sides, incisions rather than excisions and construction of the vermilion from three separate flaps (which often led to lumpiness). . . . It did feature a small triangular flap from up near the columella which was fitted across into a spread incision under the ala, an idea which has persisted in some respects in Millard's more recent operation.

To see any important similarity calls for a stretching of the imagination. The fact that surgeons view the rotation-advancement as simply the interdigitation of two small triangular flaps at and near the nostril floor is discouraging. This may be due partly to my poor original orange-crate drawings, but the more recent revised diagrams make the comparison seem more far-fetched.

Others have pointed to Padgett and Stephensen's rendition of Veau's operation as being similar to the rotation-advancement approach. Here again, the fundamental Veau principle is shown as a straight-line closure with a vermilion interdigitation. The only possible similarity is the small triangular flap based superiorly and transposed across the nasal floor. This flap, however, is closer in size, angle, base position, function and principle to the family of flaps described by Collis, Blair, Trauner, Marcks, Obukhova and Wynn.
After my initial presentation of the rotation-advancement principle in Stockholm, Jacques Récamier, a student of Veau, gave me a reprint of a cleft lip paper he had published recently. It showed a high horizontal incision on the non-cleft side but in no way moved the cupid's bow into normal position or made any attempt to fill the gap with a lateral advancement flap. When he offered me the little paper he said:

We have discarded this as we found the scar deplorable.

Eight years later, with M. Récamier, he published a modification in which the high horizontal incision was extended across into the normal lip and a slight rotation was produced by a triangular excision.

Galambos of Budapest, in Hamburg in 1964, said:

Récamier's method is based on the Veau procedure. The post-operative scarline however is of an entirely vertical direction; thus the correction of the alar base will not have been accomplished.
As expressed in my cleft lip section in Grabb and Smith,
The triangle excision of the Recamiers, although not considered sufficient for adequate rotation, could be an adjunct when the normal side is too long vertically. Yet their Veau-type vertical straight line scar is considered a disadvantage, as the normal philtrum column has a gentle medial curve.

WHEN IS A Z NOT A Z?

As moderator for the cleft lip and palate panel during the International Congress in Rome, after listening to numerous presentations devoted to the use of the Z in cleft lip, I questioned the panel and the audience on the justification of such universal fascination for the Z and made the following accusation:

Promiscuous use of the Z-plasty in cleft lip surgery has become almost an obsession among modern plastic surgeons. Yet, the use of a Z-plasty against natural lines elsewhere would be abhorred. No surgeon would crisscross a forehead crease or the nasolabial line.

The Z has become undeservedly popular in cleft lip surgery probably because it can be used to lengthen the short sides of the cleft and actually assist in positioning the cupid’s bow element. Yet a Z-plasty that interrupts the natural philtrum line and violates the philtrum dimple to produce an unnatural effect offers too few assets for the price demanded. The results may be passable when the scars consent to heal almost to invisibility or when the postoperative photographic records are so burned out with light that no scars can be seen. Otherwise such scars are unacceptable. Therefore, as each surgeon hastens to do his Z thing, one thought should be foremost: The scars we make will be our own and are irreversible. They will not self-destruct in 60 seconds, 60 minutes or 60 years.

The Z got its greatest lip boost in 1959 when Clifford and Pool suggested that the one procedure that accomplished two of the requirements in cleft lip surgery, positioning the bow and lengthening the cleft edges, was the "Z" plasty.

The Z-plasty, in all its possible forms, was then drawn by them on diagrams of the complete unilateral cleft using the adjacent
sides of the cleft as the central limb of the Z. They concluded:

It was soon apparent that all the repairs described in the recent literature become modifications of the "Z" plasty.

Bob Chase, Stanford University’s Chief of Surgery, 10 years later summarized it this way:

All techniques for closure of the lip cleft are variations of a Z-plasty. The goal is to gain adequate length from the nostril floor to the vermilion ridge or junction to match precisely the contralateral side of the lip. The various methods which have been proposed (Mirault, Brown, Skoog, Tennison, LeMesurier, Millard, etc.) differ in the vertical level at which the Z-plasty is performed, but all represent the application of surgical geometry with an interdigitation of flaps.

Secondarily, and by chance, this may be partly true; primarily, it is not important. Strictly speaking, a Z-plasty is a double transposition of flaps or a double interdigitation. The rotation-advancement action in actual practice, or even in spirit, is neither. Yet in my original description I referred to the rotation-advancement as a "type of a lopsided Z and a half." This was another way of identifying it in a general plastic surgical manner and was more nearly true then than now. Since that original reference I have regretted the association because it is extremely misleading and only partly accurate. Those who see the rotation-advancement principle as a high-level Z-plasty will have difficulty with its execution and will probably fail with it in complete clefts.

Calling it a Z-plasty is like grouping a proud peacock (this bird was suggested specifically for such comparison by Vipin Buch, Bombay plastic surgeon) with a scrawny chicken. Both fowl are walking birds that lay eggs, peck for their food and are good to eat when well cooked. Yet their beauty, form, style and sacredness are quite different, and any similarity is both unintentional and at the genus Gallus level.
The rotation-advancement method may be a Z to some in the West, but in one area of the East it is considered linear. Russian Kolesov, of the Moscow Stomatological Institute, as late as 1970 itemized the cleft surgeon’s role crudely as elimination of the cleft, lengthening of the upper lip and correction of the nasal shape. He then gave as the first grouping of modern cleft lip operations the linear or straight-line closure, which he discussed and dismissed in the following manner:

The positive aspect of the linear methods is the cosmetic appearance of the line of the scar contained within the limits of the philtrum. However these methods do not permit adequate lengthening of the lip essential for wide complete clefts. After scarring, one half of the cupid’s bow is pulled upwards, destroying the symmetry of the vermilion border line. Also several months after operation a creeping up of a triangle of mucous membrane is noted along the vermilion border.

Then comes the hooker! Included in his category of so-called linear methods, Alexander A. Kolesov has grouped Yevdokimov, Limberg and Millard, explaining that they differed in the means of forming the nostril floor in complete clefts. Either he lost a hell of a lot in his translation or we are missing something in ours—maybe both! Yet diagrams are universal, and at no time has the rotation-advancement method simulated this Russian rendition. A communist plot was suspected, but as this event occurred before the recent policy of détente, it is hoped that new light will shine between nations and on methods even unto cleft lips and their treatment.

THE COUNTERPUNCH

Anyone who dares to propose a surgical technique becomes fair game in open season and exposes himself to honest, vigorous and constructive criticism by his peers. It is also his prerogative to evaluate this criticism and defend his stance with just reason,
or at least in good humor. As to past and future "potshots,"
John Trumbull said it best:

But as some muskets so contrive it,
As oft to miss the mark they drive at,
And though well aimed at duck or plover,
Bear wide, and kick their owners over.
SKIN LINES

Basic studies by others have corroborated the soundness of the rotation-advancement principle. This is exemplified by Dupuytren’s study in 1834 of the natural direction of skin lines. He noted that three round puncture wounds created by an awl in the skin of a suicide victim had been drawn flat as if cut by a knife and concluded that fiber alignment accounted for skin tension. Then Langer in 1861 repeatedly punctured cadavers with a 2 mm. awl at 2.5 cm. distances and hypothesized that skin was always in a state of dynamic tension caused by the arrangement of fibers of connective tissue, and this pattern was thought to be in the direction of the muscle pull.

Then Leonard Rubin at Kings County Hospital in Brooklyn, New York, in 1948 in Plastic and Reconstructive Surgery, using a police technique of coating the skin edges with a colorless chemical, mapped on sensitized paper the pattern of facial lines. Analysis of the anatomical skin line structure of different faces showed definite trends—at times similar to, at other times at variance with Langer’s lines. Rubin made an important conclusion:

The skin lines followed a definite pattern; being at right angles to the resultant pull of the underlying muscles. Since the skin is attached to the muscles by fascia, it was thrown into accordion-like folds or lines always at right angles to the muscle direction.

The subsequent work of Conway and Kraissl confirmed Rubin’s hypothesis.

Rubin also noted that there was individual variation in the
direction of lines, which was influenced by the fact that "some facial muscles are stronger than others." This was particularly notable in the cheek as represented by their uplifted direction in the happy type and downward drooping in the sad. Fortunately, regardless of the emotion involved, the lip lines coincide invariably with the rotation-advancement plan. What's more, Rubin practices what he preaches for he wrote in 1972:

I have been teaching my residents at the Nassau County Medical Center and Kings County Hospital the technique of the rotation-advancement repair since its introduction. Our long range evaluation has shown it to be the procedure of choice over all other procedures.

To help our residents do the surgery without "eyeballing" we have devised a simple wire technique patterned after Tennison's bent wire which allows our boys to do the surgery with the greatest of ease.

**PHILTRUM COLUMN VARIATION**

If the premise is right that the scar of cleft lip union can best be camouflaged by hiding it in the line of the philtrum column, the direction of the normal column becomes important. A study is presented of candid portrait photographs, taken by my brother Hamilton, of movie actors, actresses and models who, being the beautiful people, should have the nicest philtrums. Interspersed among the celebrities are some "regular" people. The direction and termination of the philtrum columns are seen to vary even among the movie stars. All were found to run from the height of the bow's arc in a gentle upward medial curve toward the base of the columella. Some terminated in the lateral sides of the columella base, while more seemed to meet at the front center of the base or before reaching the columella at all. Very rarely did the column eminence actually run into the floor of the nose, and when it did it usually was positioned to the medial side of the midline, blending with the lateral foot of the columella. Thus this important landmark coincides with the rotation-advancement design.

In the few cases in which the philtrum column actually runs directly into the floor of the nose the effect is less aesthetic. Ugly
Columns blend into the columella at its base and side.

Columns meet at or below the base of the columella.
or not, if it is the condition that exists on the non-cleft side, for the sake of symmetry an attempt to duplicate it on the cleft side may be justified. Here Reichert's positioning of the scar in the vertical direction all the way up into the nasal floor, after rotation, may be acceptable . . . ?

APPARENT VERSUS ACTUAL DEFICIT

Brown and McDowell in 1950 repeated the earlier concept held by Blair and Brown that

The major deficiency of tissue in an open lip is a triangular deficiency at the lower border on the columellar side.

Several years later Marcks repeated this premise. At the Second International Congress in London in 1959 I pointed out the fallacy of this established position of the missing triangle. Although the apparent gap in the cleft lip seems to be in the lower portion of the lip with its apex pointing toward the nasal floor,

The actual defect exists much higher and this fact was a contributing factor toward the development of the rotation-advancement principle.

In 1965 Cosman and Crikelair, of Columbia University Medical Center, with the aid of casts measured unilateral clefts and found that the perimeters of the cleft and non-cleft alae were not very dissimilar in length and the difference was not related to the width of the cleft. They also discovered that the sum of the lengths of the vermilion segments present on the cleft side and on the cleft edge of the normal side was equal to or slightly in excess of the vermilion length of the normal. Then, with the aid of scale diagrams, they charted an absolute deficiency of tissue in the unilateral cleft lip of a roughly trapezoidal shape as seen from in front and of a tapering tetrahedron as seen laterally, with the magnitude of the defect greatest beneath the nostril floor rather than at the vermilion border of the lip.

It was particularly encouraging that the scale diagrams, published in Plastic and Reconstructive Surgery, 1965, led Cosman and Crikelair to decide:
The technique which most nearly repairs the hypothetical deficiency is that of Millard. In this method the tissue advanced from the cleft side is placed superiorly beneath the nostril where the deficiency is greatest.

Actually this trapezoid is closer to actuality than a triangle. Its medial two-thirds (1) has always been filled by the medial advancement of the lateral lip element. The lateral one-third of the trapezoid, which is usually a smaller triangle (2), varies in amount. When there is a definite deficiency by measurement, the lateral lip flap must be extended into the vestibule to get skin or up on the alar base to steal the required lip tissue. A muscle edge flap from the medial lip can be transposed to provide extra muscle and bulk to this otherwise muscleless extension.

I. A. Kozin of the Moscow Scientific-Research Institute of Cosmetology of the Ministry of Health, Moscow, U.S.S.R., noted in 1969:

Great attention should be given the research of Millard and later Cosman and Crikelair, who proved beyond doubt that in this deformity, the absolute defect of the tissue had the shape of a triangle or trapezium, the base of which is located at the nose base and its upper part is directed towards the lip red on the cleft side. The authors also proved that the total amount of red sections of the cleft side of the lip equalled, or slightly surpassed, the length of red on the healthy half of the lip. Consequently, many contemporary surgeons (Borde, Lawrakerov, Wynn, Galambos) admit the appropriateness of such methods of lip plasty in which advancement of triangular wedges of tissue into the area of maximal lack, i.e., to the upper third of the lip . . .

Proving he practices what he preaches, Igor Andreevich Kozin, my correspondence friend from Russia, wrote a pleasant letter in April 1973. He said:

Quite recently I began to use your method of cheiloplasty in infants in the first year of life in incomplete and narrow complete clefts of the lip and palate. The results of the operation both I and my colleagues like but I would like to clarify several questions.

1. The amount of mobilization of the orbicularis oris in the region of the lateral flap?
2. How do you carry out the plasty of the vermilion border and mucous membrane of the lip?
These are good questions, and, although the answers are always changing, the latest stand on each appears in this volume.

**THE BOO-CHAI PAPERS**

Soon after paper was invented in ancient China 2,000 years ago, the original Oriental art of paper folding was developed. Khoo Boo-Chai of Singapore, who has built his own 50-bed hospital and plows 10 percent of his earnings back into his cleft lip and palate program, decided to duplicate the cleft problem in paper. This study was published in 1970 in the *British Journal of Plastic Surgery*. Boo-Chai and Ichiro Tange of Tokyo, with paper, pencil and paste, created origami models to facilitate the study of the cleft deformity and its surgery. First they cut the pattern and folded it into the normal lip and nose complex.

Then they fashioned the cleft lip nose complex. Consistent with Boo-Chai’s previous 1965 endorsement in the *Singapore Medical Journal* of the Tennison inferior triangular flap method, they chose this approach for demonstration in their origami models. Although confused as much as intrigued by origami art,
I challenged Boo-Chai’s paper tiger, questioning the wisdom of his choice and suggesting action at a higher level in the origami lip models.

The scholarly Boo-Chai responded, admitting,

I welcome this sort of brainstorming session with you.

He reminded me of the observations that the original origami paper had brought to light, noting particularly:

There is an apparent triangular defect in the lower portion of the columella border of the cleft . . . to this I would like to add another observation. There is an excess in the unfinished origami model of the medial lip element in the region of your flap "c." You have quite rightly utilized this area in the R-A technique for the nostril sill. Now the problem in question is the position of the triangular defect. In the unfinished paper model of the medial lip element you can see the triangular defect very clearly. In the R-A technique, you have rotated the whole lip (including the inherent defect) en bloc down. At the same time, you free the excess tissue on the lateral side of your cut for flap "c." You have, on many occasions, pointed out the advantages of this step, one of which is the preservation of the philtrum dimple. This can be simply demonstrated when you play about with the unfinished paper model of the medial portion of the lip. If you open up the paper model to show the triangular defect of the inferior incision clearly, then the dimple simply disappears.

Introduction of the paper flap into the lower portion of the paper philtrum flattens the cupping (A) whereas insertion of the paper flap high above the cupping drops the paper philtrum without diminishing its dimpling (B).

Boo-Chai concluded:

I have used both the triangular flap technique as well as the R-A method in my personal series of 850 cases. Nowadays, I tend to use more and more of R-A because a follow-up of my own cases (not reading about other people’s series) has convinced me that it gives superior long term results and the underlying principles are sound.
PROOF IN THE FLESH

Thus has Boo-Chai brought out more vividly than ever that flap interdigitation into the dimple releases the cupping and actually flattens it! To avoid destroying the coveted dimple, as we cannot go any lower, the obvious direction is ever upward to R-A! What a shame it would have been to spoil the dimple in this Jamaican baby. The rotation skirted the philtrum and only let the advancement in above, where it does the least harm.

MUSCLE ALIGNMENT

Then there is the positioning of the orbicularis oris muscle bundles. As first mentioned in Stockholm's concert hall in 1955 in defense of the rotation-advancement principle, it was later published in the Congress Transactions:

A well balanced lip is produced primarily because the strong medial lip element has been allowed to take over the major part of the construction. I have been impressed by the natural looking muscle action. Is it the lopsided "Z" and a half of full thickness flaps that more evenly distributes the balance of muscle pull by juggling the dysplasia of the orbicularis on each side of the cleft? In lips with a major portion of the scar vertical, the patients seem to smile on either side of the scar. In this method he is forced to smile through it.

CLEFT MUSCLE DISSECTIONS

It is reassuring that science eventually supported my optimistic impressions. Basic histological studies by Pennisi, Shadish and
Klabunde, presented in 1966 but not published until 1969, compared microscopic sections of the normal lip in the region of the philtrum and the fused portion (Simonart’s band area) in an incomplete cleft lip. The normal revealed harmonious arrangement of all tissues with consistent transverse arrangement of the orbicularis muscle. The incomplete cleft lip revealed sparse transverse arrangement of orbicularis oris muscle and more abundant vertical muscle bundles with chaotic appearance of all tissues.

Other studies, by Fara, Chlumska and Hrivnakova of Prague in 1965 and Novoselov and Lavrentiev of Moscow in 1969, seemed to coincide generally with the findings of Pennisi, Shadish and Klabunde of San Francisco.

A CONSTRUCTIVE EVALUATION

In the normal lip the orbicularis muscle is arranged in parallel horizontal bundles of considerable bulk decussating across the midline to provide the necessary strength for normal function. The correct positioning of these muscle bundles in the surgical closure of cleft lip is considered important. Thus, Vincent Pennisi with Shadish and Klabunde in 1966 closely examined the more popular procedures of today to determine how they fail in varying degrees to redirect the vertically placed muscle bundle mass.

The quadrilateral flap repair (LeMesurier) simply advances the vertical muscle bundle closer to the midline. An insignificant amount of the vertical muscle is directed transversely in the rotation of the quadrilateral flap. This does provide more normal animation about the vermilion but the remainder of the lip hangs as an inanimate curtain. Most of the orbicularis function on the cleft side is limited to an oblique line between the commissure of the mouth and the alar attachment of the nose.

The same sin of omission may be ascribed to those procedures which utilize triangular flaps [Brown-McDowell and Tennison] whether they be single triangles above or at the vermilion and single or double triangles [Skoolg] in the central portion of the lip. In each instance, only a small amount of vertical muscle is redirected horizontally, leaving the lip inadequately reconstructed from a functional point of view.
There are two procedures which could make a more realistic attempt at rotating the entire vertical orbicularis muscle by including it in the lateral flap on the cleft side. In both of these instances, the apex of the flap is directed toward the alar attachment of the nose and the base is located in the direction of the commissure of the mouth. In both procedures, the surgeon's attention must be directed at complete visualization of the vertical muscle mass, and its inclusion within the rotated skin flap. From this point on, an end to end anastomosis of the orbicularis muscle could be achieved.

A Davies type lip repair showing more satisfactory mobilization of the orbicularis muscle but still inadequate:
A Millard type repair showing complete mobilization of the orbicularis muscle on both sides of the cleft, permitting more normal functional and anatomical approximation:

Kurt Schneider of Zurich, MMM Fellow with me in 1972, had visited Charles University, Prague, and considered it important to bring my attention to a 1971 paper by Fara in *Acta Chirurgiae Plasticae*. Fara explained his experience to be, in cooperation with several pathologic-anatomic Institutes, autopsy in 25 still-born children with different types of cleft.

His anatomical findings (muscular and vascular) were much as he first described and similar to Pennisi’s. His clinical application of these findings to the cleft surgery by now had become obsessed with obtaining, at all cost, end-to-end anastomosis of the orbicularis oris muscle fibers across the cleft. He said:

> We pay maximal attention to the physiological reconstruction of the m.o.o. manifest not only in the esthetically satisfactory appearance of the lip, but mainly in far more favourable development of the maxilla.

Most would agree in principle with the concept that end-on muscle fiber anastomosis is ideal. In fact, I agree in most part with his stand that

Any crosswise incision over the course of the muscle bundles is of an unfavourable effect on its peripheral sectors which have been separated from the vessel and nerve supply. . . . It must be assumed that thus separated muscle fibers are unable to obtain nutrition from anastomosis in their upper—predominantly ligamentous—attachment at the nasal base and that they undergo scarring. The nerve supply is destroyed in every case by such a step because it depends upon the facial nerve fibers, proceeding from the corners of the mouth to the center of the lip.

Here the rotation-advancement approach is in perfect rapport
as its only muscle incisions are high up at the lip’s so-called avascular and amuscular attachments to the nose!

Fara then indicated sketchily his interpretation of what eight different operations did to the muscle fibers of the lip. There are several inaccuracies in his sketches, but his dealing with the rotation-advancement design is hopeless. First, he has an inaccurate idea of the incisions and has diagramed something similar to my old Korean sketches which long ago became obsolete. Second, although he has the non-cleft element in good position, had he rotated correctly he would have the muscle fibers horizontal, ready and eager for end-on anastomosis. Third, although he has not drawn the advancement flap correctly, he has shown its oblique position being transposed horizontally into the rotation gap. The unreal part is that Fara shows the muscle fibers originally running in a less vertical direction than after the advancement! Of course, this is absolute nonsense.

In 1967 Von J. Koch of Leipzig, East Germany, indicated his preference for the rotation-advancement incisions because of a better orbicularis oris muscle fiber alignment.

In 1973 the robust Joachim Gabka of Berlin presented to me in Copenhagen his cleft lip and palate section in a new German Handbook of Plastic Surgery. Gabka, like Pennisi and Koch, favored the rotation-advancement positioning of the orbicularis
oris muscle fibers for end-on union. His schematic drawings clarified its comparison with several other standard methods.

I feel that Pennisi, Koch and Gabka were closer to the truth than Fara in the positioning of the fibers after rotation-advancement, but I also feel that the muscle fibers in the lateral lip element are not quite positioned into perfect horizontal alignment. The appearance and function of my lips over the years and recent electromyographic studies indicate that in most cases this is not of great importance, but Fara has a physiological point to which I now direct my attention.

Recently, a two-week-old complete unilateral cleft with cerebral anomalies became available for autopsy study. Dissection and sections taken by resident Gene Tanski reveal findings similar to those of other workers.

In general the muscle fibers seem to run parallel to the cleft edge, turning more horizontal as they progress away from the cleft. There is, however, some chaos in the arrangement which prevents any hope of getting true horizontal alignment with end-to-end anastomosis. The greatest chaos seems to be occurring in the cleft side muscle bulge.

Although Fara’s and my muscle end point will be the same, our methods of achieving it are somewhat different. In his drive for end-to-end muscle fiber contact he ignores Langer’s lines, dimple integrity, philtrum column balance and the artistic construction of the lip and nose complex. As he says:

We free the attachments of both labial muscle stumps from the periosteum of the edge of the piriformis aperture and fold it in distal direction. We cut off the ligamentous terminations so that the muscle bundles afford sharp intersections and we thus prepare the muscle stumps suitably for suture. . . . Thus relatively optimal reconstruction of the labial muscle circle is obtained. . . . We may carry out minimal skin excisions because even
if the lip is shorter by 1–2 mm. but starts to function well, it shall be equal in height to the healthy side within 1–2 years. . . . In all the less serious cases, we carry out simple vertical or somewhat arched incisions and sutures of the lip. Only in serious clefts we supplement the hypoplastic medial edge of the cleft with a flap according to Tennison, which is however only formed by skin.

ALIGNING THE MUSCLES IN ROTATION-ADVANCEMENT

Medial fibers O.K.

In the rotation-advancement, flap c removes the so-called ligamentous termination of the muscle edge on the medial side, and the rotation with back-cut positions the muscle fibers in a horizontal direction. Minimal edge undermining is all that is allowed to protect the integrity of the philtrum dimple.

Lateral fibers?

On the lateral side, we had already begun transposing a muscle edge flap from the medial side into the "weak" grooved area between the nasal base and the muscle bulge of the lateral lip element. One of the principles, the actual position of the defect, that caused the flap action to be shifted from the inferior triangular flap of Tennison to the superior rotation-advancement position suggests a similar repositioning of the muscle edge flap. Instead of an inferiorly based muscle edge flap taken from the weak cleft side by Randall and introduced into the non-cleft element, a superiorly based muscle flap from the medial element introduced into the deficient and often grooved upper portion of the lateral lip segment is more urgent! It at least supplies muscle to the defect of the lateral triangle (2) of Cosman and Crikelair’s trapezoid (see p. 282). This may be all that is actually necessary.

Yet Fara’s 1971 challenge to align all orbicularis oris muscle fibers for an end-on join was “a glove across the cheek.” It provoked me to take up the gauntlet and go for the extra few degrees toward better horizontal positioning of the muscle fibers of the lateral element. This is more important in those complete and incomplete clefts which show the exaggerated bulge of
muscle in the lateral lip element. After the advancement flap has been developed, its muscle is freed from the skin and the mucosa, except in the upper one-half centimeter, so that with a muscle back-cut the fibers can be brought into horizontal position and stretched out to reduce the unnatural bulge, and the attenuated edge is trimmed back to good muscle. This procedure leaves a muscle gap above, which is filled by the previously mentioned muscle flap from the medial side. As the key stitch pulls the advancement flap into the rotation gap, a guide suture leads the medial edge muscle flap into the high lateral muscle gap.

Such positioning of the muscles, as demonstrated in this case which resident Les Hovey and I did in 1972, sets a possible plan for the future in certain cases in our clinic.

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A. Complete cleft with lateral lip muscle bulge.  
B. Normal Philtral column dot marked; rotation and advancement incisions line marked.  
C. Rotation with "backcut" lets flap A down and flap c up. Muscle flap on medial cleft edge being developed.

D. Flap c sutured to columella. Abnormal direction of orbicularis muscle fibers outlined on the lateral lip element.  
E. Lateral lip musculature undermined from the skin and mucosa and "backcut" in the musculature brings fibers down into horizontal alignment.  
F. Attenuated cleft edge of freed orbicularis oris is trimmed back to good muscle.
Postoperatively in each instance, there has been excessive firmness of reaction following the extensive freeing of the muscle of the lateral lip flap. In time, of course, the hardness subsides, but with the excellent muscle function achieved previously, there is a question whether this extra trauma will be completely justified.

**TIT FOR TAT**

For the effort we have put in Fara's muscle fiber dilemma it is hoped that he will reciprocate by taking the time in his busy operative schedule to reconsider the advantages of the rotation-advancement principle. It is our contention that, besides happy end-to-end muscle fiber contact, he then will have "put it all together" and by preserving other important landmarks will achieve even more natural and aesthetic results.

**A CLINICIAN'S DREAM**

Erle Peacock, professor of surgery, evangelist of the fibroblast, historian of the Civil War and almanac of Carolina football, wrote a learned book, *Surgery and Biology of Wound Repair*, with...
Walton Van Winkle, also of the University of Arizona College of Medicine. It was published in 1970 and stated:

In the opinion of the authors, one of the real advancements made in the last few decades in this area has been in devising a technique for the repair of congenital clefts based almost entirely on the concept of the cleft as a healed intrauterine wound. The most successful surgical procedures have been designed on the basis that the cleft is not only a wound but a wound which has undergone healing with all its complications. The concept that the original defect must be re-created (or corrected) before surgical reconstruction has been the most important contribution of the rotation-advancement technique. In addition to the fact that the rotation-advancement concept has made it possible to reduce the deformity of the congenital cleft more than any other previously devised procedure, it is enthusiastically recommended by us to all students of surgical biology as an example of the benefit to patients which accrues from combining technical excellence with sound biological principles.
V. Incomplete Clefts
OFTEN it has been said, "An incomplete cleft can be more difficult than a complete one." Yet, with less tissue missing, less nasal distortion and a better maxillary platform, this need not be the case. If efficiently designed, the end product should approach normalcy. The rotation-advancement method received almost immediate acceptance in incomplete clefts. First, it not only exceeded the accomplishments of the other methods but did so with greater economy of tissue. It was the only method that, rather than excise, utilized Simonart's band when there were mesenchymal elements present. Second, the early diagrams, and particularly the drawings of Freret, were an excellent guide to how to handle incomplete clefts and were partly responsible for the early acceptance. Several surgeons expressed their preference for the rotation-advancement in incomplete clefts.

Clifford and Pool started a precedent:

If it is necessary to combine the length of the Z-plasty with lengthening of one side of the central limb, this can be done by eccentric lengthening of one of the flaps of the Z. This modification of the Z-plasty is the basis for repair as outlined by Dr. Millard and is most useful in incomplete clefts, since the vermilion of full thickness on the two sides is usually at a different level.

Consistent with his prediction on incomplete clefts, Robert Pool has continued his use of the rotation advancement as
exemplified by the lovely case he forwarded in 1974.

Ross Musgrave from the University of Pittsburgh, in a presentation to the American Cleft Palate Association in 1962, gave his opinions:

In an attempt to save as much of the cupid's bow as possible, various procedures to introduce lateral tissue into the deficient medial portion of the lip have been designed. For example, the insertion of the major portion of this tissue into the area just below the columella has been well demonstrated by Millard. This produces a tightening of the lip in the upper portion, and some fullness of the lip at the mucocutaneous junction, especially in the incomplete clefts.

In our experience the Millard procedure is particularly recommended for those clefts which are somewhat more severe than the notching or grooving and yet somewhat less than the wide complete cleft lip. This operation produces a nicely camouflaged scar. It elevates the floor of the nostril and it rearranges the columella base particularly on the cleft side. For those infants who have a full lip with a well demarcated mucocutaneous ridge and for whom the cleft is not quite complete, one can produce with this method a most satisfying and aesthetically correct result.

Musgrave repeated these feelings in 1964 for Converse and told me on the side:

The rotation-advancement gets the most whistles from the nurses at the end of the operation.
Clayton DeHaan, for Stark in 1968, joined Clifford, Pool and Musgrave:

The majority of incomplete clefts present much more complicated problems and call for a more sophisticated approach. Millard has a repair which we consider excellent for an incomplete cleft. A triangular flap is shifted from one lip margin to the other, but, in contrast to other techniques, the tissue is shifted at and below the nostril floor so that a minimal amount of lip tissue is discarded. Advancing the flap beneath the columella gives adequate length to the lip, and the wound is closed along a line closely simulating the normal philtral ridge. At the same time, the columellar base is rotated upward and the flaring ala nasi is drawn medially, thus creating a longer columella and a natural appearing nostril floor and sill. This repair, which has yielded excellent results, is relatively simple technically and does not rely on a set of predetermined points; any adjustments required in the length of the flap can be readily made. An additional advantage is that secondary repair can be accomplished by simple reduplication with extension of the original incisions.

Even some of my most worthy antagonists such as David Davies and Peter Randall, it has been rumored, prefer the rotation-advancement method for many of their incomplete clefts. Residents do not seem to find the procedure difficult. Here is a cleft that was rotated and advanced by my first resident, Peter Stokley, in 1968 and his result as seen four years later.

The Easiest of All

Probably the ideal general category for any cleft lip procedure is an incomplete cleft in the adult Negro with the more massive
musculature, voluminous vermilion, natural nasal flatness and racial columella shortness. Therefore, as most surgeons admit the rotation-advancement principle is easy in incomplete clefts, it is little wonder that I reveled in rotating and advancing, at 30 minutes apiece, the clefts pouring out of an inland valley on the island of Haiti.

Although these people were never seen again, there need be no concern. With such full-bodied labial structures and less haughty nasal aspirations, as they sat with their stitches at the end of the operation, so shall they be until the end of their time.

**AN EXCEPTION**

With general acceptance of the rotation-advancement procedure for incomplete clefts, there was a "foot in the door" and a temptation *not* "to look a gift horse in the mouth" but to claim all incomplete clefts for the R-A method. Yet, lest we run like stupid sheep into the slaughter pen, let us balk and reconsider.
In the rare minimal cleft, where the displacement of normal structures is nil, a radical rotation and a complete advancement may be unnecessary. Any effort to avoid skin scarring must be considered carefully.

**THE MINI-MINI CLEFT**

Takuya Onizuka of Tokyo, in Melbourne in 1971, suggested a conservative but intriguing method of handling the minimal cleft lip where a slightly wide nostril floor and a vermilion notching are the deformities noted. Here, except for a lack of philtrum column on the cleft side, the skin is intact and should be kept that way. Onizuka narrows the nostril floor with an excision and corrects the vermilion peak with a small Z-plasty. He then undermines the lip skin between these two areas and gathers it into an exaggerated roll like a philtrum column with mattress sutures.

As noted by Ohmori, the long-term results of this gathering will be of interest as there is a tendency for scars and rolls to flatten in time, particularly under continuous lateral pull of the lip muscles. Avoiding a skin scar in these small notches has always been a favorite hope of mine, but as yet I have not been able to correct all the other associated discrepancies without violating the skin. This indeed may prove to be the answer in certain very minor clefts.

It is important to end with this note: In all the clefts that I have treated since 1954, only two could be corrected without a skin incision. One was a vermilion notch with no other
deficiencies or distortions present. The other was a slight deficiency of the orbicularis oris muscle appearing as a vertical skin groove which was undermined from the floor of the nose and filled with a dermal graft.

Yet recently I treated a cleft lip which, although it required skin incisions, was correctable without rotation. The patient was a 35-year-old man who has a sister reported to have a similar microform, but there is no family history of the cleft anomaly in his family, including his own four children. His cupid's bow, both columns of the philtrum and the intervening dimple were in normal position. The skin groove lateral to the "cleft side" philtrum column required skin excision. The lateral lip muscle bulge was dissected and rotated down, and a medial muscle flap from the area of the vertical groove was transposed up into the rotation gap in the muscle. The interruption of the mucocutaneous "white roll" ridge was interdigitated. The free border mucosal deficiency was filled out with a posterior V-Y roll-down. The flaring ala and wide nostril floor were corrected by a circumalar incision, its medial advancement, denudation of the tip of this flap and suturing it to the septum at the nasal spine. The other nasal deformities required a rhinoplasty, submucous resection of the septal cartilage with a strut graft to the tip, alar cartilage reduction on the normal side and an onlay alar cartilage graft on the "cleft side." It is interesting to note the correction, which necessitated all other aspects of rotation-advancement with refinements, extensions and adjuncts, still did not require rotation. This is indeed a rare situation!
WHEN an infant with a cleft of the lip and palate appears in the newborn nursery, a chain of reactions and actions is set in motion. After nine months of happy anticipation the parents listen in horror to the news that their baby has a facial deformity. If either parent had suffered the deformity or knew of it in the family, then the gnawing fear already present has become a painful reality. If the anomaly is unknown to them, it will strike panic in their hearts. The disappointed obstetrician will call in the pediatrician, and he, in turn, will call a plastic surgeon.

The future of this baby now becomes the responsibility of the plastic surgeon, who will be assisted, as the baby develops, by the prosthodontist, orthodontist, pedodontist, otolaryngologist, speech therapist and even the psychiatrist.

GENETIC COUNSELING

It is well to put the parents somewhat at ease by assuring them that in no way, by negligence or other obvious action, have they as parents been responsible for their baby's anomaly. It should be explained that the ratio of cleft to normal births runs about 1:750 in the United States and that, although there is a definite hereditary factor, it is only a part of the entire problem, for parents with one or more children with clefts can have a normal infant and, to a lesser extent, normal parents with no family history of anomalies can produce a child with a cleft. The arrival in a family of one infant with a cleft does not indicate that subsequent babies will be deformed. Although a repetition can occur, in general the chances are against it.
Heredity plays a significant role in the occurrence of cleft lip and palate. CL, with or without CP, appears to be transmitted by separate genetics from that involving isolated CP. Although some data exist suggesting sex-modified inheritance in clefts, they remain inconclusive. The data available support a polygenic inheritance for both CL, with or without CP, and isolated CP. An exception is the rare Van Der Woude or “lip pit” syndrome, in which CL and/or CP occurs with a lower lip fistula and which is transmitted by an autosomal dominant gene.

Woolf, Woolf and Broadbent (1963) in Utah, and Bixler, Fogh-Andersen and Conneally (1971) in Denmark published data from select populations from which it is possible to derive empirical risk factors for concerned parents. The child of a parent having a cleft lip, with or without associated cleft palate, has a 3 to 4 percent risk of being similarly affected. A child with unaffected parents but with an affected sibling has a 4 to 5 percent chance of being affected. The child with both an affected parent and an affected sibling has a 13 percent chance of being affected. The risk for children with normal parents but with an affected grandparent, aunt, uncle or first cousin is under 1 percent.

The analogous data for isolated cleft palate are as follows: Children of an affected parent have a 6 to 9 percent risk, children with normal parents but with an affected sibling have a 2 percent risk, children with both an affected parent and an affected sibling have a 13 to 14 percent risk and children with normal parents but with an affected grandparent, aunt, uncle or first cousin have under a 0.5 percent risk.

An exception to the above data is the “lip pit” syndrome. Seventy percent of those affected will also have CL(P) or CP and will pass on the gene to 50 percent of their children. Of the 50 percent, 60 to 80 percent will have CL(P) or CP.

*The Fraser parental genetic guide*

The studies of Canadian geneticist Clarke Fraser has made it possible to advise parents of their percentages.

If they are unaffected and have an affected child, the chances
of the next child being affected is 4% in CL ± CP but 2 to 7% in CP depending on the existence of affected relatives. If they as unaffected parents have two affected children, then the chance of the next being affected increases to 9% in CL ± CP and drops to 1% in CP. If one parent is affected and they have no affected children, the chance of the next being affected is 4% in CL ± CP and 6% in CP. If one parent is affected and they have an affected child, the chances of the next baby being affected are 17% in CL ± CP and 15% in CP and if both parents are affected the chance is about 60%. The presence of affected distant relatives apparently does not increase the chance; other major malformations not part of a genetic syndrome reduce the recurrence of the cleft anomaly. The severity of the degree of the cleft increases the recurrence risk by double. For instance, a unilateral cleft lip recurrence risk is 2.5% while a bilateral cleft lip and palate rises to 5.7%.

**ETIOLOGY**

Extensive study has been under way for years in search of the etiology of this deformity. Both heredity and environmental factors have been covered in the parents' questionnaire.

1. Careful study of the family history for other congenital anomalies.
2. Data on the condition of the parents at the time of conception of the deformed child.
3. Details of the first trimester of pregnancy including the mother's diet and activities, exposure to radiation, occurrence of bacterial or viral infections, use of drugs and experience of emotional stress.

Environmental factors produce clefts in experimental animals, but their influence in man is unproved.

**REASSURANCE OF PARENTS**

The nurses taking care of the mother and the infant with the cleft will have a natural compassion, but it should be channeled beyond sympathy toward a constructive preparation for what
lies ahead. Poignant memories of other children with clefts who ended up with scarred and twisted lips, crooked hooked noses and cleft palate speech rendered unintelligible by the nasal escape of air can be minimized. The nurse can emphasize to the parents the great progress that has been achieved in the surgical, dental and overall care of these babies.

CARE OF THE BABY

The baby himself can be treated with the same gentle kindness that other more normal babies receive. Only the feeding requires specialized training. A cleft in the lip reduces the baby’s ability to suck and will render breast feeding improbable and bottle feeding difficult. A cleft of the palate also interrupts suction and allows escape of fluids through the nose. Therefore, the baby is supported in the nurse’s arm with his head held upright in her left hand. Formula is fed by bulb compression through a 50 cc. Asepto syringe with a 1½ inch rubber catheter extension. The catheter is slipped over the baby’s tongue, and the formula is fed as the baby is able to take it. As soon as the baby has adjusted to this routine, the mother is instructed in the technique. Once mother and baby are prepared by the nurse, they are allowed to go home. This general routine was taught to me as an intern by MacCollum at Boston Children’s Hospital.

In certain particularly malnourished cases in which successful intake seems to be more difficult, a nasogastric tube can be introduced and fixed to the face with tape to facilitate forced and controlled nourishment through gavage.

ANTICIPATION OF SURGERY

Most parents are anxious to have plastic surgery immediately. Yet, when it is explained to them that the best result for their baby can be achieved if the lip and nose surgery is postponed until the tissues are larger and stronger, they are content to wait, take the baby home and fatten him up. If the cleft is incomplete, a definitive closure is scheduled at age three to six months, while a complete cleft is set for an adhesion at three weeks and a definitive closure at six to eight months. It is felt that there
is a better psychological adjustment with fuller understanding of the problem if the parents have a chance to become familiar with the deformity. To shield them completely reduces the maturity of their approach.

SPECIAL CARE BEFORE LIP SURGERY

If the cleft is incomplete, the baby should be at least three months of age, healthy and gaining weight and should have an estimated hemoglobin of at least 10 gm. The requirements can be outlined in a general “rule of over 10”:

- Weight—over 10 pounds
- Hemoglobin—over 10 grams
- White count—not over 10,000
- Age—over 10 weeks

He should have been trained to sleep on his back in preparation for the postoperative period, when this position is mandatory to protect the healing lip from brushing the bed.

No special preoperative or postoperative formula is required. What was considered satisfactory by the pediatrician before closure will suffice after surgery.

Before we turn our attention to the actual technical aspects of incomplete cleft lip surgery, let us have one last look at another vital principle in craftsmanship.
26. Never Underestimate the Importance of Detail

Sir Arthur Conan Doyle received his medical degree from Edinburgh University in 1881 but, finding his early practice slow, turned to writing and in his spare time created a detective genius in Sherlock Holmes. In a foggy gaslit 1890 London, Holmes, rumbling over cobblestones in a hansom while collecting clues or at 221B Baker Street in dressing gown with calabash pipe and magnifying glass fitting these clues into the puzzle, outwitted the cleverest criminals of the late-Victorian-early-Edwardian era. Through the same fog and over the same cobblestones, William Rose and Edmund Owen trudged to and from the London hospitals, but, lacking in Holmesian observation and intuitive inference, they were still concerning themselves with straight-line or distorted broken-line lip closures. Across the Channel in Germany, Hagedorn had surpassed their best efforts. Yet Sherlock Holmes, had his attention been directed to the cleft lip problem for but a moment, might have hastened the advances needed for the surgical solution of the puzzle. He explained the secret of success quite simply:

[My dear Watson] They say that genius is an infinite capacity for taking pains.

A plastic surgeon correcting the embryological catastrophe of a cleft lip uses methods which parallel those employed by a detective solving a crime. The missing bit is the criminal, and what tissue is available, including the landmarks, provides the clues. Then by collecting and piecing together what is there with "infinite pains" and using every available millimeter, the surgeon finds the solution to the mystery.
It always seems to amaze observers that it takes me as long as it does to deal with the detail involved in rotating and advancing the lip and nasal elements. A millimeter here or there is vital, and even when first measurements suggest accuracy, the trained eye may find a flaw. It is then that the inherent patient persistence of a perfectionist invariably will compel suture removal, realignment and resuture. To the hurried surgeon, whether on account of too heavy an operative schedule or his insistence on speed rather than precision, this concern over trivia may seem ridiculous. He must wonder, with so many clefts in the world being improved in appearance and function, what real difference one more millimeter can make?

In his 1961 presidential address, Herb Conway repeated the classic story about the child who was asked:

> With all the hundreds of millions of people in the world, what difference does it make at all to the world if one man be killed?

The child replied:

> I suppose it would not make any difference at all to the world but it would make all the difference in the world to that one man!

And it is the same with every cleft, for as standards rise so also does the importance of detail. Generalizations may point the way, but without explicit and minute detail there can be no finesse.

Michelangelo put it another way, and if he still had the patience, after lying on his back on a scaffold for more than four years painting 343 masterpieces from the Book of Genesis on the ceiling of the Sistine Chapel, to say,

> Trivials make perfection but perfection is not trivial, it might be well for us all to pause and reconsider . . .

Enough of history, principles and discussion. It is now time to turn to the actual detail of corrective surgery on incomplete unilateral clefts. As Holmes would say,

> Come, Watson, come! The game is afoot.
27. Incomplete Unilateral Cleft Lip Rotation-Advancement Detail

SCALPELS

A sculptured stone tablet found at the site of the temple of Asclepius near the Acropolis at Athens dates back to about 300 B.C. The shape of the blades depicted by the ancients is not unlike the Bard-Parker and Beaver today. Hippocrates alluded to these "bellied" scalpels, and Galen called them bellied surgical knives from the Greek word meaning "like the breast of a woman." These scalpels were of steel, for, as Galen remarked, the best quality of steel yielded a knife which neither blunted nor bent or chipped.

Today I use the small #67 Beaver blade because of its maneuverability to score the skin to dermis along the marked curved incisions. A #15 Bard-Parker is used to incise along the upper labial sulcus and to free the lip elements from the maxilla. A #11 Bard-Parker blade is used to stab along the initial superficial incision through the full thickness of lip when the rotation and advancement flaps are actually cut.

I.O.U.'S

The basic rotation-advancement principle still stands while refinements and extensions have facilitated its execution. The final design with all the possible present variations synthesized into a master plan reflects many recent influences which are acknowl-
MEASURING

The unilateral cleft has a normal side which presents a challenging comparison and sets the standard, but it also provides an ideal pattern to be simulated. Use it as a guide, measure it and be directed by it in the plan of surgery.

Dot-mark the center of the cupid's bow on the mucocutaneous junction ridge 1 and then the peak on the non-cleft side 2. The distance between these two points, 1 and 2, is usually about 4 mm. and will set the site of the bow peak on the cleft side of the medial element 3. This siting can be done with calipers or a practiced eye.

The vertical distance from the alar base on the normal side 4 to the height of the non-cleft peak of the bow 2 gives the distance that must be matched ultimately on the cleft side from its alar base 10 to its bow peak 8. This is usually around 10 mm.

Measure the distance from the peak of the bow on the non-cleft side 2 to the commissure on the non-cleft side 6, which is usually about 20 mm. Mark the same distance on the cleft side from the commissure 7 to a point along the mucocutaneous junction ridge of the lateral lip element to be the matching peak on the cleft side 8. This measurement is done with slight spreading of the cleft element as it is bunched because of contracture with lack of muscle continuity across the cleft. Point 3 should eventually approximate point 8 to create the cleft bow peak.

MARKING THE ROTATION

Now that all peaks of the future cupid's bow have been indicated, the next step is to mark the rotation incision. Start at point 3, the potential bow peak on the cleft side, and skirt the
edge up to the base of the columella. At this point the incision mark curves medially across between base and lip but definitely hugging the columella and extending past the midline of its base almost as far as the philtrum column on the normal side but no farther. The final extent of the rotation curve is point 5. Always keep in sight and mind, as the rotation incision is
positioned and shaped, that it must balance in symmetry as near as possible the line of the opposite normal philtrum column.

MARKING THE ADVANCEMENT

There are four important points to be determined in the creation of advancement flap B. These will vary according to the amount of usable Simonart’s bridge band. This, in turn, depends on the condition and conformity of its skin and the amount of subcutaneous tissue and muscle in it.

The first point has already been marked tentatively at 8, a distance from the commissure to the potential peak of the bow on the cleft side as compared to the normal. At least this gives the surgeon an idea of how much legitimate running room he has down the lateral lip element. Digression past the designated point 8 is rarely necessary and should be limited to 2 mm. at most. The position of point 8 is verified further by checking that the distance from 10 to 8 is equal to the distance from 4 to 2.

The next dot mark is placed at the most medial point possible in usable Simonart’s band 9, which will serve as the leading point of the advancement flap. One way to determine the position of point 9 after evaluation of the usable tissue in Simonart’s band is to use a heavy wire. With the normal distance from the commissure to the potential peak of the bow on the lateral element set at 8, the distance from 8 to 9 will provide the edge of the advancement flap. This edge must match the rotation edge plus the back-cut, or 3 to 5 + x = 8 to 9. A piece of wire held at 3, bent to 5 and kinked to x, when straightened out and placed along the lateral edge beginning at 8, will indicate point 9 reasonably accurately.

The third dot mark has been set at the midpoint of the alar base 10. The fourth point will be set at the end of the upper lateral alar base incision after it has curved sufficiently around the alar base 11. The amount of circumalar release depends on the degree of rotation necessary to place the flaring cleft side
alar base into balanced symmetry with the normal side. When the lateral cleft lip element is severely deficient, the circumalar incision can be raised to include a small amount of the actual alar base in the lip flap B, thus increasing the size of the flap to adequate proportion. This addition is required more often in complete clefts. Another rare occurrence in incomplete clefts is to have the cleft side slightly longer vertically, requiring a slender transverse wedge excision from its upper edge to allow the desired lift with the advancement.

The actual final position of each of the four points, 8, 9, 10 and 11, is determined by a "cut as you go" policy. Rough estimates are easy, but the final placement of each of these points is interdependent on the other two, and the last millimeter of revision may have to wait until some of the key sutures have been set.

The "unneeded" attenuated center portion of incomplete clefts between the rotation flap A and the advancement flap B is flap c and some extra tissue. This segment of tissue will be isolated by the rotation and advancement incisions and will be left attached to the columella as in the original flap c design. Care must be taken, however, not to interrupt, during the medial and
lateral undermining, the mucosal attachments of this central segment to the alveolus. Any skin, subcutaneous tissue, muscle and mucosa that is not used in the tip of advancement flap B or the body of flap c can be used to line any raw areas in the lateral nasal vestibule and alveolar sulcus and at the same time should offer extra contour when the cleft alveolus is deficient. In actual practice the “extra tissue” will be mostly mucosa.

NO STRICT ORDER OF ACTION

Once the rotation and advancement flaps have been measured and marked, they are scored. After this the order of incision making is not important. Usually the rotation is cut first, but in incomplete clefts with sufficiency of tissue the creation of lateral flap B is not quite so dependent on the positioning of flap A. Thus, in the case being used for demonstration the advancement flap was stabbed out even before the rotation incision was completed. Freeing of flaps A and B from the maxilla can be achieved either before or after the flaps are actually cut. Again it depends on the case.

CUTTING THE ADVANCEMENT FLAP

Advancement flap B has been incised into dermis with a #67 Beaver blade from point 8 to 9 to 10. Now the flap is completely severed through and through along these lines with a #11 blade leaning on the bias to include as much muscle and mucosa in flap B as possible. The extension of the labial-alar incision from 10 on farther around the alar base to 11 depends on the amount of medial rotation desirable for each specific alar base and creates flap D. Along the same principle, the amount of Simonart’s band retained in the tip of the advancement flap B is determined by how much is needed against how much is usable.
LATERAL UNDERMINING

An incision with the #15 B.-P. blade high in the upper labial sulcus of the lateral lip element frees the soft tissue attachments to the maxilla.

In incomplete clefts, the amount of lateral undermining varies, but freeing up to the infraorbital foramen may be required. This decision is determined by manipulating the lip element to see when it moves freely into its destined position across the cleft without resentment. Any final restrictions can be felt along the sulcus with the finger and released with the scalpel.

Cutting the advancement flap (B).

Undermining the lateral lip element and alar base from the maxilla.

CUTTING THE ROTATION

It is well to remember that the difference in the distance from the mid-base of the columella to the two peaks of the bow on the non-cleft element indicates exactly the amount of cupid’s bow displacement and, consequently, must determine the amount of rotation and back-cut necessary to place it into a balanced position.
Cupid's bow peak is now in normal symmetrical position.

Rotation incision dividing lip element (A) from the columella.

The difference in the heights of the bow peaks.

Deeper release.

Freeing medial element from the maxilla.

Back-cut for final bit of release.

Cupid's bow peak is now in normal symmetrical position.
The rotation incision will lower the non-cleft element, flap A with cupid’s bow, one philtrum column and dimple into normal position and release a portion as flap c to rise up for columella and nostril sill duty. The marked curve of the rotation incision has been cut through skin to dermis with a #67 Beaver blade and now is severed completely with the stabbing action of a #11 B.-P. blade through full thickness of lip to release flap A from its superior nasal attachments. Again the blade is tilted on the bias to retain as much muscle and subcutaneous tissue as possible in flap A. The descent of A is then tested to see whether points 2 and 3 are on a direct horizontal line, which would position the cupid’s bow in perfect symmetry.

**MEDIAL UNDERMINING**

The next maneuver is the freeing of the medial lip element from the maxilla by an incision at the height of its upper labial sulcus. The amount of undermining is usually less than on the lateral side and need be no more than will let this element rotate easily. This undermining can have been completed earlier to facilitate the rotation or postponed until after the rotation incision.

**BACK-CUT**

Even after the rotation incision and the undermining, the position of A usually will be found a little short of perfection. With flap A tugged slightly toward normal position, the tip of a #11 is used to stick-cut at point 5 the back-cut, which speeds up the rotation. One to 2 mm. of back-cut in the skin obliquely down with slightly more release of the muscle will complete the necessary rotation for normal positioning of flap A. A back-cut of as much as 3 mm. is needed only in odd cases. As the back-cut lowers the scar in the lip, it should be used sparingly and only when needed.
USING THE SCRAPS

The "extra tissue" now has been isolated to a section which was once posterior and edge mucosa of Simonart's band along with whatever muscle and skin were not carved off for more important duties in flaps B and c. It is based on its mucosal attachments to the alveolus and can be used to line the sulcus and cover raw alveolus preferably on the cleft side. In incomplete clefs this flap is usually kept in one piece with its medial m and lateral l extensions as shown and is eventually sutured to cover the raw alveolus and to preserve a deeper labial sulcus.

FLAP c AND EXTRA TISSUE

The rotation and advancement incisions isolated flap c and the remaining portion of this central segment. A generous estimate of the needs for flap c in columella lengthening as well as columella base and nostril sill construction should allow the cutting of flap c free from its lateral attachments. Flap c will be composed mostly of skin for anterior and cleft side columella. The extra mucosal scraps have been trimmed free from flap c.

Flap c is attached now to the cleft side of the columella and is continuous with the nostril floor. It is further released by dissection from the maxilla with scalpel and dental scaler.

FREEING THE MEDIAL CRURA

Through this exposure scissor dissection between the crura will facilitate upward shifting of the cleft side of the columella as flap c is fed into the columella as a one-sided forked flap. This increases the columella length on the short side by 2 to 4 mm. and creates a fullness at the columella base to balance the normal side. If the columella is very short, further facilitation of advancement of flap c by a posterior membranous septal incision may be necessary. This is less often needed in incomplete clefs.
Salvaging the “in between” tissue.

Medial (m) and lateral (l) cleft edge mucosa preserved on a single alveolar base.

Subperiosteal dissection around the pyriform opening to free flap c, nasal floor and alar base for medial rotation.

T-shaped mucosal scrap sutured over raw alveolus to preserve the sulcus.
ALAR BASE FLAP

The freeing of the alar base flap D separately from the advancement flap B is the maneuver that will allow positioning of the alar base correctly without tendency to lateral drifting. As the alar base D is freed from the maxilla in the incomplete cleft, the dissection is carried around the pyriform opening with a dental scaler type of sharp elevator. Then as flap c is continuous with the nasal floor, which in turn is continuous with flap D, this entire contingent is whirled in a revolving motion around the nostril (clockwise in left clefts and anticlockwise in right clefts). Thus is flap c fed into the columella as the nasal floor moves into the columella base area and the alar base shifts medially into a position balanced with the normal side. The subcutaneous bulk retained in the most medial portion of the alar base flap B is now picked up with a white Prolene 4-0 suture (Ethicon #8603) or Mersilene 4-0 (Ethicon #765). This suture is passed under flap c to catch the septum at the nasal spine. When tied, the suture advances alar base flap B into symmetry with the normal side and prevents later lateral drift.

If in the original deformity the nasal floor was nearly normal, then it should be kept intact to counteract any narrowing that medial advancement of the lateral lip flap and alar base may cause.

ALTERNATIVES

If the nasal floor is still too wide, a wedge excision may be required, or the amount estimated for excision can be merely denuded of epithelium, divided from flap c but left attached to the alar base and advanced medially by sutures to the septum under the edge of flap c.

FINAL EDGE ADJUSTMENTS

In order that the scar of union imitate the opposite normal philtrum column, the convexity of the rotation edge is maintained. The convexity of the advancement edge is corrected with
Dissecting the slumped medial crus from its inferior attachments.

Tying the prolene suture from subcutaneous tissue of the alar base to the nasal spine reduces the ala flare.

Advancement of flap c into the columella.

If nasal floor is still too wide then a wedge excision is necessary.

Nasal floor is denuded and divided so through-and-through suture from septum can pull denuded alar base flap D under flap c.
a broken line marked on the skin and trimmed to a gentle *concavity* to fit the matching edge. Then the dermis and mucosa are freed from the lip muscle on each side 1 to 2 mm. to prepare for accurate approximation. The key stitch, placing the point of the advancement flap B into the rotation gap, facilitates the tailoring of the edges. This is the time for cutting the little “white roll” flap.

**MUSCLE EDGE FLAPS**

With flaps A, B, c, D and the white roll all cut, the rearrangement of tissues with final revisions begins. Use of muscle flaps for interdigitation across the cleft into the opposite side depends on the muscle bulk, or lack thereof, of the two main elements, flaps A and B. If the medial element A is deficient in its free border edge and the lateral element B has sufficient muscle bulk (this is rare), then a muscle flap from the lateral element can be inserted into the inferior edge of the medial element. The more usual condition is a muscle bulk in the medial element serving as a “springboard” to prevent good A-to-B approximation. This can be taken as a muscle flap based below and inserted into the subcutaneous tissue of the lateral side free
border to increase its bulk and fill out the deficiency of its visible vermilion. These muscle flaps are threaded into tunnels with pull-through sutures for accurate positioning and retention.

Should the tip of the advancement flap be thin, the muscle flap cut from the edge excess of the lateral flap can be turned under to bolster the deficiency. Another possibility is the transposition of a superiorly based flap, obtained from the medial edge, under the thin advancing tip of the lateral flap or rather into a *pocket* actually dissected into the advancement flap at its deficient or grooved area. Often the bulk of flaps A and B is sufficient, and these fancy muscle adjuncts are not required. Just remember they can be available if needed.
MORE RADICAL LATERAL MUSCLE POSITIONING

It is becoming apparent that the most physiological approach to the muscle of the lateral element is radical dissection to position its oblique fibers in a more horizontal direction. When there is an abnormal bulge of this muscle with thinning above causing almost a groove between the hump of muscle and the nostril sill, wide undermining of the muscle from both skin and mucosa and a back-cut release of the muscle will allow its fibers to come down for end-on apposition with the rotated fibers of the non-cleft side. This will leave a muscle gap above, which then will require any muscle flap available from the opposite edge to fill the defect. The details of these refinements will be shown in the description for closure of complete clefts.

WHITE ROLL FLAP

At point 8 the mucocutaneous junction ridge or white roll is well differentiated and can be cut free ready for interdigitation across the cleft. The notch for its insertion in the mucocutaneous junction ridge on the non-cleft side can be created by an incision when the rotation is a millimeter short or usually by a millimeter block excision for perfect fitting. This excision or incision to receive the white roll flap should not be made early because during the suturing of the rest of the lip the split will spread into oblivion. Rather it is postponed until the very end when the white roll flap is lying over its destination. Only then should the recipient bed be split and filled.

The tissues are now ready for the final suturing . . .
28. **Suturing**

Of necessity the key stitch has already been placed in order to facilitate accurate cleft edge matching and trimming. Flap c has lengthened the columella while the alar base has been advanced and the nasal floor constructed, and all of these actions have been fixed with sutures. So as not to confuse the surgery with the stitching, the description in detail of the suturing has been postponed until now.

Part of the craftsmanship in cleft lip surgery is the skill of the suturing. For me this is best accomplished with a slender-nosed Stille-made Gillies needle holder and fine-toothed forceps.

**THE ACTUAL STITCHING**

Early in the surgery, flap c is advanced into the columella and fixed with skin sutures of 6-0 silk (Ethicon #780) in front and when indicated 5-0 chromic catgut (Ethicon #792) behind in the membranous septum.

After the incisions have been made and flaps created, the vermilion parings are cut free on a single base and sutured with 4-0 chromic catgut (Ethicon #752) to line the sulcus by covering the raw area of the alveolus. At the same time, and with the same suture, the lip elements are advanced medially by suturing their upper lining edge to the maxillary mucosa along the labial sulcus on each side.

**KEY STITCH**

Now comes the key stitch. A 4-0 white Prolene (Ethicon #8603) or a 4-0 Mersilene (Ethicon #765) suture first picks
up the subcutaneous tissue of the leading point of the advancement flap and then takes a good bite in the depths of the rotation gap at the bottom of the back-cut. As this stitch is tied, the main actions of rotation and advancement shift the tissues into their final interlocked positions. Interrupted 4-0, 5-0 and even 6-0 chromic catgut (Ethicon #790), or preferably 4-0 Mersilene, sutures are used to bring the muscles together with one last suture in the orbicularis marginalis to force the free border of the vermilion “smack” together right to the very edge. A 6-0 silk suture is placed in the skin just above the white roll interdigitation and another in the vermilion just below it. Then a triangle of white roll is excised from the medial edge skin and a 7-0 silk (Ethicon #768) suture pins the point of the white roll flap into this notch. If the muscle sutures have succeeded in bringing the skin edges into “kissing” position, a 6-0 silk continuous suture will complete a gentle apposition.
Usually an incomplete cleft will have a wider than normal nasal floor, which is corrected by a wedge excision of the excess followed by direct closure with 4-0 catgut sutures. In wider clefts which have merely a skin thread of a band joining the cleft, more active advancement and fixation of the alar base may be indicated. In such cases the tip of the alar base flap D, which has been created by division in the nasal floor region rather than discarded by wedge excision, is denuded of epithelium and advanced medially across the nasal floor and sutured with 4-0 Prolene to the septum. Mersilene 4-0 is also good for this suture. Flap c overlaps the denuded area and is sutured to the skin of the alar base to complete the nostril sill with 6-0 silk.

Closure of the externally visible vermilion edges around the free border is carried out with 6-0 chromic catgut. Then the posterior mucosal edges are approximated with 4-0 chromic...
Closure by direct suturing.

Alar skin web marked for excision.

Closure by direct suturing.

catgut. A mucosal interdigitation is incorporated into the posterior closure to break the straight-line scar.

If the free border of the cleft edge is attenuated, then the medial vertical mucosal flap is cut longer and the lateral releasing incision is placed nearer the edge in order to achieve free border balance.

The final action is usually a crescent excision of skin along the webbed margin of the cleft nostril. This is simply sutured. There are other methods of dealing with the alar margin overhang, but they will be illustrated in the complete cleft section.

All sutures are now set.

A DISSERTATION ON THE STITCH MARK

Like a beast tracked by the print of its claws, the surgeon is known by the mark of his sutures. If by these permanent tracks we are to be known, it behooves us to scrutinize this potentially vicious cycle of suture. Each link in the chain of stitch mark making was charted in a circle for Medical Times in 1965.

1. First is the needle, fine, sharp and atraumatic, which enters the skin near the edge passing perpendicular or preferably turning slightly lateral to encompass a good bite of dermis. This ensures edge eversion.

2. Next are the sutures, which must be fine in caliber and for exact action must be interrupted or for gentle apposition can be continuous. They are placed close together to profit by the Lilliputian distribution of stress. Sutures placed far back from
the wound edges leave their ladder of cross marks which will require for removal too great a sacrifice of tissue.

3. During the tie the first loop of the knot is laid and locked, bringing the edges together by gentle persuasion. There need be no tension in the tie as the wound should be well approximated already with subcutaneous sutures. The tie merely nudges the skin edges together without the slightest evidence of blanching.

4. Postoperative edema is certain to swell the tissue trapped in the relentless suture loop.

5. Resulting ischemia may lead to necrosis.

6. Any local necrosis is easy prey to skin surface bacteria.

7. Infection will eagerly nibble a larger hole around the stitch.

8. Time of removal is of prime importance. The longer the foreign body suture is retained, the greater the chance of scar marks and even actual epithelialization to form permanent pits. Lip and nose sutures should be removed in two to four days. Earlier removal is possible if the wound is supported by microporous tape. Where closure demands tension, requiring longer suture retention and in a position where stitch marks are objectionable, a subcuticular suture can be used and left for one to two weeks without danger of cross tracks.

As can be seen, the sutures are out of the little patient that I have used for this entire demonstration and now even on the fourteenth postoperative day no stitch marks are visible.
29. Examples of Incomplete Clefts of Varying Degrees

KEY TO CODE ON CASES

B.D. birth date
F.H. family history
F.T. first trimester
O.C.A. other congenital anomalies
Op operation
Ad adhesion
Adv advancement
Rot rotation
R-A rotation-advancement
H.P. hard palate
S.P. soft palate
B.G. bone graft
b-c back-cut
wr white roll flap
c flap c
col columella

A cleft is indicated by stippling, a submucous cleft or submucous distortion by horizontal lines.
VERMILION NOTCH (CASE 1)

1. 8 months
   B.D. October 16, 1961
   F.H. Unknown
   F.T. Unknown
   O.C.A. Internal strabismus

2. 8 months

3. 6 weeks postoperative

MINIMAL CLEFT WITH CONGENITAL SCAR (CASE 2)

1. 6 months
   B.D. May 15, 1968
   F.H. No clefts
   F.T. uneventful
   O.C.A. None

2. 6 months
   R.A. At 6 months

3. 3 years
   Comment. Congenital scar with vertical shortness of lip and width of nasal floor required scar excision and moderate rotation and advancement to give natural balance.
MINIMAL CLEFT WITH CONGENITAL SCAR (CASE 3)

1. 7½ months
2. 7½ months
3. 2½ years
4. 2½ years
5. 7½ years

B.D. March 21, 1964
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 7½ months

Comment. Congenital scar with shortening and vermilion notch required scar excision, moderate rotation and advancement, nasal floor wedge excision, muscle suture and vermilion interdigitation to achieve balance.
MINOR CLEFT WITH CONGENITAL GROOVE (CASE 4)

B.D. September 4, 1964
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 6 months

Comment. Important to preserve philtrum dimple and cleft side column as much as possible.
MINOR CLEFT WITH CONGENITAL GROOVE (CASE 5)

B.D. March 1, 1964
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 18 months

Comment. Scar balances opposite column maintaining central dimple.

MINOR CLEFT WITH CONGENITAL GROOVE (CASE 6)

B.D. April 8, 1969
F.H. No anomalies
F.T. Mother had strep throat treated with penicillin and a “mycin” drug.
O.C.A. None

R.A. At 5 months

Comment. Scar balances opposite column maintaining central dimple.
MINOR CLEFT (CASE 7)

B.D. November 2, 1970
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3½ months

Comment. More rotation necessary than obvious at first glance.

1. 3½ months 2. 3½ months 3. 9 days postoperat
4. 10 months
5. 10 months
Minor Cleft (Case 8)

B.D.  July 29, 1963
F.H.  No clefts
F.T.  Uneventful
O.C.A. None

R.A.  At 7 months

Revisions. At 1 year. 1. Excess vermilion trim. 2. Small scar revision.

Comment. Scar excision with slight rotation and advancement plus the white roll flap achieved balance.
MINOR CLEFT (CASE 9)

B.D. May 3, 1960
F.H. Only one male sibling with congenital lip scar and cleft
F.T. Uneventful
O.C.A. None

R-A. At 4 months

Revisions. 14 months postoperative slight upper scar excision, vermilion trim on cleft free border.


Comment. Lateral lip element thicker and longer vertically than non-cleft element. By elevation of advancement into rotation gap this discrepancy was benefited.
MINOR CLEFT (CASE 10)

1. 2 months
2. 2 months
3. 1 month postoperative
4. 4 years
5. 10 years

B.D. February 3, 1962
F.H. No clefts
F.T. One day of nausea, cramps, diarrhea
O.C.A. None

R.A. At 2 months

Revisions. 3 years later. Revision of vermilion vertical and horizontal free border trimming.

Comment. This was almost a bilateral cleft but effectively corrected with a unilateral rotation-advancement and a white roll flap.
HALFWAY CLEFT (CASE 11)

B.D. May 29, 1957
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3 months
H.P., S.P. V-Y pushback at 11 months.

Revision at 11 months. Cleft side vermilion trimmed.

Comment. A well-balanced result even though white roll flap not being used yet. Here muscle tissue from the cleft edge would be used to fill out the depression in the upper portion of the lateral lip element primarily now.
R.A. At 3 months

Revision. At 1½ years. Mucocutaneous white roll created by tiny skin graft from arm.

Original deformity and early result published in *Cleft Lip and Palate* by Grabb, Rosenstein and Broch, 1971.

Comment. White roll continuity achieved by 1 mm. skin graft from the arm as primary white roll flap was not being used in 1959. Patient does not know he had a cleft.
HALFWAY CLEFT (CASE 13)

May 22, 1962

No clefts
Uneventful


Comment. The muscle deficiency in the upper portion of the lateral lip element is not evident in early postoperative photo. Muscle flap from medial element would be inserted into this deficiency during the primary procedure if done today.

2/3 WAY CLEFT (CASE 14)

B.D. April 30, 1968
F.H. No clefts
F.T. Medication to prevent miscarriage
O.C.A. None

3. Adv with wr.

Comment. Upper portion of lateral lip element thin and deficient in muscle. Muscle flap from edge of medial element would have filled out the contour.
HALFWAY CLEFT (CASE 15)

1. 3 months
2. 3 months
3. 4 years
4. 8 years

B.D. November 20, 1964
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3 months

Revisions. 1 year later. 1. Elliptical excision from free border of cleft.
2. VY advancement of alar base.

Comment. Mucocutaneous ridge on the lateral lip element flattened out too soon in the original deformity so that getting a strong ridge in continuity across the cleft was difficult.
Twin studies in Denmark and other countries have not yet been described. Partner having CL(P) and the other CP has unilateral CL(P) and the other with bilateral CL(P), while the other pair had right CL(P) and the opposite twin had a left microform CL. In 1972 Blake and Wreakes reported five pairs of monozygotic twins; one pair had a CL(P) and a normal mate while the other pair had a right CL(P) and the opposite twin had a left microform CL. In 1972 Blake and Wreakes reported five pairs of monozygotic twins; one pair had clefts of unequal degree while the other four pairs had one cleft and one normal each. Fogh-Andersen in 1971 published an account of a pair of monozygotic twins, one with unilateral CL(P) and the other with bilateral CL(P), and cited it as another example to support his theory that CP is genetically distinct from CL(P). He noted:

Twin studies in Denmark and other countries are the same; no single example of one twin partner having CL(P) and the other CP has yet been described.

Since then he has had further confirmation with another pair of monozygotic twins, one unilateral and one bilateral, and also a pair with an isolated cleft palate in one and a bifid uvula in the other.

In 1922 A. D. Davis noted a case of twins reported by W. L. Shearer in which there were

a boy and girl, one of whom had a cleft of the soft palate, the other a cleft of the hard palate and a single harelip.

**Identical Concordance in Monozygotic Twins**

In 1942 in Denmark, Fogh-Andersen reported out of a total of 867 clefts 26 twins, a twinning rate of 1:33. At the International Cleft Palate Congress in 1973 in Copenhagen, he reported 100 pairs of twins in over 5,000 clefts including 17 pairs of monozygotic twins. Among these were two pairs of identical concordant monozygotic twins. One pair had unilateral, left, complete CL(P); the other had unilateral, left, incomplete CL. There was also a pair with symmetrical or mirror type, right and left, complete CL.

In 1972, for England and Wales, Blake recorded for the year 1968, 819,272 live births, 8,697 twin pregnancies (twinning rate of 1:94) with 1,175 clefts. He extrapolated: expected number of monozygotic twins: 2,609 (30 percent of twins being monozygotic); expected number of clefts in twins: \( \frac{8,697 \times 2}{697} = 25 \). One-third of this (8) should be monozygotic twins with clefts. If 30 to 40 percent of monozygotic twins with clefts are concordant (Fogh-Andersen, 1967), there should have been three concordant monozygotic twins in England and Wales in 1968.

In the U.S.A., with a 4,000,000 yearly birth rate and 47,500 twin live births (1:86), using the cleft rate of 1:750 one can extrapolate the number of twins with clefts: \( \frac{47,500 \times 2}{750} = 128 \). That is, 128 twins would be born with clefts yearly. One-third of them, or 42, would be monozygotic. Around 14 of these would be concordant. How many of the 14 would be symmetrically concordant is uncertain. Yet it seems quite unusual that there are only three examples of identical concordant cleft lips in monozygotic twins reported in the world literature (A. D. Davis, 1922; Fogh-Andersen, 1942, 1973). What is more, Davis in 1922 wrote many of his friends in large cleft surgery clinics, like Blair, Ivy, Federspiel, Gilmer and New, and asked if they had any such cases. They did not. Two instances of exact mirror image complete unilateral cleft lips have been reported (Shearer, 1921; Fogh-Andersen, 1962). Stellmach and Frenkel in 1970 reported siamese twins with mirror image unilateral cleft.

There have been no reports concerning treatment of identical concordant clefts, but as I have had a pair as patients, here they are for your study. According to Colin Condron, once Medical Director of the University of Miami Mailman Center for Child Development, there is overwhelming evidence that these boys are monozygotic twins with a single placenta in a monochorionic state and common amnion, sharing most common blood group antigens (W. Bias), not refuted by mixed lymphocyte cultures (R. Warren), and having remarkably similar dermoglyphics and ridge counts.

**Diamond Flaps for Twin Tubercles**

Each identical twin with his symmetrical concordant cleft not only had rotation-advancement but received a "twin" diamond-shaped posterior mucosal transposition flap to bolster his "twin" tubercle.

No matter how carefully Nature tries to duplicate or how diligently the surgeon attempts to assist her, identical reproduction does not occur. Not only has one twin a difference in visual acuity requiring glasses, but the two lips show slight variations in their healing, growth and development. They are both, however, well-adjusted little gentlemen.
HALFWAY CLEFTS (CASE 16, 17)

B.D. October 5, 1969 (1st twin)
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 4½ months
5. Posterior mucosal flap from cleft element cut as ◯ to create tubercle of cupid’s bow. 6. Alar rim excision.

Comment. Monozygotic twins with twin diamond posterior mucosal flaps.
HALFWAY CLEFT (CASE 18)

B.D.  August 4, 1960
F.H.  No clefts
F.T.  Threatened miscarriage at
      2 months
O.C.A. None

R-A.  At 4 months
Op. Standard R-A without refinements except c for col. No wr flap
    unfortunately.

Revision. At 2 years. 1. V-Y tubercle. 2. Alar rim excision. At 10
    years, double-breasted vest scar excision.

Comment. My cover puzzle boy.
HALFWAY CLEFT (CASE 19)

B.D. October 7, 1963
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 2½ months
H.P. At 7 months, vomer flap closure of H.P.
S.P. At 18 months, island flap pushback.

Revisions. At 6 months. 1. Trimming of vermilion free border.
2. Alar base on normal side reduced. 3. Alar rim excision.

Comment. More of a cleft than visible but correctable with rotation and advancement.
HALFWAY CLEFT (CASE 20)

B.D. November 28, 1963
F.H. No known anomalies but mother adopted
F.T. Uneventful
O.C.A. Hemangioma of chest

R-A. At 3½ months

Comment. Balanced lip and nose with continuous mucocutaneous white roll ridge.

1. 3½ months
2. 3½ months
3. 1 year
4. 8 years
5. 9 years
HALFWAY CLEFT (CASE 21)

1. 5 months
2. 5 months
3. 8 months
4. 4 years
5. 4 years
6. 5 years

B.D. November 9, 1968
F.H. No clefts
E.T. Uneventful
O.C.A. None

R.A. At 5 months


Comment. By keeping the slightly wide nasal floor intact, rotation and advancement was possible without reducing the cleft nostril too much primarily. When seen at age 5, a healed laceration of her right commissure was more noticeable than any residual effects of the cleft and its surgery.
HALFWAY CLEFT (CASE 22)

1. 3 months
   - B.D. February 6, 1965
   - F.H. No clefts
   - F.T. Uneventful
   - O.C.A. None

R-A. 1st attempt at 3 months—cardiac arrest. Completed at 4 months.

Hard scar at 6 weeks. At 3 months soft, well-healed.

Comment. A happy ending after a hazardous beginning.

HALFWAY CLEFT (CASE 23)

1. 8 months
   - B.D. October 20, 1971
   - F.H. No clefts
   - F.T. Uneventful
   - O.C.A. None

R-A. At 8 months

Comment. The difference in the heights of the peaks of the bow on the non-cleft element (6 mm.) is equal to one-half the vertical length of the upper lip (12 mm.). This explodes the theory that a limit of 3 to 4 mm. (Randall; Cramer) is all the lengthening that rotation can achieve without crossing into the normal side.
HALFWAY CLEFT (CASE 24)

B.D. August 27, 1971
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 4 months
S.P. Closure of soft palate and vomer to both sides of mucoperiosteum of hard palate. No lengthening.

Revision. Full-thickness horizontal excision of lip along nasal join to shorten cleft side slightly, a rare necessity.

Comment. Nasal floor denuded as tip of alar base, which was advanced medially and sutured to the septum. Denuded alar rim flap transposed into the nasal tip crease.
HALFWAY CLEFT (CASE 25)

B.D. March 27, 1972
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 6 months

Comment. This is the incomplete cleft used for demonstration in Chapter 27.
HALFWAY CLEFT SUBMUCOUS CLEFT ON THE OTHER HALF
(CASE 26)

1. 5½ months
2. 5½ months
3. 5½ months
4. 4 months postoperative
5. 17 months

B.D. May 24, 1972
F.H. No clefts
F.T. Sporting during early weeks
O.C.A. None

R.A. At 5½ months

Comment: Medial muscle flap into pocket under groove to fill out deficient tip of lateral flap, a successful innovation.
2/3 WAY CLEFT (CASE 27)

B.D. July 13, 1957
F.H. No clefts
F.T. Uneventful
O.C.A. None

R-A. At 1 month

Revisions. At 5 years. 1. White roll flap transposed across scar at mucocutaneous junction. 2. Revision of free border vermilion.

Comment. This was before white roll flaps were being done primarily.
2 / 3 \textbf{WAY CLEFT (CASE 28)}

1. 7 weeks
2. 7 weeks
3. 22 months

4. 28 months
5. 5½ years
6. 5½ years

\begin{tabular}{|l|l|}
\hline
B.D. & January 25, 1958 \\
F.H. & No clefts \\
F.T. & Uneventful \\
O.C.A. & None \\
\hline
\end{tabular}

R-A. At 7 weeks

Revision. At 10 months. 1. Alar rim excision. 2. Cleft vermilion excess excised. At 2 years same procedures.


Comment. The deficiency of muscle in the upper portion of the lateral advancement flap needs a muscle edge flap for extra contour.
B.D.  February 21, 1958
F.H.  3rd cousin with cleft lip and palate
F.T.  Uneventful
O.C.A.  None

R.A.  At 2½ months

Revisions. At 7 years revision of vermilion. At 14 years V-Y vermilion tubercle, trimming excess cleft vermilion free border, alar rim excision and a chin implant.


Comment. If she looks this nice at 14 years, she will be beautiful at 18.
2/3 WAY CLEFT (CASE 30)

1. 3½ months
2. 3½ months
3. 2½ months postoperative
4. 4 years
5. 13 years

B.D. October 1, 1958
F.H. No clefts
F.T. Mother had leg infection first month
O.C.A. None

R.A. At 3½ months
3. Alar rim excision.


Comment. When patient was recalled at age 13, mother informed me that her daughter did not know she had had a cleft lip.
Comment. This case did pretty well without a white roll flap.
R-A. At 3½ months

1. R-A without refinements. 2. Cleft vermilion overlap to medial element.

Comment. Lack of refinements in this early case shows lack of finesse. The vermilion flap from cleft side overlapping the non-cleft side tends to give an asymmetry requiring secondary revision. This is reason for subsequent change to straight closure at this point.
B.D. July 16, 1961
F.H. Father had left unilateral cleft lip and palate
F.T. Uneventful
O.C.A. None

R.A. At 2½ months


Comment: Mucocutaneous junction at scar not camouflaged by white roll flap primarily so never natural. Diamond excision in this area was not effective.
W A Y C L E F T (C A S E 3 4)

1. 2½ months
2. 2½ months
3. 3 months
4. 6 years
5. 11 years

B.D. July 24, 1961
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 2½ months
3. Adv with wr with vermilion,
then did non-cleft mucosa to cleft
side at free border.
H.P. Vomer flap at 11 months.
S.P. Island flap pushback at 15
months.

Revisions. At 11 years. 1. Normal
alar base reduced. 2. Depressed scar
excised. 3. V-Y midline tubercle.
4. Normal vermilion reduced.

Comment. Greater deficiency of lip
and more distortion of nose than
in most incomplete clefts easily
corrected with the rotation-ad-
vancement action.
2/3 WAY CLEFT (CASE 35)

1. 3½ months
   B.D. February 15, 1963
   F.H. Maternal uncle had cleft palate
   F.T. Uneventful
   O.C.A. None

   Comment. Suggestion of bilateral cleft necessitated mucosal free border revision as a secondary procedure.

2/3 WAY CLEFT (CASE 36)

1. 4 months
   B.D. February 3, 1968
   E.H. No clefts
   E.T. Uneventful
   O.C.A. None

   Comment. Use of Simonart's band as the leading point of the advancement flap.

2. 4 months
   R.A. At 3½ months
   3. Adv with wr.

   Revisions. At 1 year. Vermilion trim.
   Alar rim excision

3. 8 months
   H.P. and S.P. Pushback with island flap at 14 months.
Comment. At least the rotation scar does not seem to limit his lip action.
2/3 WAY CLEFT (CASE 38)

B.D. December 1, 1966
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 2½ months
H.P. and S.P. At 1 year pushback with island flap.

Revisions. At 6 years. 1. Horizontal full-thickness lip excision to shorten cleft side. 2. Denuded alar base advanced to septum to reduce flare. 3. Alar rim excision.

Comment. This is a rare example of slightly too much rotation which required full-thickness horizontal elliptical excision of lip at its join along the alar base and nostril sill on the cleft side to lift the bow to near symmetry.
B.D. January 18, 1968
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3½ months

Revision. At 4 years. 1. V-Y tubercle vermilion. 2. Denude alar base and advance to septum. 3. Normal alar base reduction.

Comment. Rotation was not carried into the normal side but lip slightly long vertically, which suggests this is natural for this patient.
Comment. Rotation did not hug columella base quite enough so the upper part of the scar of union is not quite close enough to the nostril sill. Pretty good primary nasal correction with only columella lengthening, alar base positioning and alar rim revisioning.
B.D. March 9, 1960
F.H. Cousin with cleft lip who did not live
F.T. Uneventful
O.C.A. None

R.A. At 3½ months

Revisions. At 9 years. 1. Alar base deepithelialized and advanced.
2. Normal alar base reduced.
2. Anterior septum freed at spine, scored on left side, and moved to midline. 3. Lip muscle approximation. 4. White roll interdigitation.
5. V-Y lip mucosal roll-down.

Comment. A severe incomplete cleft which still requires minor lip and nose revisions.
3/4 WAY CLEFT (CASE 42)

1. 3 months
2. 3 months
3. 6 months
4. 3 years
5. 12 years
6. 12 years

R.A. At 3 months

Revisions. At 9 years. 1. Scar to make white roll at mucocutaneous junction. 2. Alar base transposed into nasal floor. 3. Normal alar base reduced. 4. Alar rim crescent excision.

Comment. Point of lateral advancement flap had to be taken from up in the nasal vestibule.

B.D. March 21, 1960
F.H. No clefts
F.T. Uneventful
O.C.A. None
3/4 WAY CLEFT (CASE 43)

B.D. January 17, 1962
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3 months
H.P. vomer flap at 10 months.
S.P. Pushback with island flap at 13 months.

Revisions. Slight vermilion trim at 7 months postoperative.


Comment. Another evidence of early contracture at 3 weeks that smoothed out in several months. This is one of the first "white roll" flaps!
B.D.  August 12, 1968
F.H.  Father’s paternal grandmother had CL(P)
F.T.  Uneventful
O.C.A.  None

R.A.  At 2½ months.
1. Rot with b-c. 2. c for col. 3. Adv with wr. 4. Posterior mucosal flap to cleft side.
S.P. and S.P. Pushback with island flap at 1 year.

Revisions. At 4 years. 1. Reduction of cleft side vermilion. 2. Revision of lateral lip muscle bulge with filling out of the upper groove. 3. Alar rim denuded and transposed as a flap into the weak area of the nasal tip.

Comment. The repeated need for lateral groove bolstering and revision of cleft side vermilion caused change from posterior mucosal flaps to muscle edge flaps in the primary surgery.
4/5 WAY CLEFT (CASE 45)

B.D.  March 3, 1959
F.H.  No clefts
F.T.  Uneventful
O.C.A.  None

R.A.  At 6 weeks.

F.P.  Closed with Wardill V-Y hamular fracture and Limberg osteotomy.
B.G.  At 9½ years split rib bone grafts across and in cleft.


Comment.  One of the early cases complicated by a groove of muscle deficiency in the lateral element.  No refinements, extensions or modern adjuncts were used, and the rotation scar is a little too oblique for a normal philtrum line.  No primary nasal tip correction; necessitates revision at 16 years.
A.I.L visible suture lines are covered generously with an antibiotic ointment. Then a Logan bow is placed across the sutured lip with inward tension on the cheeks.

William H. G. Logan, a soft-spoken, diplomatic plastic surgeon and Dean of the Loyola School of Dentistry, was also the son-in-law of Truman Brophy and in a sense directed the Brophy principle of metal control of cleft parts to the postoperative protection of the sutured lip. In 1921 he designed a curved metal piece with spiked loops on each end through which tape could be passed and secured. This device has enjoyed popularity in many cleft surgery clinics over half a century. In 1923 Brophy endorsed his son-in-law’s bow in his usual dogmatic and persuasive manner. In his book *Cleft Lip and Palate*, with the accompanying illustrations, he wrote:

This is Dr. W. H. G. Logan’s invention and it is not open to the slightest objection. Tension on the lip may be increased or diminished at will, and this is a feature that has not been possible with any other method. It not only holds the lip in a state of quiet without pressure against the vessels, but at the same time allows access to all its surfaces so that they may be kept absolutely clean and the process of repair may be watched from the time of operation until the sutures are removed. The horsehair sutures may be removed from three to five days after operation, thus avoiding suture scars, while the appliance remains.

Although today some surgeons sneer at the Logan bow, I still feel it helps to relax the operative site and counteract the deleterious effects of crying and laughing on the wound edges, thus affording better insurance toward ideal healing. At the same time,
it protects against an unexpected blow as well as leaving the wound exposed to facilitate local treatment of the suture line. The metal arch of the bow stands like an identification flag on a ship to warn the nurses of what has been done because after surgery, with ointment over the suture line, it may not be obvious that a cleft has "been and gone." It is extremely important that those attending the infant not let him lie face down!

The standard nursing care of the cleft lip wound previously entailed constant cleansing of the suture line with hydrogen peroxide to remove crusts. This is painful and irritates the stitches and the wound. I therefore cover the suture line generously with an antibiotic ointment after the surgery. The nurse can keep the sutures covered by application of the ointment three times daily after meals. The ointment protects the stitch holes from the contamination of constant nasal discharge, prevents crusting and keeps the sutures soft for easy removal on the fourth postoperative day. The antibiotic ointment is continued one day after suture removal until the stitch holes are sealed.

Other early postoperative precautions are taken. Sedation is ordered for excessive crying as this will cause undesirable tension on the healing lip. Arm restraints are applied to the elbows to prevent the infant from getting his fingers into his mouth and inadvertently separating the new wound. A slatted elbow restraint is made by sandwiching tongue blades side by side between two layers of 4-inch adhesive tape or fitting them into a cloth band with tie straps. This straitjacket is wrapped around the infant's elbow at the end of surgery and pinned to the pajama shoulder to prevent slippage. Plaster of paris elbow casts are also effective.

**TAKING OUT THE STITCHES**

Suture removal is one of the most difficult procedures in postoperative care. Many surgeons in desperation resort to general anesthesia to keep the baby quiet long enough to remove the stitches before a head jerk pulls open the freshly healed wound. Others sedate the baby, then wake him up to strap him on the
treatment room table and with his soft little head in a hand vise and a bright light in his eyes extract the sutures painfully one by one.

I am willing to take any amount of time to place the sutures exactly but not one second to remove them, so a method was worked out by nurses Janet Kuszaj and Beverly Wirch that has proved very successful. On the fourth postoperative day, the baby is fed and is given sedation equal to the preoperative order. One hour later the baby will be found sound asleep. The side of the bed is let down quietly, and with fine smooth forceps and tiny sharp scissors the sutures are removed with great care. The baby seldom stirs during the procedure. This takes a steady hand, a good eye, great patience and a love of babies, but then so does all of pediatric nursing.

FEEDING AFTER LIP SURGERY

After the cleft in the lip has been closed and the muscles of the lip are approximated, it is important to give this wound as much immobilization as possible to encourage good healing. The Logan bow is an aid. If the baby is allowed to suck a nipple, a pull will be exerted on the new lip scar. The baby is best fed by a method that does not require the sucking movement—that is, the same routine used before surgery. The baby is held upright in the crook of the nurse's arm with his head in her left hand. A 1½-inch rubber catheter attached to the end of a 50 cc. Asepto syringe can be slipped past the baby's healing lip and over the tongue. The liquid can be introduced by the squeeze of the bulb at whatever speed and amount the baby can tolerate easily.

The type of diet ordered by the surgeon for the postoperative cleft lip is called a cleft palate diet. This usually consists of clear fluids only for 24 hours, then half-strength formula for 24 hours, to be followed by normal formula. Like most orders that become habit, this diet is outmoded. As soon as the baby reacts fully, clear liquids are safe, and after 12 hours there is no reason why regular formula cannot be started. Return to bottle feedings one month after surgery is allowed unless there is also a cleft of the
palate. In this case the Asepto technique should be continued until some time after palate surgery.

Antibiotics are not used routinely. If the lip wound shows inflammation, they can be instituted, or if there is temperature spiking that cannot be explained by dehydration, a short course of antibiotics is in order.

The patient is allowed to go home on the fifth postoperative day with the Logan bow and elbow restraints in place. The bow and restraints will be removed after two weeks. Prior to discharge, the mother is retaught to feed her baby with the Asepto feeder.

It is important for both parents and pediatrician to realize that the lip scar that is red, firm and contracting at one month after surgery usually will be soft and pale at six months and almost invisible at one year. When a minor lip correction is necessary, it is usually done at six months or postponed until time for further palate surgery.
VI. Complete Clefts
SOME EXPRESS RESERVATIONS

ALTHOUGH Clifford and Pool accepted the rotation-advancement in incomplete clefts, they were the first to express some reservations about its use in complete clefts. These judgments were, however, based on early (now obsolete) diagrams. This was their logic:

In the Millard repair we see that the vertical height is gained by the use of a modified "Z" with lateral mobilization under the nares. The greater the vertical height needed, then, the more will be the lateral mobilization needed with added tension under the nares. Tension at this point is a great disadvantage in the wide cleft where this falls right over the separated alveolar ridge. In the complete unilateral cleft, in order to gain sufficient height with the Millard repair, the incision must be carried up through the philtrum, across the base of the columella on the uncleft side. To match the length of this incision some vermilion of full thickness of the cleft side must be sacrificed. This puts maximum tension in the Millard repair at two points; the first just under the base of the nares and the second at the white line of the vermilion.

They went on to say:

An advantage of the flap procedures which are done at the lower half of the cleft is that they put the line of maximum tension below the alveolar ridge at the point where the lip normally begins to pout.

I thought this interpretation incorrect and soon said so.
My response was published in 1960 under the title “Complete Unilateral Clefts of the Lip”:

Yet as some express anxiety when facing a severe complete cleft [with the rotation-advancement]. . . . Any closure of a wide cleft is more demanding and will call for a point of tension. The point of contention is where this point of relative tension is best tolerated—along the lower portion of the lip where any tightness is reflected in the loss of natural looseness of the free border, more in LeMesurier and less in Tennison, or high in the lip just under the nasal base where tension is almost mandatory anyway to correct the gaping nostril floor and grotesque flare of the alar base? In the latter any relative tension is splinted by the maxillary processes. This also produces a natural eversion of the free border of the lip. It might be said that if one can get a closure at the high point the possible distortion will be minimized. Thus, the flap from the lateral lip element has been designed to come from the upper portion and its medial advancement across the cleft will bring the delinquent alar base along with it into line. . . . A wide cleft should not, in most cases, require any more radical rotation than an incomplete cleft. The increased demand is the distance required for the lateral flap to advance across the cleft. Yet, as the width of the nostril floor and the flare of the alar base is [usually] greater in wide clefts, it follows that the distance the lateral flap must advance medially is also increased. Thus, it is suggested the rotation-advancement principle is actually more effective in wide clefts and certainly its margin of advantage is as definite in complete clefts as in incomplete ones.

A helpful hint in timing was also mentioned:

The time factor is an ally in the wide clefts. Although the rotation-advancement method has been used very early with success, it has been found far easier in a fat and pink three month old infant. The tissues are more generous for the approximation and the maxillary components have had at least three vital months to grow without lip restraint. Because of the former and in spite of the latter, the cleft is relatively less “breath-taking.”

Ross Musgrave in 1963 joined with Clifford and Pool in selective use of the rotation-advancement method.

When this procedure is used for the severe complete cleft lip, some difficulty has at times been encountered with the lateral flap development. Extension of the incision far down the lateral side of the lip may be required, producing tension just above the mucocutaneous ridge. . . . In the wide
unilateral clefts repaired in this manner, the involved nostril may appear small and rolled in for the flap developed below the lateral nostril insertion must be brought far medially beneath the columella. Furthermore, where the cleft is severe and the upper point of the cupid's bow lies close to the columella on the cleft side, the "uncurling" and dropping down of the medial lip segment has at times presented a problem.

Along the same line, and as late as 1969, Russian Kozin stated:

It is not possible to use the Millard method in those cases where there is a large defect of the lateral part of the lip in vertical as well as horizontal direction. In such cases, it is most appropriate to use a modification plasty according to Kawrakirov in which, in relation to the degree of lack of tissue, two opposite triangular wedges with angles of 60°, or 45° and of 70° respectively are cut from the base of the skin part of the nasal septum and from the involved nostril.

Actually, the medial incision varies the angle of rotation, and the lateral flap is based above, as advocated by Wynn. It is, in fact, a Z-plasty positioned higher in the lip and is shown here as a secondary procedure. It promises no better solution to wide clefts with deficient lateral lip elements and, in principle, does not offer many of the assets of the rotation-advancement.

In 1965 Jorge Psillakis of Brazil reported excellent results with the rotation-advancement method in incomplete clefts but not as good results in complete clefts. Yet, the results he showed which revealed retraction were only from one to three months after surgery!

A CLEARING POOL

The beginning of a breakthrough came in 1966 when Robert Pool of Michigan, the tall, ambling, artistic and astute surgeon of Dutch descent, with more experience in the method and a six-year follow-up, approved its use in wide clefts. He made some interesting observations:

In the series of cases reviewed, it was discovered that the rotation-advancement repair could be used effectively in all types of lips except when the lateral lip is short in both horizontal dimension and in its vertical height. The lateral lip is the key which locks the medial element in place. A clue
to this type of lip lies in the amount of tissue available medial to the
alar base, and in the measured vertical height of the existing cupid's bow.
It is probable that this type of lip would be difficult with most repairs
and certainly will not result in a full lip under any circumstances.

Pool made several other points:

Technically the rotation-advancement repair is simpler to execute than most
triangular flap repairs. For this reason most novitiates in plastic surgery
will obtain better results with fewer secondary problems. . . . It has been
found that if all layers are accurately approximated and a pleasing lip is
attained at the time of primary surgery, the lip height and contour will
be precisely similar after a five year period. This repair, although basically
uncomplicated, does not allow the surgeon to do a casual repair. . . . The
eye can detect asymmetry of less than 1 mm. If a lip repair is performed
in infancy and normal growth and development occur the acceptable range
of error at the time of surgery is less than 0.5 mm.

THE UNSUITABLE LABEL

Yet the label “not suitable for wide clefts” continued to be
stamped on the rotation-advancement method by some surgeons.
As Mark Twain once said,

Often the less there is to justify a traditional custom, the harder it is to
get rid of it.

DeHaan commented in 1968:

We have had somewhat more success with the triangular flap method than
with Millard’s superiorly placed flap which is sometimes difficult to advance
adequately.

Chase also, in 1963, reported that, although he generally employs
the Millard infranasal Z-plasty since it places the primary scar
along the normal philtrum line,

in order to achieve precise measurements in lips, when more vertical length
is needed than can be provided by the Millard technique, the author favors
the triangular flap supravermilion Z plasty described by Tennison.

In a discussion with Bob Chase during the half-time inter-
mission of the 1971 Super Bowl game in Miami, and over the
blare of the bands, he indicated that he was using the rotation-advancement method more in wider clefts.

PERKO

Even as late as 1971 at the Stomatology Institute of the University of Zurich where my old friend from "Gillies days" Professor Hugo Obwegeser is doing such brilliant work on facial bone shifting in clefts, there were still reservations with the rotation-advancement method. Yugoslavian Milivoj Perko does most of the primary clefts for this unit. With orthodontist M. Hotz he stated in *Minerva Stomatologica* that, when the cleft is incomplete or when the lip muscles are well developed and the cranium is of good size, he prefers the rotation-advancement method. Yet when the cleft is wide, the muscles are underdeveloped and the cranium is small, he prefers the Tennison procedure. Perko, an expert on the facial skeleton, evidently has found some correlation, but my Italian is so sketchy that the only translation I have been able to come up with is: If the head is normal size, use the rotation-advancement; if microcephalic, use Tennison. I would have to go along with that.

For complete clefts, Perko and Hotz reported difficulty using the rotation-advancement, finding that tension along the mucocutaneous border caused loss of the pout. Perko evidently is not satisfied with Tennison either, as he modifies the method with a Trauner flap.

He responded to my challenge in 1972 and confirmed his stand:

In most of the cases where I use your standard rotation-advancement method, this method is performed without any modification. I personally use very often your method, especially in partial and narrow cleft lips and find it an ingenious one. Only in a few cases an additional Z-plasty on the vermilion border was necessary.

In very wide clefts I still use the Tennison-Randall method, combined with a Z-plasty on the base of the nostril, similar to the description of Trauner and Skoog.

It was, therefore, a special pleasure to visit with the gentle,
sincere “Voyo” Perko over a breakfast Danish during the 1973 Cleft Palate Congress in Copenhagen and encouraging to hear his quiet response to my questioning.

Yes, I now use the rotation-advancement method in almost all primary cases because of the correction of the nose.

When asked if he still had difficulty with the rotation in wide clefts, he shook his head and said, with a suggestion of a smile,

No, the downward cut at the end of the incision is helpful and produces a better scar than the triangular flap, which is not always so nice.

BREAKING THE BARRIER

Several surgeons, including such renowned ones as Randall and Cramer, have cited and taught that a difference of 3 to 4 mm. between the vertical height of the two bow peaks on the non-cleft element is the automatic cutoff limit for using the rotation-advancement. They have always said simply that they have difficulty rotating the cupid’s bow into symmetry with more than that distance to go. Of course, the back-cut should wipe out this cutoff.

To drive the point home, let us turn, not even to a complete, but instead to an incomplete cleft in little Sandra of Jamaica. Her medial lip element measured 9 mm. from columella base to bow peak on the non-cleft side and only 2 mm. on the cleft side.
9 – 2 = 7! but the bow came down into perfect symmetry with a minor back-cut and very little difficulty.

At the 1973 Foundation Cleft Lip and Palate Symposium, expertly produced by Nicholas Georgiade at Duke University Medical Center, a few recent adjuncts designed to facilitate rotation and advancement in certain cases were presented. The following day in the hall, I challenged a young innovative surgeon who I knew also suffered the 3 mm. hang-up. He admitted with a twinkle that he still preferred the inferior triangular flap with more than 3 mm. bow discrepancy, and when I asked,

Even with the back-cut?

he responded with a switch:

Oh, I have no trouble with getting enough rotation. It’s the deficiency on the cleft side.

I wondered why the rigid 3 mm. limit was being used for the cleft side and countered,

Did the adjuncts just presented in measuring and extending the cleft side and the muscle flaps from the medial side help to alleviate this hang-up?

He mumbled defensively and almost as an aside,

Oh, by a little cheating, you mean?

Then I went for him.

Let’s try to get this into perspective. You are imposing inflexibility by presupposing that a published description dogmatically sets an iron rule and any modification is unfair infraction of that rule. No! That’s fuzzy thinking. Any method should be accepted merely as a proposed principle which for each case can and should be varied, not by cheating but by creating!

CATCHING A WILY ONE

There were just too many good men along with the others joining what I affectionately refer to as the loyal opposition. A
statement by Musgrave in 1963 and repeated in 1964 had caused me many a sleepless night. He wrote:

In Millard's hands and the hands of some other surgeons, this procedure has been satisfactorily used for all forms of unilateral cleft lip.

What was the hang-up? Eventually it was realized that the back-cut in rotation and the circumalar extension in advancement were the previously undescribed and inadequately illustrated essentials that were making the difference. These details were stressed in Rome in "Rotation-Advancement in Wide Unilateral Lip Clefts" and elaborated upon a year later in "Extensions of the Rotation-Advancement Principle for Wide Unilateral Cleft Lips." The "extensions" caused Musgrave to state in Rome that these modifications presented a new operation which deserved reconsideration in wide clefts.

Yet, over the past few years, the talented Ross Musgrave has continued to have a "thing" about different degrees of cleft being more suitable for different procedures. I think this is nonsense, and Ross and I have gone round and round on it, but until recently he has held tight to the theory. In 1971 there seemed to be a little weakening for he admitted about the rotation-advancement method:

A minimal amount of tissue is discarded. The ultimate suture line direction is superior to any of the zigzag scars. . . . It is a fluid method that can be adjusted as one proceeds. It is by far the method of choice for the majority of cleft lips.

He acknowledged the refinements and extensions proposed to facilitate rotation and advancement and labeled it the Millard II,

in which a much better nostril is created both at the apex and at the base of the columella. The Millard II, which is much trickier for the inexperienced surgeon, continues to have the disadvantage of extending the lateral incision too far down the mucocutaneous ridge toward the lateral commissure.

This is not necessarily the case if the operation is done correctly. Measurement from the height of the cupid's bow to the
end of the lateral commissure on each side should be within 1 to 2 mm. In fact, the width of the cleft offers no real problem in the rotation-advancement approach.

A RUSE ON ROSS

Only after several sleepless nights did I finally figure out how to persuade Musgrave. The plan was to do an adhesion procedure and turn a very wide cleft into an incomplete one and wait six months. Then, without telling Ross, I would get the case to him and, as it would be an incomplete cleft, he would use the rotation-advancement voluntarily according to his gradation theory. The result would make him so happy that one evening over a beer he could be told the truth and he would be hooked forever . . .

November 30, 1972, before this subterfuge could be perpetrated, Ross Musgrave wrote me a congratulatory note on the Dolphins football team’s record up to that time of 12 and 0. As an afterthought, he added:

Incidentally, I think you should know that for the very wide cleft lips I am now using the Millard II almost exclusively, and in the past year have done only one triangular flap and no rectangular flap operations for the wide cleft. In my “canned lecture” carousel, I now am using the Pigott illustrations you so kindly sent me. I am combining this with the little stitch from the opposite nostril to the tip of the advancement flap which you described in Melbourne.
CANADIAN COMPARISONS

BRUCE WILLIAMS, at the Montreal Children’s Hospital, even in his residency began using the rotation-advancement method. Surgeons had previously been using LeMesurier and Tennison. In 1968 he reported a “comparison of LeMesurier and Millard techniques.” Two distances, a point from the nasal floor to the height of the cupid’s bow (a), and to the commissure on the cleft side (b), were the important measurements in the assessment. He found that in incomplete clefts the rotation-advancement graded ahead of the LeMesurier. In complete clefts both ratings were lower than in incomplete clefts, and the rotation-advancement method graded insignificantly less than the LeMesurier. Williams, however, was using the rotation-advancement as originally described without either refinements or extensions, a fact which must nullify, at least in part, the results.

Williams’ original study did cause me to focus more carefully on the commissure as a landmark, but for me the distance from the cupid’s bow peak to the commissure (2 to 3) is the important guideline. With this additional adjunct and the aid of the extensions, the rotation-advancement method consistently checks out exceptionally well.

Remembering that Williams had previously been using the early rendition of rotation-advancement, I asked him recently about his present stand. This was his answer in January 1973:

The more recent modifications, that is, further curving of the upper medial incision and advancement of the small upper triangular flap into the columella, in conjunction with undermining and freeing of the alar carti-
lages with suturing at the dome, have changed the original operation considerably. I would agree with Ross Musgrave that the operations should be listed as the Millard I and II. I usually reserve the latter operation for the wider clefts and in those where I have difficulty in rotating the alar cartilage into a good position. I use only a slightly modified Millard I procedure for incomplete clefts or for those with a narrow gap.

**ANOTHER COMPARISON**

M. A. Dion and J. Parenteau, also in 1968 and also in Montreal, stated:

The senior author has been fortunate to observe the late operative results of LeMesurier, Tennison and Millard methods of repair. Since June 1964, the Millard procedure, which has given outstanding results, has been used as the primary method at St. Justine Hospital, Montreal. . . . We prefer this method for the following reasons:

1. The distortion of the philtrum is minimal, particularly at its lower part where minor deformities are most noticeable.
2. The nostril on the cleft side can be narrowed and permanently fixed in a more normal position.
3. The columella is lengthened, thus correcting the most common deformity in the cleft lip patient. The base of the columella is lifted from the nasal spine and moved toward the cleft side. The techniques of LeMesurier and Tennison destroy the integrity of the lower third of the philtrum and often leave the nostril floor wide and distorted.
4. Because of its simplicity and versatility, this technique is adaptable to all cleft deformities.
5. Revision of cleft lip that was previously repaired in an imperfect manner is readily completed with this procedure.

In the same year, 1968, but at the opposite end of the earth at Lady Ridgeway Hospital for Children, Colombo, Ceylon, Dr. S. F. Wickramasinghe wrote:

Doctors Furnas and Stokley left behind the rotation-advancement operation for cleft lip. I do not wish to sound boastful, but I honestly believe that my results have improved since my conversion.

**AN ALLENTOWN COMPARISON**

It was rumored that Allen Trevaskis of Allentown had actually dared to use the rotation-advancement method in the "lion's
den.” I wrote him in June of 1972, and the reason he gave for his change is confusing, as is the summation of his results, but you had better hear it directly from him:

As Dr. Marcks' associate I had at least 10 years experience in the repair of unilateral cleft lip with the triangular flap method, as conceived by Dr. Tennison and modified by Dr. Marcks.

When you published your first paper, I decided to convert to your method—not because I was dissatisfied, I simply felt that it would be a good opportunity to see if one method was better than the other.

From that time to the present, Dr. Marcks and I "went our different ways" in so far as this specific bit of surgery was concerned. Our friendly competition to produce the best lip permitted an on-the-spot comparison of the two methods.

Naturally my early trials with the rotation-advancement method were punctuated with new problems, but as time passed and as I kept reading your later bulletins—I found some of the answers.

In my experience at least several points of comparison are worthy of notation:

1. The rotation-advancement does not lend itself to building a balanced nasal floor as well as the Marcks' method.
2. The rotation-advancement technique frequently produces a more noticeable scar in the upper 1/2 of the lip.
3. The scars of the Marcks lip are quite thin (by comparison) but this advantage is outweighed by the unalterable direction of scars where scars should not be.

I can honestly say that though the end results are different, one method is not superior to the other. The essence of the matter seems to be the experience and ability of the surgeon, plus a little bit of luck.

**RANDALL'S RANDOMIZED COMPARISON**

It is particularly encouraging that Randall is carrying out a series of cases for comparison in which he is operating upon infants with cleft lip at random, one-third by the Tennison-Randall procedure, one-third by the rotation-advancement and one-third by what he refers to as a "combination of the two." The third group is actually treated by the rotation-advancement plus Randall's triangular muscle flap taken from the cleft side and inserted into a pocket in the lower border of the medial element.

He admits using the rotation-advancement approach in complete clefts but only after a preliminary adhesion. He also has his own
cutoff point for use of the rotation-advancement method set at those cases in which the peak of the bow on the cleft side is more than 4 mm. short of the normal, requiring greater rotation. As he explained:

Poor results for me in the rotation-advancement method come when there has not been enough rotation and poor results in the triangular flap where there has been too much release.

As rotation has never been and should not be a problem and the value of Randall's randomized comparison seemed to hinge on the accuracy of his execution of the rotation, I was pleased when Peter accepted an invitation to stop over in Miami on his way to 1971 Christmas sailing off St. Thomas in the Caribbean. A wide cleft after a four-months adhesion was scheduled, and its execution from the radical rotation to the mucocutaneous interdigitation went well. Randall and I worked together to find a suitable place for the excess skin and mucosa of the "adhesion throw away" along the Muir-Horton-Cramer plan. A small Randall triangular muscle flap had been preserved. With the usual fullness on the non-cleft side, there seemed no real need for it in this case, and with due apologies it was finally discarded.

In discussion later Randall revealed a slight inflexibility when he still insisted that in the more radical rotations the necessity of crossing the midline offered the danger of lengthening the vertical height to a "Mickey Finn" lip. This crystallized for me where others must be hanging up and I presented the following clarification to Randall:

It is advantageous to cross the midline as marked by the mid-base of the columella but it is "against the law" to cross as far as the opposite philtrum column. Not only is the height of the bow on the cleft side short but so also to a lesser degree is the central point of the bow. Both must be lowered into normal position. The rotation may extend slightly past the center of the lip to let the center of the bow down. Then the cut-back will increase the remaining rotation without the necessity of entering the normal column on the opposite side. As long as the distance from the alar base to the height of the bow peak on the normal side is unaltered and remains normal for that lip and as soon as the other two points of the bow are maneuvered into normal balanced position the game is won!
Randall agreed.

In fact, at the 1973 Foundation Cleft Symposium at Duke University, Randall showed a fine result with the rotation-advancement method incorporating his inferior muscle flap. It was in an incomplete cleft, but it is a good beginning.

RUT JUMPING

It is asking a lot to expect a surgeon who has developed his own method and is proceeding with great momentum suddenly to check and veer or "come about." Almost as difficult is it to dislodge an established surgeon set in his ways. Thus, older surgeons are less likely to change while residents, unencumbered, are more receptive. In general, such has been the case with the rotation-advancement even in programs headed by a chief who is adamant in his loyalty to some outmoded method. In most teaching programs the chief will let the residents make their own choice from several standard methods; if not, they merely wait until they are free. . . .

There are established surgeons who enjoy an "open attitude" and with it the ability to adapt, which is responsible for their being able to improve constantly on their own performance.
33. Final Acceptance, Adaptation and Dissemination

COMPLETE BREAKTHROUGH

BOB POOL, who had spearheaded the resistance in 1959, by 1970 had reviewed his cases of rotation-advancement and compared them with his cases of the Tennison type of triangular flap. At Colorado Springs he presented results like this one with a varying follow-up of four or five to six years.

He concluded:

The results from the rotation-advancement were more pleasing functionally and cosmetically due to a more symmetric cupid’s bow, a smoother philtral ridge camouflage, better dynamic and adynamic muscle balance, and less tendency for the occurrence of a redundant flattened lateral lip with a thick vermilion border. Staggered line closures in the lower third of the lip have produced flattening of the cupid’s bow even when the primary measurements were precise and accurate. This unfortunately was not predictable
and could not be quantified. With the rotation-advancement repair this series suggested that the operative posture was an excellent guide to the five year appearance of the lip. Finally, the tip of the advanced lateral flap must not be utilized as structural support from lateral to medial lip. Instead this must form the fullness where the philtrum meets with the columella, and for that reason solid deep muscle support is the cardinal point in obtaining the camouflage of the philtrum.

Finally, in June 1971 Pool wrote:

There is a large misconception in reference to the complete cleft lip. Everyone makes a great point of the width of the cleft and I may have been guilty of this error in the past myself. This is not the critical point, as you well know; rather it is the vertical height that gives greater problem than the width of the cleft. The rotation-advancement repair, in my opinion, is without a doubt the dominant method used by practicing plastic surgeons. Thus I believe that we should stop all this intellectual bloodshed about the other methods and go to the panel discussion of refinements in the rotation and advancement as well as the errors made by the inexperienced in this particular repair.

Another advocate of the rotation-advancement principle in all clefts is steadfast David O. Maisels of Liverpool, who was trained by Osborne, a student of Kilner, and in 1965 spent a year with me in Miami as an R. W. Johnson Fellow. He had the opportunity to see both sides of the lip picture and wrote, in his 1966 Kay-Kilner Prize winning paper, a comparison:

At the end of the scale we have the Kilner/Rose/Thompson type operation which often results in a lip which is too tight, especially after secondary repairs necessitating the sacrifice of tissue to obtain adequate length. This tightness, particularly in the lower third of the lip, produces an excessive moulding effect on the alveolar segments and contributes to collapse. The nasal deformity being uncorrected at the primary operation, subsequent development of the nose is faulty and secondary correction is frequently extremely difficult. . . . At the other end of the scale are the modern operations, the best of which is undoubtedly that devised by Millard, which not only preserves the natural landmarks of the lip and restores them to their normal position, but also corrects the nasal deformity to a very marked degree. This allows the subsequent growth and development of the nose to proceed normally and should render superfluous all but the most minimal of secondary corrections of the nose. By placing the tension high in the lip it has been noted that the Millard operation has a more favorable effect upon the arch alignment (Joss 1964).
He repeated one aspect:

Since it is believed that adoption of the Millard technique for unilateral clefts will eliminate the need for secondary procedures of any magnitude no further discussion on their timing is called for.

Furthermore, Maisels has deigned to extend the rotation-advancement principle beyond lip clefts. As he wrote:

A similar technique is applicable to a number of other situations, principally those in which there is a triangular shaped defect with one base bordering upon a free margin.

Thus he and Nabgy Saad in 1969 applied the principle to the repair of alar margin notches, and Saad and Maisels in 1972 reapplied it to defects of the lip and eyelids.

A TEACHER'S APPROVAL

Bill Holdsworth, trained by Gillies and McIndoe, was one of my cleft lip and palate instructors in England in 1948–1949. He is Australian, born with a yearning for the sea, and whenever absent from Rooksdown House usually could be found as a ship's doctor on a voyage to the New World or "down under." He has large steady hands and as a hobby he constructed toy ships in narrow-necked bottles—two- and three-masted schooners no less, and rigged in full sail. As it is seldom that a teacher acknowledges the work of a pupil, I quote with special pride Holdsworth's 1970 edition of Cleft Lip and Palate:

There is advantage in a plan which can be varied during its execution. To cut exactly on a drawn line is not easy. The skin yields to pressure from the knife, and stretches if pressed or pulled. However accurate the design, angles open less, or more, than expected, and edges to be sutured together are found to be unequal. In such contingencies the only hope of a symmetrical lip is to be able to redesign the opposing flap. The Millard operation is the only one in which this can be done easily. With it the surgeon is not tied to his design, and the plan is never his master.

Holdsworth cited other reasons for choosing this method:
1. Little tissue is discarded. Only the cleft edge is thrown away, and there is no removal of skin from the upper part of the lip to bring about eversion. The natural bow is preserved and can be placed easily in the centre of the lip.

2. Full eversion results from preservation of the border, often in its entirety, and from tightness in the upper lip, where the defect beneath the columella is closed by advancement of the lateral part of the lip.

3. The line of muscle closure is not over the cleft, but more medially, in front of the premaxilla, which provides a better seal than sewn mucosa.

4. Skin can be spared for increasing the deficient side of the columella adjoining the cleft. This makes equalization of the nostrils possible.

5. The outstanding advantage is in the location of scars. These are longer than with other methods, but those beneath the nostril become unnoticeable, and the long vertical scar imitates the absent pillar of the philtrum. There is no other operation which leaves the lateral plane of the lip unmarked, and in the absence of a line running down from the nostril a major stigma of cleft is taken away.

Holdsworth also confirmed a point I have made numerous times, namely, that there is spontaneous correction of contracture if the procedure has been executed correctly.

With single clefts, parents are warned about contraction in the scar, since with healing the operated side of the lip may be pulled out of shape. The Millard operation, with its long scar-line, curved and unbroken, is more prone to this disturbance than most. Providing healing is uneventful, and mucosa has been well wrapped around the back of the lip to seal the muscle union, tightening of the scar will not cause permanent deformity, and resolution can be awaited with confidence. Softening of the lip continues for years, and straightening may take as long. This applies only of course if the operative procedure was performed correctly and the medial element let down fully.

He presented a case that five months postoperatively still showed some contracture but after four years showed perfect symmetry.

SOME EXPRESS NO RESERVATIONS

During the March 1970 Cleft Lip and Palate Symposium in Miami I baited Professor Stefan Demjen, previously of Brati-
Ever since Clifford, Pool and Musgrave started the idea that the rotation-advancement method is unsuitable for complete clefts, many have been hesitant, even afraid to try it.

Demjen, an adroit technician with vast experience, gave an answer that was pertinent:

Yes, it has almost become a superstition. I don't know why as I have never found any difficulty with it in complete clefts. It is not how long you make it, it is how you make it long—but the rotation 'back-cut' is important.

In Colorado Springs in 1970, as Pool was giving an erudite evaluation of the rotation-advancement method in all types of clefts which he substantiated with excellent lip results, Georgiade in the back of the lecture hall whispered:

I don't know why there is so much discussion. I've never seen a cleft yet in which I couldn't do a rotation-advancement.

This flat-footed statement by such a light-footed tennis player stimulated my extraction of a summer of 1971 invitation to Duke University. It was a visit long overdue for me as I had been anxious for years to see with my own eyes the North Carolina unit which Ken Pickerell pioneered into one of the strongest and most productive plastic surgical teaching centers in the world. I had an opportunity to observe Nick Georgiade do a two-layer Campbell alveolar cleft closure and a rotation-advancement procedure on an incomplete cleft lip. His surgical ability during the entire procedure was impressive. I was invited to do a wide complete cleft which caused me a little more than the usual difficulty but which seemed to turn out pretty well. Then I stood over senior resident L. McCraw while he rotated and advanced a complete cleft with both skill and poise. To my great pleasure but much as expected, Nick had backed what he claimed and "in spades."
A YOUNG TURK

A worthy proponent of rotation-advancement in the Middle East has been Guler Gursu of Turkey. She works in Ankara, once the land of the Hittites but now a typical college town. It was somewhat disillusioning to discover that since 1923 the fez, veil and harem have been banished legally from this exotic country. In the same spirit of progress, some of Turkey’s more enterprising doctors travel to foreign hospitals to study.

“GiGi,” as she has become known in the States, became a resident under Barsky, Simon and Kahn at Mt. Sinai Hospital in New York, where unilateral clefts were getting the LeMesurier and Tennison treatment. Then, at a cleft palate meeting in Washington, D.C., in her usual forthright style, she asked me a leading question on lip in the hotel coffee shop and received several sketches on a paper napkin. Upon return to Mt. Sinai, she solicited the cooperation of senior resident Saul Hoffman, and together they did their first rotation-advancement operation in “silencio.” Later in 1961 Gursu accompanied our plastic team to Jamaica on a “cleft” trip and spent several weeks in our unit at the University of Miami. Then she returned to Turkey and by 1965 had become associate professor and chief of plastic surgery at the modern university in Ankara, Hacettepe Medical School. This is an abstract of her fight for plastic surgery:

There was no chair for me. I do not mean academic, I mean even a chair literally to sit on, no instruments, no residents, no program and no patients!

This girl, with flashing dark eyes behind glasses and true Turkish tenacity, scimitared her way inch by inch until in 1967 she had developed a respectable plastic surgery service. Then, at the Rome International Congress, she noted the extensions in rotation-advancement, as she wrote in 1973:

I had been able to close every wide cleft before the circumalar incision extension but after 1967 that little trick made it much easier for me and gave better results for the patients.
Over the past seven years she has rotated and advanced 175 times, and, as she says,

Rotation-advancement is easy to perform, does not require complicated measurements and it is very simple to teach. It usually takes me no more than one or two cases with each resident helping him mark the anatomical points and plan the basic rotation of flap A with its “back-cut,” advancement of flap B with its extended alar incision and use of flap c. Then they have to learn to fiddle around in their own way with the final millimeters.

Her first resident, Onur Erol of Istanbul, who found this method easy to learn and teach, is at present working on an in-depth study of 563 clefts seen at Hacettepe University from 1957 to 1971.

FINLAND

From the Finnish Red Cross Hospital for Plastic Surgery in Helsinki, where 99 percent of clefts of this country are treated, V. Ritsila, S. Alhopuro, R. Ranta and A. Rintala reported in 1973:

The surgical procedure has included our routine method of modified Veau’s anterior palatoplasty with mucoperiosteal flaps to the nasal lining and repair of the lip with Millard’s rotation-advancement technique.
Gerald O'Connor pointed out the unpretentious, clairvoyant George Scrimshaw, chief plastic surgeon of the Kaiser group of hospitals, as having "one of the best lip and nose repairs in the Bay area." I wrote Scrimshaw, of Oakland, California, for detail. He responded with sketches and expounded with specifics:

I have used the rotation-advancement technique for all clefts in the past ten years. It has been, for me, satisfactory in all cases, and I prefer it to any other present operation for lip repair. Everyone modifies each technique as he uses it, and I found early that I could work out my results better with certain changes. Some of these were presented in one of your later papers and I was pleased that my changes were in the same direction. . . .

In unilateral clefts, I have found specific measurements to be a very dependable guide during surgery. Most of my patients are approximately 3 months of age at operation. At this time the distance from the midpoint of the columella base to the normal peak of Cupid's bow (AB) is between 9 and 11 mm., usually 10 mm. This is also the distance from the normal alar base to the Cupid's bow peak (CB). Usually the distance from the alar base to the lip vermilion directly below it (CD) is also 10 mm. Thus AB = CB = CD. In measuring the cleft side, I measure from the alar base and describe an arc 10 mm. in radius. Where it intersects the skin-vermilion border is the proposed peak of Cupid's bow for the lateral segment.

From the normal Cupid's bow peak, I measure 2 mm. toward the cleft to obtain the center of the Cupid's bow and 2 mm. again for the proposed peak on the cleft side. Incisions are made along the vermilion base as you described but my skin incision passes very little beyond the base of the columella. However I free deeply by cutting the muscle and deeper tissue subcutaneously as far as necessary to allow the prolabium to flap loosely into position without pull or tension forcing it. It is often necessary to carry the mucosal incision across the frenulum for adequate relaxation but this does not appear to disturb healing or the function of the frenulum after healing.

Once the peak of the bow on both medial and lateral elements is easily located 10 mm. from the indicated points, I contour the adjoining sides into a gentle curve concave toward the midline simulating the philtrum ridge trimming mostly skin and dermis and leaving muscle for bulk. The lateral wedge flap advanced medially must be sutured muscle to muscle.

If the nostril floor is in excess, a triangle is removed but if a complete
cleft is being repaired, the floor is made of tissue taken from the lower medial area of the nostril rotated upward to meet the tissue from the lower lateral nostril area. To free the lateral nostril base adequately, an incision is made directly into the nostril below the alar base creating a flap which when elevated would advance medially bringing the alar cartilage with it. I have tried Skoog's method of suturing the alar to the upper lateral cartilage, but these structures are very thin and my needles and scissors do not appear fine enough to do this without tearing. I have tried the small "white line" flap but have not had much success with it. I occasionally left excess vermilion at the line of closure hoping to use it later for central tubercle bulk anticipating some thinning with growth. I have almost stopped doing this because of the limited number of cases in which it was valuable.

He added a P.S.

Most of my local colleagues tell me that after a rotation-advancement closure, the lip shortens but later lengthens again. . . . I have not found this in my cases . . . the length remains the same as set at operation. I suspect they do not adequately free the prolabium and pull it down so it retracts upward again later. Those I have seen do not "come down" again. In my own cases there has been no problem.
Nestled in the ancient, cobblestoned village of Antigua in the interior of Guatemala and almost in the shadow of a volcano is the unique and immaculate Centro Infantil Estomotologia of Oscar E. Asensio del Valle, an oral and maxillofacial surgeon of the University of San Carlos. Here in 1970 the proud and practical Asensio, who does about 150 cleft operations a year, presented fine examples of his modification of the Mirault-Blair method, demonstrated a case under local anesthesia with skillful precision and then allowed me to rotate and advance a couple of difficult complete clefts.

Two years later he sent me a reprint of an article published in a 1971 Venezuelan odontological journal diagraming his modification of the rotation-advancement method.

I was pleased to see his back-cut on the rotation, interested in his reversion to the old use of flap c with little or no aid to the columella and happy with his advancement of the alar base across the cleft to achieve a round nostril. His only true modification, however, is an exaggeration of my "concavity making" of the lateral cleft edge. Asensio actually excises a very large "Thompson-type" angle-shaped full-thickness piece of good tissue (9-10-11) to facilitate (temporarily) lateral edge lengthening without lateral paring. Incidentally, he is throwing away quite a bit of usable tissue on the non-cleft side also. The double sacrifice of unexpendable tissue in clefts already deficient must magnify the discrepancy. In spite of this discard of principle, Asensio sent me some interesting early postoperative results.
Cutting the advancement flap into a long, narrow rectangle produces an unnatural scar line in a more visible position.

In my opinion, the closer Asensio holds to the refined standard rotation-advancement method, the better his results.

The longest result he sent was six months postoperative and encouraging.

The plastic surgery division of Stanford University has appointed Asensio to its teaching staff and rotates residents through his hospital, where there is an abundance of clefts. Donald Laub for Asensio at the Waldorf-Astoria Hotel in New York, June 1973, presented to the American Association of Plastic Surgeons this modification of lengthening the lateral side to save mucosal paring in wide clefts. He projected slides of these same cases.

Musgrave, spotting the narrow advancement flap actually crossing the normal philtrum column, rose and approached the microphone:
I have been one of Millard's severest critics so it is only fair that I question Asensio. It is predictable that his lips will increase in vertical length as the LeMesurier method did. In fact, from the photographs, the A-P, not the under view, I can see the lips are already long.

This was like having Larry Little, Dolphin A.F.C. offensive lineman of the year, leading the interference. It gave me a chance to score around end against Asensio's temporarily expedient excessive wedge resection of lip from the deficient side. In fact, Randall asked Asensio, "Where did the muscle go?"

My comments were confined to principles:

Although this modification by title is designed for wide clefts, actually what is important is not how wide the cleft but how short the vertical length of the lateral edge. It is true Asensio can lengthen the lateral edge as Rose and Thompson did but again it is at the expense of mid lip side-to-side shortening and this is too great a sacrifice. Anyway, keeping the bow peak to commissure distance equal offers no real problem and there are better ways of achieving lateral cleft edge length than throwing away good lip.

In the face of this attack the poised Asensio responded in Spanish, which was translated adroitly by Mark Gorney:

I do not take away as much tissue as it seems in these drawings.

Then, of course, he comes into line with the refined rotation-advancement, which also concaves the lateral cleft edge.

Donald Laub's comment following my "voice of polite dissent" in Plastic and Reconstructive Surgery in 1974 gives strength of length to my stand:

Recently we have noticed three patients repaired by the Asensio technique as infants, followed-up for more than one year. They seem to have a long lip on the cleft side . . .

In fact, Laub and Kaplan of Stanford Medical Center have survived the Asensio "rapids," at least rotation-advancementwise, and after 182 Asensios and 100 true rotation-advancements have, as they say, made "the full circle" return to the rotation-advancement. They support my present modifications which are the natural process of evolution of this principle. These include lip
measurements using the commissures and labial muscle reconstruction, both of which I presented at the 1973 Cleft Palate Symposium at Duke University, as well as concave shape of the advancement flap and frequent need for a back-cut on the rotation, both of which I presented at the Rome Congress in 1967 and published in my 1968 "Extensions."

In September 1974 Ernest Kaplan sent these diagrams of the rotation-advancement method with explanations. His quotes will be followed by my comments.

He made the point:

I have not been using the C-flap for columella reconstruction. I believe I achieve equivalent lengthening because of the nearly straight line of the rotation, thus the C-flap is greater in vertical direction when it is transposed.

*Answer:* Not really. I have been through all of this years ago as it is merely returning to my original use of c flap as nostril sill which simply does not achieve as fine shaping and lengthening of the columella.

He noted:

I also have found that it is necessary to release the C-flap from the septum to allow it to ‘ride up’ into a more superior position.

*Answer:* Yes, this was also published in 1967 and 1968—but with far more release than shown by Kaplan. As a matter of fact, this is a partial contradiction to his claim of not using c for the columella.
He mentioned:

Also, the wider quadrilateral advancement flap adds height under the columella and this also increases the vertical height. Have you tried this?

**Answer:** This long, skinny quadrilateral flap is a holdover from Asensio and does not give the natural philtrum line. Of course, the back-cut necessitates snipping off the very tip end of the advancement flap for a perfect fit. Then by switching the tail of flap c back into the back-cut to shape the cleft side hemi-column and lengthen this part of the columella, the quadrilateral defect is kept to an artistic minimum.

There is also Kaplan's holdover of Asensio's alar base (F) flap being sutured to a raw area on the septum. This was being used in Korea in 1954 (page 232) but the new methods of handling the alar base, as shown in this book, should be much more effective.

The basic problem with Kaplan's entire rendition, as seen in his diagrams, is that the rotation incision does *not* ascend high enough to the columella base (his b') on the cleft side. This cuts flap c too large, placing the rotation gap and subsequent scars too low in the lip, thus forcing Kaplan's compensations.

**AURICULAR ADJUNCT**

Cesar "Valentino" Arrunategui of Trujillo, Peru, consultant at the Barsky Unit in Saigon, presented before the Vietnamese Society of Plastic Surgery in October 1972 a paper entitled "The Addition of Tissue in the Unilateral Cleft Lip Repair Associated
with the Millard Technique." This is of special interest for two reasons. Arrunategui studied under Tord Skoog in Uppsala for nine months in 1969 but uses the rotation-advancement lip principle. Convinced of its value in all cases, he has proposed a sound adjunct for very wide clefts when he feels there is a vertical deficiency of tissue in the lateral flap when measured from the alar base to the vermilion border. After the rotation-advancement (and other methods also) he finds, as do other surgeons in the unit, that the ala ends up lower than normal with its inner part rotated downward and medially giving a wide structure to the inferior part of the ala.

He favors a wedge of whole-thickness skin graft taken from the auricular lobule, semilunar in shape and not more than 3 to 4 mm. wide. As he explained to me in 1972:

When the rotation-advancement flaps have been sutured into the right position, measurements are taken from the lower part of the base of the ala to the mucocutaneous line and compared with the normal. The difference will give the approximate amount of graft to be added between the ala and lateral flap. It is sutured in with 7-0 silk.

In my experience the lateral flap has very rarely been so inadequate that it cannot be made to carry its own. Lateral paring more than a few millimeters beyond the normal limit is taboo. Yet there is another way out of this difficulty. The upper hori-
zontal incision can be made higher, cutting through several millimeters of alar base which is left on the upper part of the lateral flap. This increases vertical lip length with no serious consequences to the more than adequate alar base length.

The addition of an ear graft is another approach which is to be commended because the surgeon has put first things first and not forsaken a vital fundamental principle because of a local correctable deficiency.

TEACHABLE

A meticulous, fastidious and artistic surgeon with a hi-fi personality and a sense of drama is Mark Gorney of San Francisco. He wrote a glowing report upon his return from two and a half months in Vietnam with the Children’s Medical International:

It has certainly been one of the most fantastic experiences of my life. It is of some interest to you in that we were doing on the average of four to six clefts a day and when I left there was still a backlog of 52 that I had not been able to schedule. Although Wynn and Randall had preceded me, you will be happy to know that ALL lips are being closed by the rotation-advancement technique. On one day I took on four cleft lips and did each one by a different method and one month later we compared results; there was just no question in the trainees’ minds which gave the best results, and above all, why. In the past 10 months the three trainees have done over 400 cleft lips between them.

LEAVES HIS MARK

A year later Mark Gorney returned to Vietnam. His report examplifies the reward a teacher enjoys when he has planted seed in fertile soil.

In the waning moments of my second Vietnamese journey I stood quietly behind our senior trainee while he laboriously took our west junior trainee through his first rotation-advancement. I was amused to hear him using the same aphorisms I had taught him the year before. At the end of 1½ hours the doctor doing his first lip had done an admirable job. Suddenly all the frustration and all the shoveling against the tide dissolved into a very warm feeling of satisfaction.
TEACHING THE RESIDENTS

On my plastic surgery service at the University of Miami, the residents scrub with me on a number of cleft lips before they do their first one under supervision. They are expected to understand the theory completely before undertaking the “practice.” With that preparation they not only enjoy the operation but achieve superior results, as seen in this patient operated on under supervision in 1971 by senior, senior resident John Devine and reviewed one year later.

FROM ISLAND TO ISLAND

Victor Hay-Roe of Honolulu, formerly an ardent surgical resident in Pittsburgh, does a nice rotation-advancement even on the most difficult of complete clefts in which the discrepancy in the height of the two bows on the medial element was horrendous. In fact, it was well over half the vertical length of the lip, possibly two-thirds!
He did not quite agree with his former chief Musgrave's earlier feeling as to the difficulty of teaching the method. His story is a fascinating adventure in paradise. It takes place on the Polynesian island of Western Samoa where 130,000 natives live in thatched, stilted *fales*. The only trained surgeon is an American-educated Belgian named Walter Vermeulen, who completed four years of general surgical residency at Queen's Medical Center in Honolulu in 1968.

Hay-Roe showed me a photograph of Vermeulen's first case and told me,

> It was after Walter's first attempt at lip repair using the description of a Mirault-Brown-McDowell as supplied in Christopher's *Textbook of Surgery* that he wrote to me asking me to come down to help him with some of his more difficult plastic cases.

Hay-Roe sailed over to Samoa, assisted Vermeulen to do one rotation-advancement and left a set of my reprints with him. After an interval of one year from his first case, he sent Hay-Roe an encouraging record of his unaided use of the rotation-advancement method. It was probably an easier case, and there are still discrepancies but even so . . .

**KUALA LUMPUR**

V. Sivaloganathan of the University of Malaya, Kuala Lumpur, in 1972 reported on 86 cleft lip cases treated over a 20-month period, covering briefly all aspects from incidence to assessment. Surgery was reported without fanfare:

Millard's rotation-advancement technique, with some modifications, was used in all the patients. . . . The overall results of management have been satisfactory to the surgeon. The parents have been pleased and relieved. Teenaged and adult patients showed immediate psychological improvement.

**EVEN UNTO KATMANDU**

Edward Lamont of Hollywood, California, and the University of California, Irvine, wrote of his 1971 visit to Shanta Bawen
Hospital in Katmandu, Nepal. Huddled in one corner of the main ward, which was filled with Nepalese with odd diseases and the usual number of lepers, was a beggar woman in her late teens with a boy of four and a six-month-old baby with a wide unilateral cleft. She had walked with her little boy from the foot of Mt. Everest for seven days and seven nights with the baby on her back.

This was only 15 years since the first Westerners had been allowed into the country. As no lip or palate clefts had been treated except by someone merely sewing the edges together, Lamont had been invited by G. Mack to start a cleft lip clinic with a demonstration of a lip procedure that could be used for all forthcoming clefts. Lamont recalls:

I was given a fleece lined scrub suit and advised it would be quite welcome when the temperature dropped to 50 below zero. General endotracheal anesthesia was given competently by a Nepalese doctor trained in England. It was my decision to employ the Millard cleft lip operation for my Nepal heritage because for someone who is not a plastic surgeon, less can go wrong. One approximates one wall to another and gains length by creating interdigitating flaps in a relatively cosmetically silent area. With just two or three opportunities to present the lip operation I was concerned that any procedure presenting triangular flaps on the lower portion of the lip might lead to confusion.

I have long been a devotee of carefully measuring the non-affected side, from the base of the nose to the tip of the vermilion (in the three to four month old baby in the States it approximates 12 to 13 mm.). Because I had no calipers, in this case I measured the distance with a cotton applicator stick. Then I marked off the triangle in the lateral lip at the alar base, and the incision below the columella, and again measured these with applicator sticks bent to form with greenstick fractures and cut off at these dimensions to serve as a pattern for this first operation and for all future procedures. The rotation-advancement operation was accomplished uneventfully.

When the baby was returned to his bed, it was found that the tiny mother had climbed up into the crib with her four-year-old son. She received and cuddled the postoperative infant, but as soon as the sutures were removed the three set forth on the long trek back to their Himalayan lair.
Only weeks later, Lamont received news that Dr. Mack and his assistants had continued to operate on a number of clefts, including that of the Secretary of State's son!

Just when it seemed that general application of the rotation-advancement principle in all types of clefts was being accepted, M. Lomas-Fuentes of Mexico City, at the Sixth International Congress in Paris, August 1975, presented this conclusion from his experience.

Dr. Millard's technic is best for repair of the complete, wide cleft and Dr. Tennison's repair is useful for closure of the incomplete one.

At first I was undecided whether to laugh, scream or just ascend 36 floors and jump off the top of the Congress Hotel Concorde-Lafayette! As a compromise Lomas-Fuentes is referred to in Chapters 24, 27 and 29.
THERE is still a small corps of surgeons who do not understand the back-cut and, rather than include it at the end of the rotation incision, prefer to place it separately in the inferior portion of the lip.

In 1966 Takuya Onizuka proposed in the Japanese Journal of Plastic and Reconstructive Surgery a tiny Tennison flap as an adjunct to the rotation-advancement method much as Skoog had done years before. In 1972, from Showa University in Tokyo, Onizuka elaborated in English his preference for the rotation-advancement principle. After 2,000 cases he concluded:

All methods have advantages and disadvantages. Millard's method is no exception.

He then describes what he considers the disadvantage:

Especially, elevation of the cupid's bow on the cleft side is conspicuous and the shape of the cupid's bow on the cleft side is more peaked if compared with the smoothly curved shape of the normal cupid's bow.

Acknowledging my 1 to 1.5 mm. "white roll" flap and expressing his fear of the Tennison-Randall larger triangular flap causing cupid's bow droop "due to overgrowth of the triangular flap," he suggests using the rotation-advancement method but inserting a small triangular 2.5 mm. flap at the mucocutaneous junction. In other words, Onizuka is joining Skoog's earlier design by adding 1 mm. to the white roll flap.

Onizuka says:
If the difference of the two peaks is over 3 mm., the small triangular flap (limited to 2.0 mm.) should be used. Otherwise Millard’s method must be applied.

He is against use of the standard triangular flaps of Tennison and Randall in infants because of the resultant distortion that occurs from what he refers to as “the rapidness of the growth of the lip.” He admits, however:

The limit of the flap should be less than 2.5 mm. but it is not clear presently about how much of a deformity will occur after operation since it has only been a few years since application in infants.

As this flap calls for an increase of only one millimeter or less from the original white roll flap, we are now quibbling over split millimeters. Yet, in principle, I must say again, if the back-cut is used properly, it does not matter what the original difference in the height of the peaks of the bow is. The 1.5 mm. wide white roll flap is not designed to lengthen the cleft side even though it can do so slightly; its main purpose is camouflage: to construct a continuous white ridge across the scar of union at the mucocutaneous junction. It should be made, therefore, the width of each specific white roll, whether it be 1 mm. or 2 mm.

Also in 1966 Jean Paul Lintilhac with J. P. Cochain of Paris discussed the rotation-advancement method:

Theoretically, the curvilinear skin scar, not interrupted by a flap, best imitates the philtral ridge.

On this last point, our experience in particular with Moroccan infants, who are very prone to form hypertrophic and retracted scars, has shown us that often an upward retraction of the mucocutaneous line occurs. This problem must have been encountered by Millard, since in an article published recently [1964] he describes a small rectangular flap involving only the mucocutaneous junction, a modification which he had personally communicated to one of us at the end of 1962, but which when tried did not seem to entirely resolve the problem for us. This is why, since 1963, we have returned in the majority of cases to a small, triangular flap, which we previously used in association with the rotation-advancement flap.
Actually from the diagrams of their design, it seems there is very little difference from the 1964 rotation-advancement including the tiny mucocutaneous flap.

AGA I N  A M A T T E R  O F  A  M I L L I M E T E R

Then came a similar hybrid which will receive more attention than it deserves because of the principle involved. Leslie Bernstein, a South African E.N.T. surgeon at the University of Iowa Medical Center, in 1969 was quoted by the *J.A.M.A.* "Medical News" under the misleading heading, "Repair Procedure Returns 'Pout' to Wide Cleft Lips." He said:

Because the standard procedure is so good . . . I selected only candidates . . . that were certain to be failures with standard procedures.

His photograph of what he referred to as "conventional results with a similar congenital defect" revealed his lack of adequate rotation and inadequate use of the lateral advancement.

In 1970 he reemphasized what he called a modified rotation-advancement operation using the same "Tennison type but Randall sized" flap that Skoog described in 1958, Meyer presented in Hamburg in 1966 and Onizuka published in Japanese in 1966. His motive seems commendable as he adopted a quote from McDowell to be used in his own context:

... any new design will be adopted alike by superb, average, and clumsy surgeons ... this modification ... is being offered for use in wide unilateral clefts of the lip in the hope that it will produce improved results.

(It never occurred to me to design an operation for a clumsy surgeon, but it *is* a thought!)

In his address to otolaryngologists interested in plastic surgery at the American Academy of Facial Plastic and Reconstructive Surgery Meeting in New Orleans in 1969, he restated, in a British accent, an old wives' tale:

This is an excellent procedure for partial and narrow clefts ... When applied to wide clefts there is often a tendency to contraction of the main scar, so that a short lip results ...
Yes, if the method is not done correctly, this and other secondary deformities can occur. Then he repeats another common misunderstanding:

Also, when the cleft is wide, there is a need to extend the incision for the rotation flap beyond the midline in order to gain additional vertical height.

This surgeon keeps referring to more recent descriptions of the rotation-advancement operation but continues to use them to whatever advantage suits him and completely ignores the important message in the later work, i.e., the back-cut, which is the essence of rotation negating any need to cross the column and enter the uncleft side of the lip. A study of Bernstein’s marks on one of his complete clefts reveals lack of back-cut in rotation and lack of nasal extensions for advancement and explains why he had trouble.

Another inaccuracy reads,

Not infrequently the vermilion grows into the lower part of the scar, leaving a permanent red streak.

The vermilion does not grow into anything. The skin scar extending directly to the vermilion gives the eye the effect of an extension suggestive of a contracture. For this problem he does get his statement correct:

To overcome this Millard has designed a narrow little skin flap from the lateral segment to create the white ridge at the vermilion-cutaneous border.

The white roll flap measures 1 to 1½ mm. in width, and Bern-
stein has gone to all this trouble to justify increasing this flap 1 to 2 mm. more.

It is amusing that Gerald Hodge, Professor of Art, University of Michigan, for Grabb, Rosenstein and Bzoch drew the white roll correctly in one sketch (A) and in another (B) inadvertently made the flap 1 mm. wider at its base, a cross between my white roll flap and the Onizuka-Bernstein flap. Bernstein accused me of using "his" flap without giving him credit!

There was so little difference that I actually missed the artist's very slight discrepancy but suggest you do not!

This questionable modification publicized by Medical News with its second inferior triangular flap is similar in principle to what Skoog proposed 12 years before. Yet, in my experience, this interruption in the philtrum column and violation of the dimple is unnecessary if the surgeon executes the rotation and the advancement correctly. That view seems substantiated by the results published by Bernstein, who, in my opinion, has tried to milk a mile out of someone else's millimeter.

DOUBLE ROTATION

Motomasa Sasaki of Sapporo, Japan, when grading his rotation-advancement cases, reported an occasional peak of the bow on the cleft side to be high. To counteract this contracture or failure to rotate sufficiently, Sasaki in 1969 developed a double rotation-advancement, a large high one as in the original Millard and a little low one as in Skoog, but as a curved rotation incision rather than the Z of Tennison. During Sasaki's visit to Miami
in 1971 he was introduced to the back-cut in the high rotation to save him the need for the low rotation incision. He seemed particularly pleased with a demonstration of the white roll interdigitation at the mucocutaneous junction line.

A PLEA

It is hoped that Onizuka, Meyer, Sasaki, Lintilhac, Perko, Bernstein, and others similarly tempted to act at this low level, as their experience increases, will perfect the back-cut and forget the "low cut" except as a camouflaged white roll.
34. Berkeley Joins Forces

O V E R the years, Bill Berkeley and I have maintained a friendly but heated battle over clefts which was constantly flaring up in the literature, during open discussion on the floor at meetings and once in the john. One letter from “Wild Bill” Berkeley challenged me to “scalpels at dawn” in a duel with each of us operating on a cleft lip and then comparing the results. In July 1970, before this confrontation could take place, Berkeley in his typical explosive honesty wrote again:

I want to extend a belated apology for my failure to appreciate fully the excellence of your lip repair. I now believe, as you do, that it will give a superior lip and I also feel that in combining my nasal reconstruction with your procedure that the two complement each other in a way in which none of the other lip and nose procedures do.

This gold star marks a special moment for R-A because of my personal affection and respect for Bill.

He later explained that his section for Grabb et al., which was to be published later in 1971, had been written before his “change of heart” and accounted for his old refrain,

The Millard Technique, a more free-hand method . . . requiring a more artistic touch, produces a superb lip . . . but I find this the most difficult of the four techniques to master.

DUEL IN THE SUN

So, in January 1971, a special operating workshop was scheduled for Bill Berkeley in Miami. The cases were chosen to enable Bill
and me to heal old wounds and open new ones! One of the cases was a unilateral cleft in which the rotation-advancement method was demonstrated. Berkeley was pleased with the lip but expressed a slight disappointment that the columella lengthening had not been followed with more radical nasal correction including an external skin incision. He asked if I would accept a midline columella incision, and I admitted that I would. He then demonstrated the hemi-rotation of Joseph using an external nasal incision extending well over the nasal tip in a secondary cleft lip nose. The conformity correction was impressive, and only the scar posed a potential problem.

I waited one full year for the scars of our duel to have time to soften and then in January 1972 called Berkeley by phone one night and asked him to sketch and sign or initial his design for what he considers the ideal primary correction of a complete cleft lip with a marked nasal deformity. This is what he sketched and initialed. He marked rotation flap A, advancement flap B and little flap C much as I have described previously. His specific description for the nasal correction is pertinent:

With a double prong hook placed in the roof of the cleft nostril, the roof is elevated so that one can definitely define the mid line between the two medial crura making up the columella. Mark in the mid line of the columella and extend the line well up into the dome of the nose. In severe deformities of the nose, this line may continue upward in Joseph fashion curving laterally above the upper margin of the lower lateral cartilage. The position of the mark is thus between the upper and lower lateral cartilages similar to the plan for the creation of a Joseph lift of the ala.

The arrows indicate the general flow of four participating elements in the combined correction of the lip and nose. The rotation flap or flap A has been created by making the full-thickness cut through the lip salvaging as much mucous membrane as possible on the interior of the lip. The incision through the lateral element develops the advancement flap and partially frees the base of the ala. Neither flap is actually ready for rotation at this point in the dissection.

The mid line columnella incision is made between the medial crura of the two ala cartilages exposing the cartilaginous septum. Careful dissection is required at this point to prevent trauma to the cartilaginous septum. The dissection should be performed as in a submucous resection, beneath perichondrium. This dissection will later communicate with the dissection
for the development of the vomer flap in Figure E. When the dissection is complete the defect side of the columella rides free and contains the medial crus of the defective cartilage as well as the c flap. Posterior to this the vomerian flap rides free so that the medial crus can rotate upwards to assume its normal position. The c flap should be thought of as that important element necessary for the formation of the foot of the columella on the defect side.

With a mouth gag in place, the palate is exposed. An incision is made at the posterior margin of the hard palate at the junction between nasal mucous membrane and the oral mucous membrane on the medial side of the cleft margin. This incision is continued forward around the base of the pre-maxilla. It then continues forward to the peak of Cupid's bow. This completes the lateral circumscription of flap c. Using a Freer elevator, the vomerian flap is fully developed by elevating the nasal mucous membrane from the septum throughout its entirety. This is also known as the Veau flap. A similar incision which is somewhat harder to develop is made at the junction point of the nasal mucous membrane and the oral mucosa on the lateral cleft element beginning at the posterior extent of the hard palate. Using a combination of the small Cronin elevator and a Freer elevator, this flap can be developed up to the base of the inferior turbinate. Anteriorly this incision continues around the maxillary component to join the incision at the base of the ala. When this dissection is completed, the base of the ala is totally freed so that it can then rotate medially to that extent which is necessary. The freeing of the two nasal mucous membrane flaps is not considered complete until they can be sutured from posterior to anterior without tension from the oral side.

When viewed from the oral side, the degree of freeing along the buccal sulcus can be seen. One frees along the buccal sulcus line to whatever degree is necessary to completely mobilize flap B so that it can interdigitate with the apex of the incision created by the development of the rotation flap on the medial lip element. The mucous membrane closure of the advancement flap is not made until the floor of the nose has been closed sufficiently forward so that the remainder of the floor of the nose can be closed through the nostril anteriorly.

The dotted line represents the closure of the floor of the nose using nasal mucous membrane (Veau flaps) and this closure is continuous into the floor of the nose and out onto the lip.

The bowstring in the cleft nostril runs along the upper margin of the lateral crus of the lower lateral cartilage from the apex of the nasal cavity down to the margin of the pyriform sinus. This is a constant finding in the cleft lip-nose deformity and we have chosen to correct it with a z-plasty as depicted in Figure G. If one attempts to develop the z-flaps in the
opposite direction, the result is a reverse z which defeats the purpose of gaining added length.

The medial crus as well as the dome of the defective cartilage is freed up subcutaneously so that one can define the angle and the normal anatomical dome. In severe deformities, the Joseph incision is continued upward so that the entire lateral segment of the lower lateral cartilage is defined. Through this incision the upper margin of the lower lateral cartilage can be sutured to the lower medial aspect of the upper lateral cartilage on the opposite side as described by Horton and Reynolds. This gives greater assurance for obtaining nostril symmetry in difficult cleft lip-nose deformities than the simple advancement sutures between the two medial crura of the lower lateral cartilages. In the lesser defects, the simple advancement sutures between the medial crura are sufficient to insure nostril symmetry without overhanging on the defect side.

The floor of the nose is closed anteriorly through the nostril thus completing the reconstruction of the floor of the nose from the posterior margin of the hard palate to the base of the ala. The base of the ala and the foot of the columella must then be carefully closed using the marriage suture of Marcks. This suture must be deeply placed in order to accentuate the lateral nasolabial angle on the defect side.

The final closure of the lip includes the all important muscle closure followed by the skin closure. . . . The mid line columella incision is closed with a 6-0 atraumatic suture and leaves little or no perceptible scar.

In spite of the recent "improvement" in his plan with the incorporation of rotation and advancement, it was imperative to present at least one of his cases. Berkeley sent two examples with the following labels.

1. a. Born 2-10-72.  b. Repair of lip (Millard), nose (Berkeley) and anterior palate (Veau); local with sedation (Straith) on 3-24-72.  c. Final photograph one week postoperative on 4-1-72.
a. Born 2-8-71. Lip and nose design marked.  
b. Repair of lip (Millard), nose (Berkeley), floor of nose (Veau); local with sedation (Straith) on 4-26-71.

c. 4-30-71, four days after surgery.  
d. 7-15-71, 2½ months after surgery.

As Berkeley's changeover to rotation-advancement has been relatively recent, he does not have long enough follow-up to show his promising results to their best advantage. In his typical honesty, he concluded:

Nothing seems to come up to my standard when I examine them closely but I hope that the basic plan as we now are performing it is on the right track.

As for local anesthesia in the intubation era, I do not know whether to question Berkeley or pin a medal on him. Personally, if I tried to work under these conditions I long ago would have been talking to myself and answering.
IT was not long after Berkeley’s provocative visit to Miami that I was scheduled to demonstrate over live TV a cleft lip closure at the Fifth International Congress of Plastic Surgery in Australia. When the preoperative photo of the severe cleft that O’Brien had saved especially for me arrived, I began looking at travel folders for a February holiday in Alaska. Yet the temptation to go for a primary nasal correction without external scars at the time of the lip rotation and advancement was too great. I postponed a trip up the Yukon and headed down under.

The time was the hour and a half at the opening of the International Congress on the morning of the first day, February 22, 1971. The place was St. Vincent’s Hospital, Melbourne, Australia, before the color television cameras with 14 viewing sets at the Masonic Centre for the international membership. The patient, 11 weeks old and having wide unilateral cleft with severe nasal distortion, was “kindly” presented me by Bernie O’Brien, who also masterfully engineered this first color TV medical presentation in Australia.

The panel of opponents which had been collected included Skoog, Johanson, Manchester, Randall and Davies, and these were partially buffered by a gentle moderator, Bill Lindsay. In my opening remarks, I explained that if I were back in Miami on such a wide and difficult cleft patient I would use a small adhesion at one to two weeks of age, let this mold the maxilla and then at five to six months do a vomerine flap closure of the hard palate as Manchester advocates, an alveolar cleft closure with possibly a Skoog periosteal flap and then a rotation-
advancement closure of the lip. With the nasal structures less
delicate at six months, the more radical correction would be
facilitated. As this was not Miami, there was no time for adhesive
action.

With one of Benny Rank's top registrars, Felix Behan, as
assistant, I proceeded to do the rotation-advancement, emphasizing
the back-cut. Then we launched into a radical nasal correction. The incision which freed the lateral lip from the maxilla
was extended in the usual fashion in the vestibule along the
intercartilaginous line of the nasal lining to free the abnormal
attachments of the alar base. In this case this incision was carried
around under the tip and joined the membranous septal incision
previously started from below for the advancement of flap c into
the columella. The alar cartilage was freed by undermining from
the skin, and the skin was also freed from the septum at the
tip. A white 4-0 nylon suture picked up the slumped alar cartilage
at the junction of medial and lateral crus and stitched it up onto
the septum and to the opposite alar cartilage. The first tie-up
was not quite right, and Hector Marino was heard to whisper
among the spectators,

He will take this one out.

The second attempt at suture placement finally did sit the nose
up nicely.

The remainder of the operation went smoothly, as previously
described in publications, but with special attention to possible
queries from the panel. I had the benefit of John Hueston
remarkable pre-Congress publication of the Transactions and knew
what my friend David Davies was thinking and probably plan-
ing to say. Davies had already acknowledged in the 1971
Transactions,

Finally, the Millard repair. Almost certainly the most commonly used today,
it is presumptuous of me to criticize it but no method is as yet perfect
and one must be prepared to discuss its flaws. The line diagrams are simple,
the logic flawless, the concept brilliant; but many of us struggle to execute
it . . .

What he was saying was that it looks good on paper but the free-
hand fiddling may be difficult. In the Transactions he had pointed
to an attenuated medial element which occurs in some cases but need not be a problem. Davies emphasized another flaw:

A factor that I find disturbing is the approximation of two convex curves which appears to leave the majority of the bulk in the centre of the lip and not on the lower rim.

This can be troublesome, and so, during the Congress operation I made a particular effort to demonstrate fashioning the lateral lip element concave to fit the convexity of the medial component. It seemed to go well.

Then, on the fifth and last day of the Congress, after suture removal the baby was brought back on TV for a final show. The nose, lip and baby behaved so well before the cameras that a "hand of applause" was requested and received for this future actor. Recently, O'Brien sent me the 21-month follow-up photographs of the Congress cleft lip baby with a report that the palate had been closed and all was well.
After my cleft lip operation in Melbourne, Musgrave informed me that he had been most interested in this demonstration, but it was not until I read his and Garrett's section in Goldwyn’s 1972 book that I understood his reference.

The most dramatic improvements in the correction of severe nostril defects in the wide complete cleft lip have been recently observed in Millard's personal application of the rotation-advancement principle, wherein attention is paid to both the medial and the lateral alar crus. The medial crus is elevated in the upward swing of the composite columellar pedicle, and the lateral alar cartilage is advanced medially and upward to simulate the dome effect of the opposite alar cartilage.

Let us say that at this specific time in the evolution of cleft lip surgery the rotation-advancement principle would seem to be generally accepted. There are those who follow the original design. There are those who have adjusted to the refinements and extensions. There are those who use the principle but “do their thing” with some little modification which is of benefit in certain cases. This is my general approach, always trying to improve in the detail as with the refinements or nasal correction at the Congress. There are other surgeons with the same motive, also trying to improve the final results.

LOOK OUT FOR THE BACK-CUT

One afternoon of the Melbourne International Congress was spent at Emu Bottom, the oldest homestead farm in the area. Here dogs demonstrated their skill at herding sheep, champion woodcutters competed with their axes chopping through logs of equal girth, wool was shorn and unleavened bread was served. Then, out on an open sloping field, boomerangs were offered. Lessons given in the position of the hand and the angle into the wind to throw soon challenged the plastic surgeons. The Australian surgeons were conspicuously absent, being fully cognizant of the hazards of a novice with this sharp, flat, curved stick, for if accurately thrown it will in truth “cut back” to the thrower without concern for those within the arc. Cleft lip and palate surgeons were notably present—optimistic, energetic, per-
fectionist, competitive and determined to master every detail of the technique. Among the throwers were Bengt Johanson, Ivo Pitanguy, Ed Schmid, Rudy Meyer, Theo Wilkie and myself, each ducking the other’s boomerang when not trying to get out of the way of his own. Tord Skoog watched wisely from high on a hill. The winner—the surgeon getting the boomerang to return the closest to him the greatest number of times—was Wilkie of Vancouver, and this outcome was pleasing, for he has long been using the rotation-advancement method effectively, as he described in 1969.
In extremely wide complete unilateral clefts, no matter what the technique used for closure, any adjunct is welcome. An adhesion-type procedure allows the surgeon a chance to stall for time and tissue growth, reduces the actual deformity by molding the maxillary segments into closer approximation and, consequently, facilitates the subsequent construction of a more perfect final lip result. In the absence of a normal intact orbicularis oris muscle spanning the maxillary arch, there is no molding action. It was noted by Veau and mentioned by Plessier in 1930 that even the most minor Simonart's band acting as a restrainer in utero greatly reduces the extent of maxillary and nasal distortion, Pruzansky has reconfirmed these findings.

Although delayed in its application, any closure of the lip across the cleft affects the width of the gap and position of the segments of the maxilla. In my 1964 "Refinements," in reference to a wide cleft of exceptional severity, I suggested:

In such cases postponement should be considered particularly for those not veterans of the rotation-advancement approach. Rather than compromise the final result by forcing the rotation-advancement technique or settling for less with another method, a simple straight first stage approximation of the superior one-third of the lip cleft is a possibility. This could be carried out high enough to avoid destruction of any natural landmarks. Partial union of the lip will help to mould the distorted maxillae and, if deemed necessary, better alignment can be achieved with orthodontia and maintained with a bone graft. The rotation-advancement method then is available for final lip closure.

At Princess Margaret Hospital, Nassau, in 1963, a severe cleft from Turk Island was closed with an adhesion procedure. After
the medial lip element had been freed from the maxilla, it was underlapped with a rectangular vermilion flap from the lateral lip element. All landmarks were preserved by the superior position of the adhesion.

As early as 1954 Johanson advocated a type of lip adhesion procedure as part of his routine for obtaining closure in the anterior palate area in preparation for his primary bone grafting. By 1961 Bengt Johanson with Ohlsson of Sweden realized that the adhesion had other values. He noted,

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.

In 1965 Randall, in his enthusiasm for the adhesion procedure, did much to popularize it. His reasons are clear-cut:

When the cleft is complete and wide there is likely to be more concern over tension, the position of the lip segments after the bony segments have been moulded and the eventual position of the alar base. In addition there is considerable worry whether or not an "S" shaped alar cartilage is ever going to approximate the contour of the normal side.

Randall advocated short broad triangular flaps interdigitated and approximated with sutures of the mucosa, muscularis and skin.

He explained that this was a broader attachment than that of Millard and an improvement over the simple margin incisions or limited excision of the cleft margin as suggested by Spina (to add substance to the prolabium in bilateral clefts). Randall’s report indicated that he used an adhesion on all complete clefts
regardless of width, and the procedure was carried out at ages 2 to 10 months (average 3.6 months) with the final definitive repair following after a 2- to 7-month (average 5.2 months) interval. In his opinion the price of an additional operation and an extra trip to the hospital was more than offset by two factors:

1. The adhesion renders the newborn infant much more acceptable looking if the surgeon prefers to delay a definitive closure until the child is older.

2. There is no true sacrifice of tissue with the scar of adhesion because the tissue used ordinarily would be discarded in the [Randall] final lip operation.

The first point, for what it is worth, is valid, but the second point holds only for Randall's procedure and is too costly in the rotation-advancement method. It is felt, first, that the adhesion is required only for complete clefts and, second, that only mucosal flaps in the upper third of the lip need be approximated, for once the adhesion is firm, the muscles lateral to it will act just as effectively as a molding band.

In 1970 Takahashi reported his use of the lip adhesion procedure. He diagramed what he considered to be (1) the Millard and (2) the Randall type of adhesions.
Actually this has never been my design. The medial flap turns the wrong way and, of course, there should not be any skin involved and wasted in this temporary maneuver. A cardinal point is the placement of the adhesion high up in the lip.

More recently, Randall with Hamilton and Graham reported on 68 lip-adhesion procedures with an incidence of dehiscence of 8 percent in unilateral clefts. They varied their adhesion to matching rectangular flaps reinforced with a retention suture.

This modification also encroaches on tissue valuable in the rotation-advancement procedure and, thus, is a bit too extravagant.

It is thought that an adhesion that does not encroach on valuable tissue, if done early, can be instrumental in shifting the maxillary components into better position. At the same time, it reduces the horror of the deformity so that the parents are pacified, allowing the surgeon to postpone the final surgical repair until the more ideal age of six to eight months. At this time, primary nasal correction may be accomplished.

C-W

In 1966 Walker, Collito, Mancusi-Ungaro and Meijer proposed the C-W technique ("close and wait" or "Collito and Walker") as an atraumatic preliminary and definitive two-stage lip closure. They made a big point that there must be no undermining of soft tissue in the buccal sulcus, no muscle detachments or sectioning of bone even in the presence of a large and/or protrusive
premaxillary segment. They believe that the lateral bands, supporting the anterior portion of the lesser segment, should be preserved and to destroy it surgically would encourage arch deterioration. They almost hissed at Randall's undermining his lateral lip segment in 30 percent of his adhesions. They describe their method and its physiology:

In the first stage, the high and low points of the expected cupid's bow are marked on the lateral and prolabial tissue and used as landmarks which are not to be interfered with surgically. . . . Bilateral vermilion flaps are turned down and sutured together.

This maneuver positions the adhesion low in the lip, placing the constriction in the inferior border, which is less than ideal. It is, however, quite necessary because, without the aid of undermining, the tension will not allow union of the upper portions of the lip elements.

Following first stage closure, the alveolar and palatal clefts are reduced spontaneously. The premaxillary area is gently molded back to the midline, and the lateral segment is oriented toward a nearly ideal arch form. The definitive or second stage closure is executed after the soft tissue and bone [reorientation]. . . . A time interval of 6-12 weeks seems average. Again no undermining is allowed for the second stage. . . .

Thus, the unimpaired tissues are expected to gain their full growth potential by eliminating the suspected inhibiting factors, i.e. cicatrix, produced by undermining and the change of muscle environment created by unwarranted soft tissue detachments.

The C-W principle was first described to me by John Walker over a cup of tea in a flower garden behind the Iron Curtain during an International Plastic Surgery Congress in Bratislava in 1965. I had thought about it from time to time. As in all plastic surgery, the more atraumatic the procedure the better, but wounds do heal and with normal healing there is minimal restraint of growth. Yet, one factor in the C-W principle makes good sense. Keeping the original attachments of the lip elements to the maxillary segments allows them to act as effective strings with which to control the maxillary "puppets."
Discarding the concern about scarring following undermining but focusing on the control of segments by maintaining original attachments made it possible to formulate an adhesion plan that seems to take the best of both methods. The rotation and advancement incisions are marked to protect the landmarks. The medial lip element is freed from the maxilla so that it can advance over the outwardly rotated segment and be united in an adhesion to the lateral lip element, which is not undermined and is allowed to maintain its original attachment. Release by undermining of the medial side reduces tension and facilitates success of the adhesion uniting in the more strategic upper portions of the lip elements. Once the lip adhesion is firm, the constricting band of lip muscles will mold the forward-projecting maxilla back into the arch while the tug of intact lateral lip attachment to the retroplaced lateral maxillary segment should help to pull it forward into better alignment. After six months, adequate freeing of the lip tissues seems justified, not only because the attachments are in abnormal position on the maxillary segments, but because their release reduces the tension of the final lip closure. This allows repositioning with an improved prognosis for the lip scar and without great jeopardy to maxillary growth.
Making the Adhesion

Dark lines mark the adhesion plan.

Freening the medial element from the premaxilla.

Mucosa of lateral cleft edge turned back.

Lateral mucosal flap slid under the medial element.

The lateral and medial muscle bundles are further approximated with a mattress suture of 4-0 chromic catgut.

Mucosa is sutured to skin.

The adhesion will push the premaxilla backward and may help to pull the lateral maxillary segment forward.
A SALUBRIOUS ADJUNCT

An adhesion is not necessary in every case, but in wide complete clefts it can be an aid. Here is an example in which it worked wonders. A very wide cleft had this type of adhesion created at three weeks of age. Two and a half months later, the final lip procedure, including alveolar and anterior palate closure, was done easily as a surgical demonstration before a cleft lip and palate symposium at Jackson Memorial Hospital, University of Miami School of Medicine, in March 1970.

ACTUAL FACTS

Subsequent experience with the adhesion procedure, which I still advocate as diagramed, has presented two minor problems:

1. An early adhesion within the first month of age will usually move the maxillary components quickly into apposition in the alveolar area with abutment which renders anterior alveolar closure difficult at the time of nasal floor reconstruction during the definitive lip closure. At the present time, a small prosthesis is being used to prevent this abutment and maintain a half-centimeter gap of access to facilitate alveolar closure at the time of rotation and advancement of the lip.

2. Even without undermining of the lateral lip element from
the maxilla, the pull of the adhesion does not, in many cases, show a rapid and dramatic forward growth of the diminutive maxilla on the cleft side.

There are certain exceptionally wide clefts that may require undermining of the lateral lip element also in order to achieve an adhesion. Yet, as shown in this case, the progress in both lip and nose is worth the effort and trauma.

? INCLUDING SEPTUM IN ADHESION

Recently, the residents and I worked on a patient with severe lateral lip element discrepancy who also had a strangely persistent nasal distortion. It resisted much improvement after the adhesion, and even after rotation-advancement with a lateral cleft edge mucosal flap let into the vestibule-releasing alar base incision and a primary alar lift, the nasal correction was disappointing.
Of course, with tissues placed in better position, there must be gradual improvement with growth in time, but the discrepancy struck such a discord that, again, a search for a better way was begun.

The key to this residual nasal deformity seemed to be the severe deviation of the septum. The thought occurred that, considering Latham’s concern over the bent septum, Reidy’s lack of concern over early septal surgery and Berkeley’s valiant primary correction, maybe in certain cases the septum should be straightened during the adhesion procedure. Exposure, after freeing of the medial lip element from the maxilla, would be easy. The septum could be freed with the nasal spine from the maxilla and vomer a short distance. Careful, limited mucoperichondrial dissection and scoring of the cartilage on the concave, non-cleft side could be accomplished. Then, during the suturing of the high lip adhesion, possibly a stitch from the lateral lip element could catch the anterior septum to bring it around into a midline position, rendering the alar lift during the rotation-advancement operation either more effective or less necessary.

**A TRIAL VARIATION**

Recently I have tried a variation which achieves more primary nasal correction during the adhesion procedure. The cleft edge vermilion of the lateral lip element, flap 1, has been inserted across the tight area in the lateral vestibule allowing release of the alar base. The lateral lip element was also freed from the maxilla enabling the entire lip-nose component to come forward in a more nearly normal position. This necessitated a reversal of the vermilion flap which was turned from the cleft edge of the medial element to underlap the edge of the lateral element to form the adhesion. It will be interesting to study the advantages, if any, of this modification.
SECONDARY USE OF THE ADHESION

Man's ingenious adaptation to circumstance is boundless. After World War II in London, I remember queues everywhere were an accepted way of life, particularly out in front of cinema theaters. They, in turn, attracted troubadours, jugglers, acrobats, magicians and even an occasional pickpocket to entertain those waiting to be entertained and to pick up a little extra change. In the same parasitic relationship, once the obvious values of the adhesion procedure had been exploited, ingenious secondary uses began to be developed.

In 1971 Culf, Cramer and Chong of Temple University, disenchanted with the consistent depression and retrusion of the alar base and certain that this discrepancy could be corrected in many cases without bone-grafting the deficient maxilla, stole, like pickpockets, the *adhesive bridge* itself. They denuded its distal skin and mucosal epithelium but salvaged the bulk of subcutaneous tissue, muscle and scar, usually leaving it attached medially (and in the rotation-advancement it is merely an extension of flap c). Then, through a 1 cm. lateral endonasal incision below the alar base, a pocket was dissected. Into this space the denuded adhesive flap was plugged with the aid of a pull-out skin suture, the skin and mucosa of the medial portion of this filler flap being retained to aid in lining the nasal floor.

Always interested in how and why a surgeon has come upon a method, I asked Lester Cramer, the plastic surgery chief at Temple University, about this adjunct. When he candidly referred me to Culf, to whom he awarded the credit, I was reminded of a story about Cramer. On his first day at Trinity College he was called in by the president along with several other contestants and given nine questions involving history, geography, math and science. The tenth question asked,

> Which of these questions was the easiest for you?

Whereupon Cramer wrote,

> Question # 10 which I do not have to answer.

He won a full scholarship and confirmed the president's diagnosis with a Phi Beta Kappa and later an A.O.A. key.
I then turned to Norris K. Culf, and he responded in 1972 that three years earlier he had begun using the adhesion in a complete unilateral cleft and,

it was obvious that there was a significant displacement of the alar base which was not corrected by the previous lip adhesion. Therefore, with the abundance of tissue available, which would otherwise be discarded, we used this to create some support by tucking it under the alar base leaving it attached medially. . . . We have done the procedure with both the triangular type lip repair and your repair and it seems to be equally effective in both situations.

EARLY SOFT PALATE CLOSURE

At the time of the lip adhesion procedure, whenever possible without further surgery, the soft palate edges are split and sutured in three layers as far anterior as possible. Even one centimeter of approximation can be of value. Early soft palate closure has the same beneficial effect behind that the lip adhesion is achieving up front. Not only does this promote early coordination of soft palate and pharyngeal musculature, but it probably improves the function of the eustachian tubes and certainly promotes molding of the maxillary tuberosities.

PROGRAM FOR FIRST ANESTHESIA

As soon as the cleft infant is feeding well, has a hemoglobin level of at least 10 gm. and is free of infection, which should be within the first three weeks, three quick procedures are carried out:

1. Otological examination and insertion of tubes, if indicated.
2. Soft palate closure.
3. Insertion of a prepared light prosthesis to prevent complete alveolar collapse and then the creation of a superior lip adhesion.

This triple mission accomplished, the patient, parents and surgeon get a six months' rest. . . .
37. How to Rotate and Advance in a Complete Cleft

It has been said often that a natural-looking result following closure of a congenital cleft lip is a work of art. In fact, it is a three-dimensional work of sculptured art. Principles, measurements, marks and incisions of a technique can be standardized and a blueprint of the technique memorized. Yet the last few millimeters which make all the difference must depend upon the sculptor and his clay.

Before marking and cutting, compare the normal side and the abnormal cleft side with your eyes, switching back and forth again and again in a horizontal nystagmus. Then, by transposing the ideal normal over this entire component in your mind’s eye, it will become apparent what is present, its position, and what is needed. Now comes the surgical scramble to make up the difference without compromising the normal.
First dot-mark the key landmarks on the non-cleft element as described in Part V, Incomplete Clefts, 1 to 2 to 3 of the cupid’s bow, all of which are usually 2 to 4 mm. apart. An important measurement on the normal side is the distance from point 2 at the height of the bow on the non-cleft side to the alar base 4, which measures from 9 to 12 mm. This is the distance that will have to be matched on the cleft side and is roughly the length that must be achieved eventually along the rotation edge as well as along the advancement edge. Mark the rotation incision, which rises vertically up to the cleft side of the columella base and then curves across the midline hugging the columella base but stopping just short of the philtrum column of the normal side 5. The back-cut marking is postponed temporarily. The rotation incision mark is scored with a #67 Beaver blade.

The distance from the commissure 6 to the height of the cupid’s bow on the non-cleft side 2 is measured and is usually about 20 mm. The same distance is marked on the cleft side from the commissure 7 to a point along the mucocutaneous junction line of the lateral lip element 8. Point 8 indicates the limit of lateral paring. The highest and most medial point 9 of usable lateral lip element is marked as the probable tip of the advancement flap.
Dotting the bow.
Marking the rotation.

Marking normal commissure-to-bow-peak distance on cleft side at 8.

Ensuring normal vertical height.

Matching length of rotation incision with edge of advancement flap by bending and straightening a wire.
If the lateral element is diminutive, it may be necessary to extend point 9 up into the nasal vestibule to get the extra cleft edge length required to match the rotation edge. This extension will enable one to hold the line at point 8 in the lateral paring. An estimate of these distances is best checked by the curved-wire technique. When all available tissue has been incorporated into the tip of the advancement flap and the flap is still short, conservative paring of the cleft edge laterally even beyond point 8 may be necessary for a millimeter or two at most.

The next point 10 is set at the midpoint of the alar base join with the lip. In incomplete clefts this may be the lateral extent of the upper curved horizontal incision. Yet in complete clefts that incision must be continued to the lateral extent of the alar base join with the lip 11 and, depending partly on the amount of alar base flare, may have to be extended farther in a circumalar direction around to point 12.

If the length of the lip from the alar base at 10 to the mucocutaneous ridge at 8 is much shorter than the distance from the normal 4 to 2, then the incision from 9 to 10 to 11 and even to 12 may have to be raised to include a millimeter or more of alar base in the lateral lip flap B. Including a bit of alar base in the upper part of the lateral advancement flap will conveniently shift this prominence, as this flap advances, into
a nostril sill position in incomplete clefts or columella base in complete clefts. The stretched ala can well withstand such minor shortening.

A line is marked to join these points 8, 9, 10, 11 and possibly 12, and the line is then scored to define the advancement flap B. Now the rotation and advancement flaps have been marked finally.

SAVE THE PARINGS

The next step is concerned with the salvaging of the cleft edge mucosa. As the cleft edges must be pared in order to approximate them, a flap of vermilion based above on the mucosa of the alveolus in the upper labial sulcus is stabbed off each side of the cleft with a #11 Bard-Parker blade and left dangling for later use.
Of course, various possibilities offer themselves. The medial mucosal paring flap based above on the alveolus can be used as the second oral layer in the closure of the alveolus and anterior hard palate.

The soft palate can be closed early during the lip adhesion procedure or, if the adhesion is not used, it can be closed during the same anesthesia just prior to the final R-A lip procedure.

Nasal closure of anterior cleft is reinforced with flap m as a second layer on the oral side.
Or this medial vermilion paring flap can serve as the second layer but on the *nasal* side.

With care to avoid the base of this flap, the medial lip element is freed by sharp dissection from the maxilla.
A similar paring of the vermillion edge of the lateral lip element can produce a flap based above on the mucosa of the maxilla. This flap is extremely valuable as a filler for the defect produced during the incising of the lateral vestibular lining when freeing the alar base from the maxilla.

The strategic position of this flap (1) and the ease of its transposition into the vestibular defect have caused it to become standard in this maneuver. When one considers that this tissue has been discarded for centuries, its present salvage is an important step making alar release possible without secondary contracture.

A preliminary adhesion procedure is being used in almost all complete unilateral clefts at about 3 weeks of age. It is now standard at the time of this adhesion to insert flap 1 of the cleft edge vermillion from the lateral lip element into the lateral vestibular defect after release of the alar base from the maxilla. This freshens one lip edge for the adhesion and lets the nose and alar base come forward early without threat of back contracture.
Lateral edge mucosa preserved.

as a flap based above

Lateral lip and alar base undermined.

on the mucosa of the alveolus.

Release of alar base and lateral lip undermining is extended up into the nasal vestibule.
PRESENT APPROACH IN COMPLETE CLEFTS

In most complete clefts today, an adhesion is created in the early weeks as shown here, preferably using flap I.

All landmarks must be preserved.

Lateral mucosal flap slid under medial element, or preferably flap I shifted into nasal lining.

Then, at six to eight months of age, the rotation-advancement operation is carried out. First the rotation and then the advancement incisions are marked. Thus the "in-between" mucosa and scar tissue of the adhesion are left to be marked as (m) and (l) flaps, but are not as important if I flap already used in adhesion.

Adhesion preserves landmarks.

Marking the bow and measuring the height.

Wire-measuring rotation incision.

Rotation marked and advancement edge measured.

Vertical height on cleft side is short.

so portion of alar base is included in the lip flap.
Then the adhesion is divided down its center between the two flaps to open the lip for full exposure of the cleft. The two “adhesion-edge paring” flaps (m and l) are dissected free and left dangling temporarily.
Score the rotation incision first. Then pick up the medial lip element A with your left thumb and index finger and lift it free so that a #11 Parker blade can be stabbed completely through the full thickness of the lip along the scored rotation line. It is usually easier to start at point 3. The scalpel should be slanted on the bias to retain as much muscle and mucosa in the lip as possible. This maneuver will join the previous cleft edge paring already accomplished.
The amount of required rotation depends directly upon the difference in vertical height of the cupid's bow peaks on the normal side at point 2 and the cleft side at point 3 of the medial lip element. As soon as the rotation incision has been cut to point 5, the position of A should be tested to see if the drop has been adequate to line up the peaks of the bow on an equal horizontal plane. Further stabbing with the point of the scalpel in the subcutaneous tissue and muscle attachments will increase the release. Then, with care to avoid the base of the mucosal edge flap (m), undermine the medial lip element free from the maxilla a moderate amount to facilitate the rotation.

BACK-CUT

After the simple rotation to point 5 and the undermining, there is usually a slight discrepancy in the downward positioning of flap A with its cupid's bow and philtrum dimple. Here the back-cut makes its triumphant entry. The back-cut checks the transverse direction of the incision as it is directed obliquely downward, being pricked with the #11 point a millimeter or two to point x. This approach can make up for a discrepancy in bow peak height of 5, 7 or 8 or more millimeters, so do not panic when the difference is more than the fictitious 3 or 4 mm. cited by some to harass beginners.
FLAP c

The immediate and valuable by-product of the rotation plus back-cut drop of flap A is the freeing of little flap c, which is allowed to rise out of the lip as a one-sided “forked flap.” When the slumped alar arch is lifted with a hook to match the normal, a defect opens on the short side of the columella, and flap c naturally moves toward this area. Flap c, which has been pared of its edge mucosa, is further released by an incision posteriorly in the membranous septum on the cleft side all the way up under the nasal tip, allowing flap c to ride even higher. Then, scissor-point dissection between the medial crura of the alar cartilages frees the inferiorly placed cleft side crus to facilitate its advancement ahead of flap c along the short side of the columella. The action of flap c is partly advancement and partly rotation as its trimmed tip actually rises but also swings around into the upper gap of the back-cut. These combined maneuvers enable the construction of a well-balanced, symmetrical columella in its lower two-thirds.
If primary alar lift planned, this incision joins intercartilaginous incision from lateral side.

Posterior release of flap c by membranous septal incision.

Scissor dissection between medial crura allows upward shift of the slumped side.
FREEING THE LATERAL ELEMENT

Avoiding the base of the lateral mucosal flap (l), the surgeon dissects the lateral lip element from the maxilla through a releasing incision at the top of the labial sulcus. The soft tissues of the lip and cheek are undermined usually up to the infraorbital foramen and laterally until the lip will advance easily without evidence of tethering. The incision then enters the nasal vestibule, cutting the alar base free from the maxilla, starting laterally at the bony attachments of the pyriform opening and proceeding in an arch up and around along the intercartilaginous line. In many instances this will suffice, but in certain cases the distortion of the nasal tip is so severe that primary correction seems warranted. Then the intercartilaginous incision is extended to join the membranous septal flap c—freeing incision under the nasal tip. This presents the exposure necessary for alar lift.

If the medial mucosal paring flap (m) is not needed for the second layer of the anterior maxillary cleft closure, it can be draped over the raw maxilla to speed healing and maintain a deeper superior labial sulcus.
Exposure.

Lateral lip dissection from maxilla.

Extension of lateral dissection into nasal vestibule along inter-cartilaginous line.

Joining medial and lateral incisions in preparation for primary alar cartilage lift.

After total vestibular incision.
PRIMARY ALAR CARTILAGE CORRECTION

First the mucosa is freed from the undersurface of the alar cartilage for half a centimeter. Then the alar cartilage is freed from its overlying skin with right-angled scissors. Further undermining of nasal skin is continued up over the upper lateral cartilage to the septum and across to the opposite alar cartilage. Then a 4-0 Prolene suture (Ethicon #8603) or a 4-0 Mersilene (Ethicon #765) takes a bite in the upper edge of the septum approximately 1 cm. from the tip and picks up the freed edge of the alar cartilage just lateral to the angle of the crura. As the suture is tied, the alar cartilage is lifted out of its doldrums over the upper lateral cartilage to ride in reasonable symmetry with its normal mate. A second suture from the medial portion of the slumped alar cartilage to the normal opposite alar cartilage sometimes helps in the fixation. Minimal if any mucosa requires trimming prior to suturing with 4-0 catgut.
Suture placed in upper edge of septum.

Freeing the alar cartilage from the overlying skin.

Tying the sutures lifts the alar cartilage into new symmetry with its mate.

Another suture approximates the angles of the two alar cartilages.

Freeing mucosa from the alar cartilage.

then picks up alar cartilage.
SEPTUM

If the septum is severely dislocated into the normal nostril at the spine, it can be carefully freed submucosally, scored on its concave side, slipped over the spine and fixed into a straight position in the midline. Excision of the spine may be indicated. Septal dissection during the primary cleft surgery must be conservative but rarely is indicated at this stage of life.

ADVANCEMENT

Pick up the lateral lip element with your left thumb and index finger and again mark the advancement incision. Then, with the #11 B.-P. blade, stab from points 8 to 9 to 10 to 11, cutting on the bias to retain in this lip element all the subcutaneous tissue, muscle and mucosa available. If the alar flare is severe, it may be necessary to extend the incision 9 to 10 to 11 and even to 12 on around the alar base. If the lateral element is diminutive, the tip of the flap at point 9 will have to be extended into the vestibule.
Marking the upper transverse advancement incision.

Incising the circumalar incision so that flaps B and D can advance separately.

Stabbing the alar base free from the lateral lip.
MUSCLE ALIGNMENT

The latest refinement is the method of aligning the orbicularis oris muscle. As has already been pointed out, the rotation and back-cut places the orbicularis oris fibers of the medial lip element into true horizontal position. A cleft edge "muscle" flap based above on the medial element not only freshens the muscle edge to healthy end-on fibers and presents a more tailored edge for approximation but creates a "muscle" flap which can serve as a transposition across the cleft into any lateral muscle gap.

The lateral element during its advancement undergoes some degree of rotation-transposition, which improves the original direction of the orbicularis oris fibers. They are not, however, brought down completely by this action into horizontal position. Then too, when there is a bulge in the muscle of this lateral element with attenuation above, more radical dissection seems indicated.

Leaving the upper one-half centimeter of lateral lip element intact to be carried by the key stitch into the rotation gap, dissect the lateral lip skin off the orbicularis oris muscle. Then free the muscle from the posterior mucosa so that it can be divided above with scissors and brought down into more nearly perfect horizontal fiber alignment. Of course, a muscle gap will be left above to be filled by the medial edge muscle flap m–m.
Freeing skin from muscle of lateral element.

Medial muscle edge flap m-m marked

Cutting the muscle in back-cut above to allow its fibers to come down into alignment.

Muscle being undermined but leaving upper edge intact.

Freesing the posterior mucosa from the muscle.
SUTURING OF FLAP m

If the maxillary components are within a centimeter of each other and are not abutting, the adhesion with the limiting prosthesis has been successful. A vomerine and premaxillary mucoperiosteal flap is dissected free with its base superior, turned over and sutured with 4-0 chromic catgut (Ethicon #752) to a mucoperiosteal flap from the lateral cleft edge. Closure of the nasal floor and nasal closure of the alveolar and anterior hard palate cleft are thus achieved. The mucosal flap (m) pared from the medial cleft edge carrying most of the adhesion scar is used as a second, oral layer to this closure, as already illustrated. If the hard palate edge flaps are turned the other way, flap m can be used to supply the second layer on the nasal side.

If the alveolar and anterior hard palate cleft is not going to be closed at this time or the medial flap m is too short, it can be used to cover the raw area of the anterior alveolus to preserve the upper labial sulcus. This is often sutured earlier, before the alar lift, in order to get the mucosal flap out of the way.

SUTURING OF FLAPS c AND l

As flap c advances into the columella and rotates into the back-cut, it is fixed in front with two or three sutures of 6-0 silk (Ethicon #780) in the skin of the mid-columella. Then the posterior edge of flap c is advanced along the membranous septum with 5-0 chromic catgut (Ethicon #792). This maneuver enables flap c to contribute to the construction of the cleft side columella and its base to achieve symmetry.

The lateral mucosal paring flap (l) is sutured with 4-0 catgut into the lateral nasal vestibular defect, extending as far as possible up along the line of the intercartilaginous release. This will maintain the forward position of the alar base.
Suturing the membranous septrum as flap c advances upward as a one-sided "forked flap" for columella lengthening.

Lateral mucosal paring flap 1 being sutured into the lateral nasal vestibular defect to maintain the release of the alar base.

Flaps c and l are in position.
KEY STITCH

Rotation of flap A down, advancement of little flap c up and release of alar base have set the stage for advancement of flap B into the rotation gap. A good bite of the deep tissue of the tip of the advancement flap B is taken with a 4-0 white Prolene or 4-0 Mersilene, and then a similar good bite is taken in the depth of the rotation gap at the bottom of the back-cut. Remember that this stitch determines the amount of rotation and if placed too low can pull up on this element to the detriment of the final resting place of the cupid's bow. It is a trial and error stitch and should be placed and replaced until absolutely correct, for upon it "hang all the Law and the Prophets."

The key stitch first picks up the subcutaneous tissue of the tip of the advancement flap and then takes a bite in the depth the back-cut above flap m-m.

Tying this stitch brings flap B into the rotation gap.

The medial muscle edge flap m-m is transposed into the high muscle defect of the lateral element (arrow).

The muscle edge flap is guided into the defect with a pull-through suture coming out the upper edge near the alar base.
INSERTING THE MUSCLE EDGE FLAPS

Next the medial muscle flap m–m is guided by a 4-0 chromic catgut pull-through suture from the upper raw edge of flap B across the cleft into the muscle gap in this lateral lip flap.

OTHER CLEFT EDGE MUSCLE FLAPS

If a muscle bulge of the cleft edges is present—usually a result of the method of mucosal paring—then these must be reduced to ease the fitting. This trimming can be salvaged as muscle flaps for use in various ways. Probably it is most important where, as already described, the muscle flap is taken from the medial cleft edge based superiorly and used to cross the cleft to make up for deficiency in muscle, a groove or an actual gap in the upper area of the lateral lip element.

The muscle flap has been taken from the lateral cleft edge l-m and tucked under itself to bolster the thin tip of its own advancement flap. This can be quite effective.
It can be taken from the opposite medial side m-m based inferiorly and inserted "tongue in tunnel" to add body to an attenuated lateral vermilion border.

**PREPARATION OF THE CLEFT EDGES**

For the scar of union to simulate the curve of the philtrum on the normal side, it should have a convexity laterally. Thus, the natural convexity of the rotation edge is ideal and only an exaggeration need be trimmed. The usual convexity of the lateral edge is not desirable as two convexities do not fit. A curved excision of skin from the lateral edge is therefore called for, to produce a gentle concavity. This will increase the length of the edge slightly and reduce the need for extra paring. Thus, the skin excesses are marked and then the lateral edge is trimmed to a concavity with scalpel and scissors, the 2 mm. by 1 to 1.5 mm. "white roll" flap of mucocutaneous junction ridge being
The excess of the skin edges marked.

Trimming the lateral edge.

Preserving the white roll flap.

Trimming the medial edge.

Suturing the muscle fibers end-on.

Suturing the free border muscle.

Ready for skin suturing.

Suture placed just above white roll flap.

Another suture placed in vermilion just below white roll flap.
The excess of the skin edges marked.

Trimming the lateral edge.

Preserving the white roll flap.

Trimming the medial edge.

Suturing the muscle fibers end-on.

Suturing the free border muscle.

Ready for skin suturing.

Suture placed just above white roll flap.

Another suture placed in vermilion just below white roll flap.
preserved on the lateral element. The medial skin edge is tailored only slightly but maintained as a convexity. Then the dermis and mucosa on either side of the orbicularis oris muscle along both edges of the cleft are freed a millimeter or two to facilitate three-layer closure.

**THREE-LAYER CLOSURE**

First, closure of the advancement incision in the upper labial sulcus is achieved with 4-0 chromic catgut sutures in the mucosa. Then, staunch approximation of the muscle fibers end-on across the cleft is accomplished with 4-0 Mersilene. It is important to bring the muscle of the vermilion border (pars marginalis) together at the very edge with authority.

Although the white roll flap was cut during the early paring, in actual practice it often has to be discarded. After placement of the key stitch, the lateral lip segment, which was relatively contracted before the stitch, stretches out with an increase in the distance from point 7 to 8. This calls for a slight shifting of point 8 laterally to match 6 to 2 on the normal side, offering two dividends. It allows a millimeter or two more of lateral paring with additional length to this edge—usually a little short. During the paring it allows a new cutting of the white roll mucocutaneous ridge flap, which at this point is quite well developed in the lip. A 6-0 silk suture is placed in the skin just above the future position of the white roll flap interdigitation, and another is placed just below in the vermilion. Thus the white roll flap is fixed in overlap position along the mucocutaneous ridge, which is now ready for interdigitation. The actual insertion is still postponed.

The remaining 6-0 silk skin sutures can be placed in the lip and 6-0 catgut (Ethicon #790) in the free border vermilion until out of sight around under the edge. At this point 4-0 chromic catgut sutures are used to close the posterior mucosa, taking some muscle in the bites. When there is an excess of posterior mucosa, it is usually interdigitated across the straight-line closure. The details vary in every case, but invariably some type of mucosal interdigitation posteriorly out of sight is used.
PREPARING AND FIXING THE ALAR BASE

In order to correct the outward rotation and flare of the alar base and at the same time the unnatural width of the nasal floor and to prevent subsequent lateral shift of the ala, a method has been devised which is proving to be effective.

The circumalar incision 9–10–11–12 has freed the alar base as flap D from the lateral lip flap B. It is now able to rotate medially and independently of the advancement flap B. It will, in fact, out-advance the advancement. The tip of this flap is denuded of epithelium for several millimeters, so that it can be pinned with a 4-0 white Prolene or 4-0 Mersilene suture to the area of the septum near the nasal spine under the tip of flap c. By eye and suture, the alar bases should be set up in nearly perfect symmetry. Then, subcutaneous sutures approximate the alar base in its new advanced position to the upper edge of the lip advancement flap B.
As described in the incomplete cleft operative section, insertion of the white roll flap is postponed until suturing on either side of the mucocutaneous ridge has been finished. Now the little flap, which is spearhead-shaped and measures 1 mm. thick, 1.5 mm. wide and 2+ mm. long, overlaps the noncleft side. It is lifted out of the way, and a similar-sized and -shaped skin section from the opposite adjacent mucocutaneous ridge is removed. Then the white roll flap fits neatly into this bed and is fixed with a couple of 7-0 silk sutures (Ethicon #768), breaking the line of the vertical scar crossing the mucocutaneous ridge. Interdigitation of a white skin roll to interrupt the red of vermilion mucosa “bleeding” into the red of the vertical skin scar avoids the effect of an accentuated bow peak or even a suggested contracture when none exists. This little flap also tends to round out the curve of the cleft join at the bow to the more gentle smoothness of the normal side which otherwise may be too sharply angular.

The area of overlap by the white roll flap on the medial side is excised and the mucocutaneous interdigitation is completed by fixation with 7-0 silk.
The final posture of the lip and nose after rotation-advancement plus alar lift and muscle alignment should have the alar rims reasonably symmetrical and the muscle fibers in end-to-end approximation. A Logan bow gathers it all together protectively postoperatively, and the suture lines are covered with an antibiotic ointment.

The amount of tissue discard, scraps of epithelium, attenuated edges of muscle and mucosal tip bits, has been reduced to a minimum, as demonstrated on the piece of gauze.
ALAR RIM CORRECTION

If a primary alar lift has been used, the alar rim may not seem to require surgery at this time. In such case, it is well to postpone alar rim surgery until the need is more obvious. Eventually, it will be indicated to some degree for there is always a skin web of varying amount which is not influenced appreciably by the columella and alar base positioning and is not completely removed even by the alar lift. This excess skin can be excised directly and 6-0 silk used for closure.

Alar skin web excised and sutured directly.

It can be taken as a small skin flap based medially and let into a tiny releasing incision in the side of the columella at the height of the arch to give added length to the columella.

Portion of alar preserved as flap to be let into releasing incision in the side of the columella.

The excess can be denuded of epithelium, cut as a flap and introduced beneath the undermined nasal tip skin into the area of greatest weakness where the alar crease extends as a groove.
across the tip toward the alar margin. This transposed flap usually is guided with a pull-out 6-0 silk, which is tied externally over the skin of the tip and is removed in two days. The alar margin is then sutured neatly with 6-0 silk.

Recently, another variation has been found beneficial. The new alar rim is marked on the drooping side to balance the normal side. An incision is made along this line, and the skin inferior to it is dissected thinly to expose the inferior edge of the alar cartilage. The cartilage is freed from the mucosa and is cut as a flap ac to be transposed up into the tip in the alar groove area. The skin flap awf which once covered the alar web is tucked up under the alar rim as additional vestibular lining with a 5-0 catgut mattress suture. The alar rim is then sutured to the alar web flap along the margin with 6-0 silk.
Normal height of alar arch is marked on cleft side.

Skin of the alar web is turned back as flap awf exposing lower alar cartilage ac.

Alar cartilage ac trimmed as a flap.

Cartilage flap transposed under skin of nasal tip in the alar crease area.

Alar web flap awf is lifted with mattress suture up under the alar arch to provide more lining.

Alar rim is sutured to alar web flap awf along margin.
38. Examples of Complete Unilateral Cleft Cases

The same code is used as in incomplete clefts. Discrepancies noted resulting from the primary surgery in complete clefts will be dealt with in the secondary section.

KEY TO CODE ON CASES

B.D.    birth date
F.H.    family history
F.T.    first trimester
O.C.A.  other congenital anomalies
Op      operation
Ad      adhesion
Adv     advancement
Rot     rotation
R.A.    rotation-advancement
H.P.    hard palate
S.P.    soft palate
B.G.    bone graft
b-c     back-cut
wr      white roll flap
c       flap c
col     columella

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

In the unselected series of 80 unilateral clefts operated on in Miami and presented in detail, 45 were incomplete (Chapter 29), 35 complete (discussed in this chapter); 39 had associated cleft palate; 77 were Caucasian, 3 Negro, 21 female, 59 male, 29 right, 51 left; 16 had a family history of clefts; 15 had incidents in the first trimester of pregnancy; 8 had other congenital anomalies.

In the incomplete clefts (45), 10 had associated CP, 44 were Caucasian, 1 was Negro; there were 12 female, 33 males, 16 right, 29 left; 8 had F.H. of clefts, 6 had incidents in F.T. and 2 had O.C.A.

In the complete clefts (35), 29 had associated CP; 33 were Caucasian, 2 Negro, 9 female, 26 male, 13 right, 22 left; 8 had F.H. of clefts, 9 had incidents in F.T. and 6 had O.C.A.

There is no significant difference between incomplete and complete cleft lips in the following parameters except that associated cleft palate was 3.8 times more frequent in complete clefts (22 percent of incomplete and 83 percent of complete lip clefts had CP).

PERCENTAGES IN TOTAL SERIES

49 percent of lip clefts associated with palate clefts
96 percent Caucasian, 4 percent Negro
74 percent male, 26 percent female
64 percent left, 36 percent right
20 percent with family history of clefts
19 percent with first trimester incident
10 percent with other congenital anomalies
EARLY CASES WITHOUT REFINEMENTS (CASE 1)

Comment. An early rotation-advancement without refinements that still produced a good lip and nose.

B.D.  October 8, 1957
F.H.    No clefts
F.T.    Uneventful
O.C.A.  None

R.A.  At 2 months


The advancement of the lateral flap into the rotation gap often produced attenuation of the lateral vermilion. This required a secondary V-Y roll-down and finally started me doing a primary posterior mucosal transposition to the weak side.

Comment.
ARLY CASES WITHOUT REFINEMENTS (CASE 3)

B.D. September 26, 1958
F.H. No clefts
F.T. Auto accident in 2nd month
O.C.A. None

R.A. At 2½ months

H.P. and S.P. At 1 year vomerian flap for hard palate and 3 flap pushback.

Revisions. At 3 years. Extracted tooth in prominent premaxillary area. Mid V-Y of vermilion tubercle.

Comment. The outward rotation of the premaxilla and retroposition of the maxilla on the cleft side would have benefited by an adhesion which it did not have. The nasal deformity was stubborn. The muscle bunching in the lateral lip element resting over the prominent premaxilla has produced an unnatural bulging which is improving with time. The lack of the white roll flap is noticeable. Modern refinements and extensions would have improved the early result as would the more recent muscle surgery now being used.
EARLY CASES WITHOUT REFINEMENTS (CASE 4)

B.D. October 17, 1958
F.H. No clefts
E.T. Uneventful
O.C.A. Midline upper lip sinus

R.A. At 2½ months


4. 9 months—contraction present at 2½ months postoperative but gone by 9 months old.

Comment. A skin sinus in the midline of the upper lip is rare, having been reported six times in the literature. It is has never been recorded in association with a cleft of the lip except in this case.
ARLY REFINEMENTS (CASE 5)

B.D. January 16, 1962
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3½ months
H.P. Vomer flap at 10 months.
S.P. Pushback with right island flap at 13 months.
B.G. Iliac cancellous bone blocks and chips across cleft and over maxilla under alar base at 9½ years.


Comment. Original nasal deformity so severe that without primary alar cartilage correction will eventually require secondary rhinoplasty at 16 years of age.
EARLY REFINEMENTS (CASE 6)

B.D. March 27, 1962
F.H. Paternal great-aunt cleft lip and palate
F.T. Uneventful
O.C.A. Capillary hemangioma of the cheek

R.A. At 4½ months

Revisions. Hard palate fistula closed twice and finally used tongue flap for closure. Lip vermilion first mobilized by lateral advancement and then filled out by V-Y rolldown.


Comment. Tip of advancement flap taken from nasal vestibule. Primary procedure produced attenuated vermilion on cleft side requiring several secondary mucosal advancements.

1. 4½ months 2. 4½ months 3. 3 weeks postoperative
4. 4 years
5. 11 years
EARLY REFINEMENTS (CASE 7)

1. 3½ months
   B.D. June 12, 1962
   F.H. No clefts
   F.T. "Ptomaine poisoning"
   O.C.A. Congenital heart deformity

2. 3½ months
   R.A. At 3½ months
   H.P. and S.P. Surgery postponed because of severe heart deformity, subsequently performed elsewhere.

Comment. Primary rotation-advancement without refinements carried out with great concern for poor circulatory condition of patient.

EARLY REFINEMENTS (CASE 8)

1. 2 months
   B.D. January 14, 1963
   F.H. No clefts
   F.T. Tooth extraction and infection
   O.C.A. None

2. 2 months
   R.A. At 2 months
   H.P. and S.P. At 9 months soft palate and vomer flap closure of hard palate fistula.

Comment. Not as easy a cleft as it seems and will deserve minor revisions if ever seen again.

Comment. Alar base drifting required secondary transposition, finally encouraged me to advance the alar base on top of the advancement flap and later denude its tip and suture it to the septum for a strong alar base tie.
EARLY REFINEMENTS (CASE 10)

1. 3 days
2. 3 months
3. 3 months postoperative
4. 1 year
5. 4 years
6. 10 years

B.D. July 26, 1963
E.H. No clefts
E.T. Uneventful
O.C.A. Mucous pits of lower lip

R.A. At 3 months
Deficient cleft element resulted in attenuated vermilion on cleft side.
B.G. At 7 months split rib grafts to onlay maxilla and chips into cleft.

S.P. At 10 months soft palate closure. At 7 years pharyngeal flap to soft palate.
H.P. At 2 years vomer flap closure of hard palate.


Mucous pits. Excision at 7 months and reexcision at 2 years finally corrected this deformity.


Comment. Severe deficiency of lip and maxillary tissue required several tricks including bone grafting but ended up with good result.
EARLY REFINEMENTS (CASE 11)

B.D. February 27, 1964
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 2 months
H.P. At 10 months vomer flap hard palate closure.
S.P. At 13 months soft palate closure with island flap.
B.G. At 8½ years iliac bone graft to maxilla under alar base.


Comment. A wide cleft with severe nasal distortion which was rotated without difficulty. Lack of mucosal flap bolstering of the cleft side is seen in early postoperative photo and eventually required V-Y roll-down and maxillary bone grafting.

1. 3 days
2. 2 months
3. 3 months
4. 3 years
5. 5 years
6. 7 years
7. 8 years

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ARLY REFINEMENTS (CASE 12)

1. 3 days

2. 3½ months

3. 3 weeks postoperative

4. 3 months postoperative

5. 3 years

6. 7 years

Healing. Lip contracture at 3 weeks gradually relaxed at 3 months and 3 years.

H.P. Left open until 5½ years.

S.P. Pushback with island flap at 13½ months.

B.G. Split rib grafts to maxilla at 5 years.


Comment. Original deformity severe. The early lip contracture was marked but gradually settled until almost symmetrical, requiring only minor revisions at 7 years. Further nasal correction will be required at 16 years.

B.D. October 20, 1964

F.H. Mother’s paternal cousin cleft lip and palate

F.T. Viral infection

O.C.A. None

R-A. At 3½ months
4. Alar rim excision. 5. No posterior mucosal flap transposition to non-cleft side.
EARLY REFINEMENTS (CASE 13)

B.D. January 7, 1965
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3 months


Comment. The original nasal distortion with the alar crease extending into a kink in the alar rim caused a persistent problem. It was not corrected primarily so will require revision at 16 years or sooner.
B.D. February 24, 1965
F.H. No cleft
F.T. Auto fright around time of conception
O.C.A. None
R.A. At 2½ months
H.P. At 1 year vomer flap at time of pushback.
S.P. Pushback with island flap (rt).
Revisions. At 7 years. Closure of oronasal fistula; lip scar excision.

Comment. Original nasal distortion severe but as it was not corrected primarily with lift of the alar cartilage, rhinoplasty at 16 years will be necessary.
EARLY REFINEMENTS (CASE 15)

B.D.  March 9, 1963
F.H.  Paternal 3rd cousin cleft lip
F.T.  Uneventful
O.C.A.  None

R.A.  At 3 months
H.P.  At 9 months vomer flap for hard palate closure.
S.P.  At 11 months soft palate pushback with island flap. Fistula closed at 2 years.
B.G.  At 7½ years iliac bone graft over maxilla under alar base with chips into the cleft.


Comment. Cleft with severe distortion that was effectively corrected with the primary rotation-advancement procedure necessitating only minor revisions at 7 years.
EARLY REFINEMENTS (CASE 16)

B.D. May 4, 1966
F.H. Father's grandmother had twins and one had a cleft lip and palate
F.T. Bleeding during trimester
O.C.A. None
R-A. At 5 months
2. Rot with b-c. 3. c for col. 4. Adv with wr.
5. Posterior transposition

of mucosa from medial side cut off inadvertently so cleft mucosa bolstered by reversed Burian from medial sulcus.
At 15 months screw-plate inserted to spread maxilla.
B.G. At 2 years. Split rib into the alveolar cleft and across maxilla under alar base.
H.P. and S.P. Pushback with island flap at 2½ years.
Anterior fistula closed 6 months later.


Comment: Original defect was horrendous, necessitating secondary mucosal roll-down to balance the vermilion free border.
EARLY REFINEMENTS (CASE 17)

B.D. October 14, 1966
F.H. No clefts
F.T. Uneventful
O.C.A. None

At 2½ months anterior palate closed with vomer sepal and lateral flaps and backed with turbinate mucosa.

R.A. At 3½ months

B.G. At 13 months split rib bone grafts to arch maxilla and into cleft. Covered with Burian mucosal flap.
S.P. At 18 months island flap push-back of palate.

Hypoplastic maxilla noted and orthodontia in action with some improvement.


Comment. Wide cleft with good early result with rotation-advance-ment without primary nasal correction. Yet early anterior palate closure using turbinate and at 13 months bone graft to maxilla resulted in hypoplastic maxilla being benefited by orthodontia.
B.D. December 24, 1966
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3 months
3. Adv with wr. 4. Mucosal inter­
digitation posterior to cleft side.
H.P. and S.P. At 14 months nasal
closure of hard palate and covered
with anterior mucoperiosteal flap.
Pushback with island flap (rt).

Comment. The deficiency in the
upper portion of lateral lip element
is reflected in the various stages
from postoperative photo to late
result. Cleft edge muscle flap could
have filled out this upper grooving
for slightly better balance. The nose
will deserve revision at 16 years.

1. 3 months

2. 3 months

3. 1 month postopera­
tive—early contracture
of lip which subsided by
6 months

4. 10 months

5. 4 years—good

6. 5 years

7. 5 years

8. 8 years
EARLY REFINEMENTS (CASE 19)

B.D. February 21, 1969
F.H. No clefts
F.T. Uneventful
O.C.A. None

R.A. At 3½ months

Early contracture subsided by 6 months.

Comment. Closure of lip over the projecting premaxilla so that the lump pummeling the lip probably explains less than ideal upper scar of union and lateral drifting of alar base. Secondary corrections will not be difficult.
EARLY REFINEMENTS (CASE 20)

B.D. December 12, 1969
F.H. Maternal cousin with cleft lip and palate
F.T. Uneventful
O.C.A. None

Ad. At 3 weeks. 1. Medial lip undermined. 2. Turn back vermilion flap from cleft side without undermining. 3. Lateral flap tucked under and sutured to medial element.

R-A. At 3 months


H.P. Posterior hard palate closed with mucosa of nasal layer.

S.P. Pushback with island flap at 14 months.

Revisions. None but improving with growth.

Comment. A severely wide cleft in lip and maxilla with such marked nasal distortion benefited by an adhesion. Requirement of a millimeter more back-cut than usual placed scar slightly lower in the lip. Two-layered closure of the alveolus and anterior hard palate at 3 months caused initial reduction in nostril on cleft side, but with growth this is improving, as seen at 3 years.
RECENT ADJUNCTS WITHOUT PRIMARY ALAR LIFT (CASE 21)

B.D. April 5, 1971
F.H. No clefts
F.T. Uneventful
O.C.A. None

Ad. At 1 month
R.A. 5 months later
  2. Rot with b-c. 3. c for col. 4. Adv with wr. 5. Posterior mucosal interdigitation.
  6. Alveolar cleft and nasal floor closed with mucoperiosteal flaps and lined with labial flap from sulcus.
  7. Alar rim web denuded and transposed as a flap to nasal tip.
H.P. and S.P. At 13 months

1. 1 month
2. 1 month
3. 3 months
4. 6 months
5. 3 months postoperative

Comment. A severe cleft improved by an adhesion. Then without using the adhesion material the rotation-advancement was carried out resulting in early contracture which is gradually subsiding. Use of adhesion material would have improved the early result. A re-rotation and re-advancement may be necessary.
RECENT ADJUNCTS WITHOUT PRIMARY ALAR LIFT (CASE 22)

B.D.   April 16, 1971
F.H.   No clefts
F.T.   Uneventful
O.C.A.  None

Ad. At 3 weeks with slight freeing from maxilla on cleft side
R.A.  At 5 months
Op.  1. Rot with bc, 2. c for col.
     3. Adv with wr. 4. Posterior mucosa interdigitation to cleft side.
     5. Alar rim depithelialized and transposed into tip.
     Healing with catgut reaction even at 6 weeks (arrow). Scar never completely recovered.
     H.P. and S.P. At 17 months push-back and island flap and vomer flap with anterior mucoperiosteal cover.

Comment. Wide cleft benefited by an adhesion. Rotation-advancement went well, but reaction to catgut sutures at 6 weeks increased scar- ring in upper portion which is still noticeable at 2 years but should improve with years or be revised.
COMPLETE CLEFT (CASE 23)

1. 4½ months

2. 4½ months

3. 2 months postoperative—contracture

4. 8 months—lip laceration

5. 8 months—no primary alar lift was done

6. 2 years—lacerated again but only cheek!

B.D. May 14, 1971
F.H. Mother had severe bilateral cleft of lip and palate
F.T. Much emotional stress
O.C.A. None

R.A. At 4½ months

Comment. All’s well that ends well.
COMPLETE CLEFT (CASE 24)

B.D. June 23, 1971
F.H. No clefts
F.T. Uneventful
O.C.A. None

Ad. At 2 months adhesion created.
S.P. At 7 months soft palate split and sutured.
Alveolus. Septal flap closure of alveolus and anterior portion of hard palate covered with mucosal scraps from adhesion.
R.A. At 7 months
H.P. At 1 year vomerine flap tucked under opposite mucoperiosteal edge.

Comment. At 7 months two-layered alveolar closure, definitive lip closure and soft palate closure.
COMPLETE CLEFT (CASE 25)

B.D. July 13, 1971
F.H. No clefs
F.T. Uneventful
O.C.A. None

Ad. At 3 weeks
R.A. At 6 months
3. Adhesion denuded and inserted under alar base. 4. Alar base advanced toward septum. 5. Adv with wr. 6. Alar rim denuded and transposed as flap into crease.
S.P. At 16 months soft palate closed.
H.P. Left open.

Comment. Primary alar lift should have been done and will be done as a secondary procedure before school age.
Ad. At 1 month. 1. Medial lip element freed from maxilla. 2. Vermilion flap from lateral lip element sutured under medial element without undermining.

R.A. At 6 months


S.P. Soft palate split and sutured at time of lip closure.

H.P. Closure of hard palate at 12½ months with vomer flap.

Comment. This wide cleft had the benefit of most of the modern adjuncts including an early adhesion, soft palate closure at the time of rotation-advancement, use of adhesion tissue to release the vestibular lining of the alar base and line nasal floor, muscle flap insertion from non-cleft edge into cleft side. The ultimate result should be good.
COMPLETE CLEFT (CASE 27)

B.D. October 9, 1971
F.H. No clefts
F.T. Uneventful
O.C.A. None

Ad. At 3 weeks. (No undermining lateral segment.) Separated after 1 week. Adhesion recreated after 1 month with slight lateral undermining.

R.A. At 6 months

Comment. All latest mucosal edge flaps used for alveolar cleft closure and release of alar base. Reasonably symmetrical nasal tip without primary alar lift.

1. 3 weeks 2. 3 weeks 3. 4 months 4. 6 months 5. 1½ years
COMPLETE CLEFT (CASE 28)

B.D. December 30, 1971
F.H. Father's father had CL(P); father's uncle's son's son had CL(P)
F.T. Uneventful
O.C.A. None

Ad. At 1 month. Medial element undermined, lateral element not freed.
R-A. At 5 months
Op. 1. Septal and premaxillary mucoperiosteum freed to close anterior cleft; mucosal paring flaps used for second layer. 2. Rot with b-c. 3. c for col. 4. Adv with wr. 5. Tip of alar base denuded and sutured to septum.

Comment. One of the cases with the upper lateral muscle deficiency present in the original deformity (arrow) and still present at 1 year (arrow). This recurring deformity finally caused me to use a medial edge muscle flap to fill out this lateral depression in the primary operation.
SECONDARYALARLIFT(CASE29)

1. 2 weeks
2. 2 weeks
3. 1 year
4. 20 months
5. 20 months
6. 20 months

B.D. August 20, 1971
F.H. No clefts
F.T. Uneventful
O.C.A. None

Ad. At 2 weeks
R.A. At 5 months

S.P. Closure of soft palate at 1 year.
H.P. Vomer flap closure at 17 months.
No attempt at alar lift primarily and alar base positioning difficult.

Revision. At 17 months. Alar base advanced and alar cartilage lift in attempt to reduce the severity of the nasal distortion but leaving final work for age 16 years.

Comment. Unusually difficult nose had delayed primary correction but requires further work.
STRAP FLAP ALAR LIFT (CASE 30)

1. 1 month

2. 1 month

3. 6 months

4. 1 month

5. 5 years

6. 5 years

B.D. July 27, 1966
P.H. Paternal aunt
had complete
cleft of lip and
palate
F.T. Uneventful
O.C.A. None

At 5 months anterior
palate oral closure from
septum and lateral flap
from turbinate mucosa
for 2nd layer. Prosthetic
plate by Balber.

R.A. At 7½ months
3. Adv with wr. 4. Primary nasal
correction by bipedicle chondro-
mucosal flap of alar cartilage su-
tured with cotton to septum and
opposite alar cartilage. 5 months
later, Hagerty-Mylin screw-plate
pinned in.

Original deformity and early result

Comment. A wide cleft that had 3
modifications in surgery. Alveolar
and anterior palate closed (1) with
vomer flap and covered with tur-
binate flap 2 months before lip
closed. Primary radical nasal correc-
tion with (2) chondromucosal strap
flap lifted and sutured to septum.
(3) Maxillary bone graft at 2 years.
In spite of these innovations, pa-
tient seems to be developing well.
B.D. August 10, 1966
F.H. No clefts
F.T. Uneventful
O.C.A. None

Fitted with feeding plate by Dr. Balber (McNeil-Burston).

R.A. At 3 months
3. Adv with wr. 4. Nose: primary correction. Marginal and intercartilaginous incisions formed chondromucosal strap flap which was cut free laterally and sutured to opposite alar cartilage and septum with nylon.

Screw-plate (Mylin-Hagerty) by Balber at 9 months.

Revisions. At 10 months postoperative. Oronasal fistula closed. Alar base transposition.

B.G. Split rib graft across maxilla and into cleft at 19 months.
S.P. Closed at 21 months.
H.P. Closed at 29 months.

Comment. Primary radical nasal correction with chondromucosal strap flap advancement balanced the nasal tip quite well. Early lip contraction soon smoothed out with good balance.
**RECENT ADJUNCTS AND ALAR LIFT (CASE 32)**

1. 3½ months
   - B.D. October 20, 1966
   - F.H. No clefts
   - F.T. Uneventful
   - O.C.A. None

   **R.A.** At 3½ months
   1. Rot with b-c. 2. c for col. 3. Alar rim incision allowed chondromucosal flap sutured with nylon to alar cartilage and septum. 4. Adv with wr. 5. Alar rim web excision.

   **Revisions.** 5 months postoperative.

   **Comment.** The difference in height of the two peaks of the bow required a radical rotation with the aid of the back-cut but it was achieved without difficulty.

**RECENT ADJUNCTS AND ALAR LIFT (CASE 33)**

1. 4 months
   - B.D. November 18, 1970
   - F.H. No clefts
   - F.T. Uneventful
   - O.C.A. None

   **R.A.** At 4 months
   1. Rot with b-c. 2. c for col. 3. Through intercartilaginous incision alar cartilage sutured with nylon to septum. 4. Adv with wr. 5. Alar rim excision.

   **Comment.** Lip was closed over the projecting premaxilla without difficulty. Alar cartilage was lifted up to septum with a buried nylon suture with reasonable balance to the tip.
Recurrent Adjuncts and Alar Lift (Case 34)

1. 9 months
2. 9 months
3. Early postoperative
4. 6 weeks postoperative—severe hypertrophy
5. 3 months postoperative—improving
6. 8 months postoperative—even better

B.D. April 4, 1970
F.H. No clefts
F.T. Mother had rash at 2 months
O.C.A. Congenital esotropia

R-A. At 10 months
Op. 1. At time of R-A vomer flap closure of hard palate but left alveolar cleft open. 2. Rot with

b-c. 3. c for col. 4. Adv with wr.
H.P. and S.P. Island flap pushback at 18 months.

Comment. Cuban patient with severe absence of tissue seen first at 9 months. So no adhesion. Excellent early result with gradual hypertrophy of scar, more than seen ever before, but by 18 months greatly improved.
RECENT ADJUNCTS AND ALAR LIFT (CASE 35)

B.D. October 22, 1970
F.H. No clefts
P.T. Uneventful:
    mother—38
    father—56
O.C.A. None

Ad. At 9 days
R.A. At 2½ months
Op. 1. Large Skoog periosteal flap
    for 2nd layer closure. 2. Rot with
    b-c. 3. c for col. 4. Alar lift with
    suture. 5. Alar base advanced.
    6. Adv with wr. 7. Posterior mucosal
    flap to attenuated lateral side.
    8. Alar rim excision.
H.P. and S.P. At 13 months vomer
    flap and island flap pushback.
Revision. At 18 months. Closure of
    fistula. Nose: alar base advancement
    with denuded tip. Alar rim margin
    excision.

Comment. This case had a large peri-
    osteal flap from the maxilla and will
    be reviewed later on this basis.
Even during the writing of this volume, changes have been instituted into the primary correction of the lip and nose by the rotation-advancement principle. Here is the most recent example using many of the latest changes.

At six weeks of age a bilateral myringotomy with insertion of tubes, closure of the soft palate and creation of a high mucosal lip adhesion were accomplished.

At six months of age
1. Flap m covered the raw alveolus.
2. Rotation with back-cut.
3. Flap c advancement.
4. The membranous septal incision used to advance flap c extended across under the dome to join the intercartilaginous incision extension coming up from the lateral freeing of the alar base from the maxilla.
5. This exposure facilitated nylon suture lift of the slumped alar cartilage up on to the septum.
6. Flap I filled the lateral defect in the nasal vestibule.
7. The diminutive lateral lip element was increased in vertical dimension by including the tip of the alar base.
8. The lateral lip muscle fibers were dissected and brought down more transversely.

9. A muscle edge flap from the medial element was transposed into the muscle defect in the upper portion of the lateral element.

10. The lateral cleft skin edge was trimmed to a concavity to fit the convexity of the rotation edge.

11. A subcutaneous flap dissected from under the alar base flap was sutured to the septum at the nasal spine to correct the alar flare.

12. Flap c and ala base flap D joined to form the nostril sill.

13. A 1.5 mm. wide “white roll” mucocutaneous ridge flap was interdigitated across the scar.


SUMMARY

By the time this volume is published, it will be over 20 years since the first cleft lip was rotated and advanced. The early results of the initial “crude” procedure in Korea, 1954–1955, long lost to follow-up, in general seem to be almost as good as today’s early results awaiting later evaluation. This is an overwhelming vote of confidence in the method’s fundamental principles and basic design. Extensions, refinements and more recent adjuncts have
been added to facilitate the execution particularly in difficult
clefts, to bypass postoperative discrepancies, mine or those com-
plained about by others, and to ensure greater final finesse in all
cases. By now you should be able to rotate sufficiently without
crossing the normal philtrum column and advance with adequacy
but without paring laterally beyond normal limits. Placing more
and more nasal components into more nearly normal position
primarily seems to be decreasing the nasal distortion. The increase
in economy with absolutely no discard of tissue and the con-
servatism in the timing of surgery, with early lip and soft palate
adhesion but postponement of radical hard palate manipulation,
promise an even better long-term prognosis. Fastidious scrutiny
of the healing, growth and development of each patient through
the years is constantly influencing the plan for the ensuing case.
Ever looking for a better way, I have not done one case exactly like
the one before, and no case in this book has been done exactly as
I—or you I hope—will do the next cleft and the next . . .

Semper investigans, nunquam perficiens.
VII. Secondary Surgery
By definition this secondary section is devoted to the losers who, for one reason or another, temporarily have to be placed in the minus column. To avoid having such a calamity happen to a patient in the first place, and to correct it when it does in the second, calls for us to take a hard line.

As the renowned Notre Dame football team suffered loss after loss over several years, a frantic search was begun for another winning coach like the legendary Knute Rockne. The University of Notre Dame, the U.S.A. mecca for Catholic students, after both coach and soul searching, decided in a businesslike manner to sign aggressive Ara Parsegian, an unlikely French-Armenian Presbyterian, as head coach. They announced to him with very little ceremony,

We are behind you 100 percent—win or tie!

And Parsegian did succeed, placing Notre Dame back in the winning column and reviving the victory spirit at South Bend. Then, on the way to an undefeated season, the team suffered an upset defeat by Purdue University. Coach Parsegian, overworked and in semi-collapse, admitted himself to the hospital for a "recovery period," fully aware that the University Athletic Advisory Committee was meeting simultaneously to decide his fate. He waited anxiously. Finally, a telegram from the committee arrived:

We wish you a speedy recovery by a vote of 4 to 3.

Parsegian, after a number of "secondary corrections," finally
achieved his desired result. Notre Dame University defeated the University of Alabama in the 1973 Sugar Bowl. His team was in the number one spot in the nation.

Cleft surgery is far more than a game. The stakes are higher and winning is vital, as a loss is a disaster. A most disturbing fact persists: Try as hard as we may, we still cannot quite win them all. But we have to keep trying!

It is the hope of all cleft surgeons that the initial surgery will be so effective that no further correction will be necessary. As noted by Muir and Bodenham of Great Britain for Gibson’s 1966 *Modern Trends in Plastic Surgery*,

There is evidence, however, that primary cases treated by the more advanced techniques of today—for example, rotation advancement . . . will need less major surgery than previous generation cases.

Certainly as the primary surgery improves, the secondary work is reduced until it amounts to no more than minor revisions.

Many pages have been devoted to why and how to plan the primary procedures and if these are understood and executed with skill befitting a plastic surgeon, that should be the end of it. Unfortunately, there are still patients who have been operated on without benefit of modern developments. Either their surgery was executed too many years ago or it was done more recently by untrained surgeons.

Secondary surgical correction of cleft deformities is a whole new ball game, but the rules that govern the primary operation also hold secondarily: Know the normal, find it and place it in normal position, throw away nothing until it is proved useless, borrow from an area of excess to correct an area of need only when it can be afforded, do not get shackled in routine but look at each case individually and when surgery, growth or lack of growth has been responsible for loss of tissue, then replace lost tissue with similar tissue in kind.

It is vital that the first failure not throw the surgeon into panic, so that his second effort is neither irrational nor repetitious of the previous error. If the secondary surgeon could be guided by such simple, sound dicta as
Never make the same mistake twice.
Two wrongs do not make a right.
When in doubt, don't!

the tertiary surgeon would have little or nothing to do.

THE ORDER OF LINEUP

Secondary corrections must be subdivided into so many categories that it is difficult to know what to put where! There are corrections dealing with the lip and those dealing with the nose and some dealing of necessity with both at the same time. What is indicated for a unilateral deformity is not always ideal or must be modified for a bilateral problem. There are general methods that can be adapted specifically to the common result seen after certain standard primary lip operations. All this overlapping makes some repetition unavoidable.

Of course, when the fundamental principles of the surgery were wrong, the faults will be glaring. But even with sound principles there is always the possibility of human error of hand and eye, and all scars just do not heal equally well. Areas of secondary error in the lip vary with the primary methods but are most common in the scarring, the muscle approximation, the contour, the landmark preservation and alignment and free border symmetry.
When scars have been placed across normal lines, they produce an unnatural effect. Even when of fine quality they still strike a discord. At rest with a flat light they may be passable, but in the action of muscle contraction and against various angles of light they become grossly accentuated.

Scars under tension spread. In the lip not only does this spread produce wide stripes of discoloration but in the male the absence of hair emphasizes the discrepancy. When scars are placed along natural lines and the tension of closure has been reduced and supported at the subcutaneous and muscle level, there should be less need for scar revision.

**STALL FOR TIME**

As Sir Harold Gillies once said,

*Time, although the plastic surgeon’s most trenchant critic, is also his greatest ally.*

He later simplified this idea to,

Never do today what can honourably be put off till tomorrow.

It takes time for scars to achieve their optimum healing—six months and more. During the early weeks and months after surgery, the fibroblastic contracture can wreak havoc with our work, causing discouragement and even panic. The inexperienced surgeon may be pressed into early reoperation. Patience will allow healing to solve the problem more effectively and less traumati-
cally. This sequence of events has been demonstrated repeatedly in the primary cases.

**TEENAGE REACTION**

Experience has shown that from the age of about 8 to 18 years surgery is followed by exaggerated reaction with longer periods of scar erythema and hypertrophy. More than ever patience is important because if the surgery was executed correctly and the teenager is given the chance, the scar will eventually soften, smooth and fade. Make certain to tell him so.

**INEXCUSABLE STITCH MARKS**

Unforgivable and often uncorrectable are the hideous broad stitch marks flanking the lip scar like ties along a railroad track. These telltale marks are the result of widely placed retention sutures used to counteract the tension that adequate, careful undermining and muscle approximation by deep suturing should have alleviated. True, they are rarely seen any more but when encountered are a nightmare. Fine skin sutures must be placed close to the edges, must not be tightened and must be removed within two to four days. To ignore these fundamentals of wound closure is to be responsible eventually for some surgeon's facing the horrible stitch mark dilemma, which has no acceptable solution. The total area is too wide for simple excision, and sandpaper abrasion cannot smooth deeply enough.

Jack Penn's individual diamond excision of each "crosshatch" scar carried out in a double saw-toothed series, the defect being closed by a shift of the opposing edges until they mesh, may improve the scars, but the zigzagging across normal lines is far from ideal. Besides, in such a confined area the shift might distort the mucocutaneous border unless a discrepancy was already present.

Another secondary procedure aimed specifically at stitch marks and ending up with the same general zigzag scar was presented by Onizuka of Japan in 1971. He marked a Borges W-plasty.
excision of the vertical scar of the lip, with the upper interdigitation similar to the rotation-advancement maneuver. He created a philtrum groove and then approximated the series of interdigitations after quite a wide resection of skin and scar.

These various interdigitations are all in the same saw-tooth scar family as Morestin’s multiple Z-plasties, Hazrati’s compound right-angle Z-plasty and Borges’ W-plasty. Considering this general principle as a possible approach to the cleft lip scar, I challenged skin scar expert Albert Borges, the perspicacious Cuban, to send me from Falls Church, Virginia, the photos of a secondary cleft lip case in which he had used a series of his W-plasties. What a pleasure to receive this candid and refreshing response:

The W-plasty is not indicated in the revision of postoperative cleft lip scars for two main reasons. The excision of skin which is required in the W-plasty technique would further increase the already high transverse tension of the repaired upper lip frequently seen in many cases. Following a W-plasty on a wrongly indicated vertical lip scar, each segment of the zigzag scar lies almost perpendicular to the normally vertical relaxed skin tension line of the lip. This should give a poor esthetic result since scars that cross the R S T L direction are notoriously unesthetic as compared to those that follow it.

A WAVY LINE

In 1973 at the Copenhagen Congress Gerhard Pfeifer, who has followed Schuchardt as chief of Nordwestdeutsche Keiferklinik, University of Hamburg, offered his wave-line scar closure. He had developed it over the past eight years, using it in 200 primary clefts and 200 secondary clefts. He diagramed his design prior to the suturing as

Parallel, symmetrical and differently curved wave lines,

explaining,

The variable system consists of a few basic types of semicircular skin incisions which can be adapted to the requirement of each individual case . . . . The resultant scars are vertical or curved in form . . . all bilateral clefts can be closed in the same operation.
Pfeifer mobilizes and approximates the orbicularis oris muscle fibers during his wave-line skin closure.

DO U B L E - B R E A S T E D V E S T
S C A R R E V I S I O N

The double-breasted vest scar revision, first presented in 1970, has been found of value in certain cleft lip scars. Of the many factors that adversely influence the character and width of a scar, tension is probably the prime offender. Smiling and crying are constantly pulling on the lip, which inevitably under this tugging has to spread its scar. Then the young teenager, just at the time for secondary revisions, tends to react more angrily to everything, including his wound, heaping fibrous tissue into the zone of the healing. In areas of no tension, a hairline scar is not unusual, so if the tension can be taken up "underground," the edge-to-edge scar should have less "tension reason" to spread.

In lips that have a vertical straight-line or curving scar which has broadened or is ugly, and especially when the lip conformity is flat on the scar side with lack of philtrum column, the double-breasted vest is indicated.

First the lines of incision are marked (1). Then the epithelium is dissected from the lip scar, leaving the dermis intact (2).

Along one side of the scar an incision is made through the dermis into the subcutaneous tissue. Then this edge is undermined on the bias laterally with a scalpel, somewhat more than the width of the scar (broken line) (3).

The dermal scar, still attached to the opposite side, is undermined as a thin sheet until just before the level of the opposite side is reached, at which point the undermining dips deeper (broken line) (4). Along the point where the denuded dermis joins the normal skin, a nick incision on the bias is made to a conservative depth but deep enough to create a matching edge for level apposition with the skin thickness of the opposite edge (5).

The scar sheet, attached to the freed edge of one side, is pulled across and under the opposite edge until their two skin edges
almost overlap. Then the scar tether is sutured with 4-0 Mersilene to create the first-line under-buttoning, taking up all the tension of the closure (6). The advancement of this sheet of scar can be increased by rolling it on itself, and in the process it not only relieves tension but forms a mound similar to the missing philtrum column (7). With all the tension taken up at the subcutaneous level, a subcuticular suture of the relaxed skin edges can achieve an outside buttoning, or fine interrupted sutures can be used (8). Any stretch of the scar at the underpinning is hidden. The adhesions of the dermal imbrication should ensure against the exertion of any tension on the actual visible skin scar.
SIMPLICITY OFTEN SUFFICIENT

Of course, most of the time scar excision need not be so fancy, particularly when the scar runs along natural lines. Simple, clean perpendicular excision of the scar, freeing and careful approximation of the muscles and accurate skin apposition can eventually produce an almost invisible union.

HIDING THE SCARS IN THE MUSTACHE

When the lip scars and cross-hatching stitch marks are such that excision is impossible and abrasion ineffectual, at least in the male it is possible to let the hair grow and excise special portions of the scars to effect a balanced mustache. This principle obtained a reasonably good result (below) but the central and left area seemed more bald than the right. A hair-bearing free graft from the bushy eyebrow was transplanted and is so swashbuckling that the left brow may be called upon for the right mustache.

ABRASION

When the lip scars are too many or too scattered for effective excision, they may be improved by abrasion with sanding. If the scars are reasonably good but show some minor irregularities which cannot be benefited greatly by further excisions, often they can be smoothed by abrasion. This is but a final scar-polishing
gesture. It can be done along with other minor revisions, such as a V-Y vermilion roll-down and normal alar base and cleft side alar rim excisions as shown.
41. Discrepancies in Muscle Continuity and Philtrum Contour

SECONDARY MUSCLE DEFORMITY

The importance of accurate and complete muscle approximation across the cleft cannot be stressed enough. As noted by Pennisi and Fara, most cleft lip closures do not correct the alignment of the orbicularis oris muscle fibers, so that often vertically oriented fibers are sutured side to side. Then, as Pickrell has suggested, there is dysplasia of the orbicularis oris muscle itself, which can be responsible for later appearance of flatness in contour after surgery. In fact, there is often a discrepancy in muscle body in the actual edge of the lip element on the cleft side and a true attenuation with grooving horizontally of the upper portion of this element just below the alar base. This relative thinness is accentuated by an unnatural muscle bulge below and lateral to it. Thus, it is important that the surgeon expose good muscle structure on each side of the cleft and bring these together with authoritative suturing.

Merrill Climo of Falls Church, Virginia, as an alert resident at New York Hospital–Cornell Medical Center, repeatedly observed a diastasis of the orbicularis oris muscle in older patients returning to the cleft palate clinic. In 1968, before the New York Academy of Medicine, he proposed that if the surgeon does not succeed in his primary procedure, whether it be improper muscle apposition, dehiscence or gradual attenuation, an orbicularis diastasis occurs. For this defect he advised scar excision, reorientation of the orbicularis fibers and secondary suturing with the nasal spine as the suspension point. Climo was awarded the first
J. P. Webster award for best resident’s paper, and in 1969 this work was published in the *Cleft Palate Journal*. His chief, Herbert Conway, pleased with the simplicity and effectiveness of this approach, presented him with a trip to Italy. There he served as a teaching fellow at the Catholic University under Professor Litterio Maggiore who himself was inundated with secondary cleft lip cases from Sicily.

**SECONDARY CAMOUFLAGE**

The ambling but astute George Crikelair of Presbyterian Hospital, renowned for his devoted work in accident and burn prevention, was content to treat secondarily, rather than prevent primarily, the cleft side flatness after lip closure.

Cosman and he noted,

In forms of lip repair that fail to respect the philtrum, a flattening of the area beneath the nostril and extending down to the vermilion is to be noted . . . the result of the absence of the normal philtrum eminence on the cleft-side. Comparison between the cleft and normal sides makes the difference even more striking.

This flattening need not be blamed on the primary operation. As already noted, there is often a deficiency of contour in the lateral lip element above the muscle bulge which when incorporated into the closure will retain a flatness. Rather than discard this valuable tissue, it is better to bolster it. Cosman and Crikelair advocate a dermolipomatous graft:

Medially based turnover flaps of muscle and fibrous tissue from the lateral lip and rolled on themselves along the philtrum line did not produce satisfactory results . . . The use of a dermal fat graft to create a philtrum eminence . . . and its placement via the incision in the nostril floor while rotating the ala seemed apropos.

This is a worthwhile secondary procedure.

**A SWEDISH SCARRED MUSCLE SLING**

Others have found interesting secondary uses of parts of the lip scar. For instance, the father of Swedish plastic surgery, Alan
Ragnell of Stockholm, suave and as sly as a fox, had his early training in England. As Gillies once said,

I was flattered by Alan’s devoted attendance to my surgery until I discovered he was courting my theatre sister on the side. What’s more he took her back to Sweden with him and married her!

In 1946, with the same clever efficiency, Ragnell, concerned about the creeping alar base in unilateral clefts, excised the lip skin scar including the nasal floor and a dart at the columella base. He then cut a vertical flap of muscle and scar, based it medially and superiorly and used it as a sling to pull in and support the alar base, which was itself advanced into a dart in the columella base. Of course, a tertiary advantage of this sling now becomes apparent as it could be used simultaneously to fill any deficiency in the upper portion of the lip if its course to the alar base were directed accurately.

As another example of his crafty efficiency, Ragnell, living on one island not far from another, had a wire strung between them. To save launching a boat daily he suspended a 60-foot net from the wire, which he hauled in twice a day along with several delicious one-pound perch fresh out of Scandinavian waters. Now retired in sunny Sicily, from his picturesque spot in Taormina on top of that shear rock cliff covered with purple bougainvillea and with Mt. Etna at his back, he can look with contentment upon a vast expanse of teal Mediterranean sea. He can also reflect with pride on plastic surgery in Sweden, and the world-renowned cleft lip and palate centers at the Universities of Göteborg, Stockholm, Uppsala and Umea.
MUSCLE READJUSTMENT

It is becoming more and more apparent that mere suturing of the muscles is not really enough, nor is the grafting of dermis. Dissection and positioning of the muscle fibers into a more transverse direction are essential. This procedure creates muscle defects which, in addition to the original congenital deficiencies, require the shifting of excess tissue. Muscle edge flaps transposed across the cleft can be inserted into tunnels in the deficient zones for contour and functional balance. These muscle flaps have been described in the primary cleft lip closure but can be employed as secondary procedures.

A COMMON DISCREPANCY IN EARLY ROTATION-ADVANCEMENT

The common secondary deformity in the orbicularis oris muscle shows up as a subcutaneous cleft or diastasis allowing distortions in the lip during puckering and whistling. At rest, a muscle bulge presents in the lateral lip element with a contour deficiency appearing between this bulge and the alar base. It is treated by de-epithelialization of the vertical lip scar, which is then elevated as a dermomyocutaneous scar flap based superiorly. This provides access to the lateral muscle, which is dissected free from its skin and mucosa in the area of the bulge, released from above and brought down and stretched across for better end-to-end muscle fiber approximation. There is then an empty space left above in the lateral element into which the dermomyocutaneous scar flap can be transposed.

Here is an example in which the unilateral incomplete cleft had been rotated and advanced without refinements at the age of three months in 1957. The balance of the cupid's bow and philtrum dimple were acceptable. At age two years the slight

3 months

2 years
deficiency inherent originally in the upper part of the lateral advancement flap was noticeable.

By 16 years it was emphasized by the ridge of the upper part of the rotation scar. The upper, crinkled and ridged portion of the scar was de-epithelialized, and a flap was taken of the deeper tissue in this area including scar, dermis and muscle. With its base above, this flap was transposed across into a tunnel under the depressed area. A small wedge from the "normal" wider alar base was also de-epithelialized and used for extra filler. The muscle was reapproximated across the cleft with 4-0 Mersilene.

Even a three-quarter view from the cleft side now shows a natural philtrum hollow and bow and in no way impedes his life or his prowess in football at defensive back.

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PHILTRUM Dimple—Preservation Or Excavation

One of the practical difficulties in the construction of the philtrum hollow is the paradox the surgeon faces in trying for solid muscle continuity and, at the same time, gouging or removing a central portion of this muscle to create a dimple. Both are desirable, but the dilemma is to gain one without losing the other.
RECREATING PHILTRUM LANDMARKS

Although the medial component of a unilateral cleft lip has a philtrum dimple, a column and two-thirds of a cupid’s bow, when these landmarks are ignored and destroyed during the primary surgery, the final result is a lip with no dimple and no bow.

Gerald Brown O’Connor of San Francisco had enough of the fight of the Irish in him to win his boxing stripes at the University of California, to hang in there as a student with Gillies at his caustic prime and to try to correct one of cleft lip’s most difficult deformities.

O’Connor, with McGregor, designed a method of creating a dimple in the prolabium of bilateral clefts and modified it to re-create a philtrum dimple in unilateral clefts. Through the old Blair-Brown incision, which, of course, did away with any dimple or bow, the skin of the center of the lip was undermined. A vertical flap of muscle tissue based inferiorly was gouged out of this area, split into two flaps and transposed bilaterally in tunnels along the mucocutaneous junction line. Tissue was thus shifted from the vertical center to the lateral horizontal plane in an attempt to create a philtrum hollow. There is a tendency for the lateral lip muscle pull to smooth out these excavations unless the skin in the area is well thinned, of sufficient amount to drape easily into the hollow and fixed with permanent buried sutures.
Takuya Onizuka of Showa University, Tokyo, creates both a philtrum dimple and a column in secondary cases in which they have been destroyed. He advocates a W-plasty excision of the vertical scar or a positioning of the cupid’s bow and alar base with the rotation-advancement principle. In combination with this he turns a roll-over flap of muscle tissue out of the central philtrum position with its pedicle on the vermillion and curls it on itself to form a philtrum column prominence. The maneuver is sound as it takes tissue from where it is actually not wanted and puts it where it is needed.

**ORIENTAL Dimple and Column**

**Dimpled Abbe**

Then there is the shield-shaped midline Abbe flap, which can transpose the lower lip groove into dead-center philtrum dimple position of the upper lip. There will be much more on this later.
42. Discrepancies in the Cupid's Bow, Vermilion Free Border and Sulcus

CU PID'S BOW MAKING

A L L components of the normal free border of the upper lip are shaped like a cupid's bow flowing in a double upward arc with a central downward curve. The mucocutaneous junction line follows this form and is ridged enough to pick up a light reflex earning it the title of "white roll." It comes to a downward point in the midline. The free border vermilion of the lip flows along the cupid's bow line arching on each side but swelling in the midline into a tubercle. Any discrepancies in this sensuous arrangement are not only abnormal but eye-catching.

SKIN ENCROACHMENT OF VERMILION

An incomplete cleft was closed in Puerto Rico at two months of age with a reasonable result except residual skin still violated the vermilion. Excision of the ectopic epithelium and interdigation at the mucocutaneous ridge at least erased obvious objections.
DEFORMITIES OF THE MUCOCUTANEOUS LINE

The most minor mucosal peaking may be actually a visual illusion as the red of the skin scar runs into the red of the vermillion. A slight spread of the scar at the junction gives the effect of a contracture peak without the actual presence of one. As prophylaxis for this illusion, a white roll skin flap interdigitation was designed to be used primarily in lip closure. The same principle has proved to be of benefit in secondary corrections and has found new advocates, as stated by Hogan and Converse:

A small flap of lateral or medial tissue 2 mm. wide, including the white line as described by Millard, may be incorporated at the mucocutaneous junction to break the vertical scar.

Here is a seven-year-old boy who seems to have had some type of rotation-advancement but ended up with a minor mucocutaneous ridge interruption. This was corrected simply with a white roll Z-plasty and several other minor labial and nasal adjustments.

WHITE ROLL FREE GRAFTS

When the mucocutaneous white roll ridge has not been interdigitated and there is no excess skin available to create one, it can be grafted. If all other aspects are in good alignment, a 1.5 × 2 mm. free skin graft can be let in across the vertical scar to give the effect of a continuous mucocutaneous ridge.
In this incomplete cleft no white roll interdigitation was used during the rotation-advancement, as can be seen in the early postoperative healing phase, and by one year the mucocutaneous ridge discrepancy had spread and was noticeable. At age one and a half years a white roll free graft of arm skin was used to bridge the ridge. At five years the result was promising, and at 13½ years the mucocutaneous ridge revealed effective continuity across the scar.

Here is a case with a greater loss of mucocutaneous ridge which is quite deforming. It is easy to reconstruct the sequence of events that led to this loss. Some type of LeMesurier quadrilateral flap was used for the primary procedure, and after the cleft side lengthened, causing flattening of the bow arc on that side, a unilateral elliptical excision of skin and mucocutaneous ridge was used in an attempt to lift this side of the bow back into the lip.
In addition to scar excisions, a reconstruction of almost the entire right cleft side mucocutaneous ridge was accomplished with a long slender free graft from the palest area in the postauricular region. It required one revision and did serve reasonably well, but the whiteness of volar arm skin probably should be preferred for this graft.

Z-PLASTY

Odd, small *true* interruptions of the mucocutaneous line can be corrected by whatever trick serves the purpose. If, as in this case, the bigger Tennison Z-plasty has not been totally effective and mucosa has been left insinuating itself across the mucocutaneous ridge into lip skin, a tiny Z is one way to correct the discrepancy as two "wrongs" make a *lesser* right.

UNILATERAL GILLIES

If the skin has encroached upon the mucosa, excision of the excess skin and the lifting of the mucosa to the correct level may be of benefit. This, in principle, is the basis of the old Gillies
cupid’s bow operation and is the classic procedure for many mucocutaneous line discrepancies.

In the original unilateral cleft lip, two-thirds of a cupid’s bow, one column and the dimple are present, and if they are preserved, all is well. If the primary surgery ignored and destroyed the landmarks, then secondary reconstruction is indicated.

**UNILATERAL CUPID’S BOW**

When a unilateral mucosal peak has appeared in a lip that is otherwise satisfactory but that has no residual of the original cupid’s bow, a half bow can be created by a hemi-Gillies operation. This maneuver has been improved over the original design. The triangular skin excisions should be marked just above the mucocutaneous junction line so to preserve this landmark. Then, the usual unilateral full-thickness skin excision and muscle notching with the lift of the vermilion will construct the other half of a cupid’s bow.

This 14-year-old Cuban girl had had a Z-plasty closure of her lip cleft with severe asymmetry of the two arcs of her cupid’s bow. The possibility for improvement of the Z was limited, but a modified Gillies unilateral cupid’s bow operation was used. Excision of an elongated triangle of skin and muscle parallel to but above and preserving the mucocutaneous ridge on the cleft side achieved better balance.
DEFORMITIES OF THE VERMILION FREE BORDER

Vermilion free border defects occur in unilateral and bilateral clefts. The common unilateral discrepancy usually appears on the side of the cleft, exaggerated by an overabundance on the normal side. This calls for correction of the cleft side shortness, but do not overlook the value of reducing the normal side in selected cases.

Lack of symmetrical fullness of the free border vermilion can be corrected by the usual V-Y roll-down of mucosa from the posterior aspect of the lip. This is a subtle procedure and seldom requires as extensive an advancement as shown in textbooks or in these diagrams. One stitch in the stem of the Y is usually sufficient.

AN EXTRA FILLER

An adjunct to the mucosal V-Y can be used to give more vermilion fullness. A V flap of posterior mucosa is incised and dissected down to the free border edge. Then subcutaneous tissue flaps from the sides of the donor area can be cut and transposed 90 degrees to crisscross each other arm to arm under the V roll. In certain cases only one subcutaneous flap is needed to "fill the chink" under the V-Y roll-down. The mucosal V flap is then advanced down and out and the donor area closed in a Y, usually with no more than one suture placed in the advancement stem of the Y.

This boy had a rotation-advancement closure by Bernard Morgan in Jacksonville with an excellent result. Only a cleft
side vermilion deficiency was noticeable. A posterior mucosal V-Y roll-down, utilizing one subcutaneous side flap, was transposed under the roll to round out the vermilion free border.

Certain surgeons in special circumstances find a Z-plasty in this area effective. At least, it is one more way to treat the defect.

One of Claude Dufourmentel’s corrective lip designs synchronizes the two Z’s. One Z deals with the skin scar and shortness while the other fills out the vermilion notch.
For this same general discrepancy J. G. Ginestet of Paris designed more radical posterior mucosal transposition flaps taken from various locations. One was designed to be taken horizontally from the normal side along the same axis as the defect, which required a turn of 180 degrees.

Another was designed vertically so that its transposition required only a 90-degree turn.

DEFORMITY OF THE UPPER LABIAL SULCUS

Gillies, Barrett Brown and many others through the years have used relaxing incisions along the alveolar margin for the advancement of lip tissue.

WIDER ADVANCEMENT

Correction of free border deficiency by radical local labial soft tissue shifting as allowed by buccal sulcus incisions and wide
undermining was presented in September 1972 by O'Connor, McGregor, Murphy and Tolleth of San Francisco. They recommended this action in old cleft lips with lack of mass on the cleft side, inadequate contour of lower middle face, excessive thinness of vermilion and scar contracture between mucosa and gingiva with tethering of the upper lip and the "whistling deformity." It was also noted that anterior oronasal fistulae are more easily repaired with large, well-vascularized mucosal flaps.

Their description of the procedure is as follows:

An incision is made in either buccal sulcus, 6.0 to 7.0 millimeters from the reflection and carried posteriorly on either side to the region of the first or second molar. . . . A downward curve [back-cut] of the incision for 1.0 centimeter will allow greater advancement. Wide undermining over the maxillae can be carried out, avoiding the infraorbital nerve. . . . With gentle traction, the mucosal flaps can be advanced medially. Deep sutures of gut are placed. Depending on the problem, a variable amount of mucosa can be made available to improve the width of the vermilion, correct contracture or solve fistula problems.

The senior author, Gerald O'Connor, a "wild Irishman," Catholic and elder surgeon, who accepted all the complications and problem cases in the Bay area, earned and enjoyed the affectionate title given him by the younger men of "Father O'Connor." He was a special friend, not only because of his early training with Gillies and his boxing exploits in and out of the ring. For a short time near the end of World War II I served under his command at Mare Island Naval Hospital and at his kind suggestion was set to assist with his private surgery at St. Francis Memorial Hospital on our day off. Then came V-J Day, and as I had previously requested sea duty, the Navy sent me off to Tennessee.

In 1972 Gerry O'Connor wrote asking a personal opinion of his method of facial soft tissue advancement in clefts. Unfortunately, he passed away a month after its presentation, but I am anxious to report now having found his approach most beneficial in the indications cited.
FREE GRAFTS

When the normal free border is excessive, it will require an elliptical excision to balance the opposite side. If the normal side is excessive and the cleft side deficient, the excised piece of mucosa from the normal side can be inserted as a free graft into a horizontal releasing posterior incision on the cleft side and avoid a 180-degree turn. The excess from the free border can also be denuded of its mucosa and the remaining subcutaneous-muscle graft threaded into a submucosal tunnel along the attenuated border to fill out the discrepancy or accentuate the tubercle.

CORRECTING SPECIFIC METHODS

Every method has, in some degree, its pitfalls, its fundamental flaws and its characteristic secondary deformities. It is important, however, to realize that some of the secondary deformities being presented would not have occurred if the method had been executed correctly and with skill. In other words, the method is not always entirely to blame for the result. Yet, it seems fair to state that repeated occurrence of a specific minor secondary deformity calls for modifications in the primary design, and recurrence of deformities requiring extensive secondary surgery commands abolition of the method.
43. Secondary Correction of a Straight-Line Closure

The most common secondary deformity of a straight-line closure is vertical contracture of this line with peaking of the vermilion and notching of the free border. A popular method of correcting a straight-line lip scar was for many years a diamond-shaped excision which, upon closure of the opposing angles, increased the vertical length of the lip while narrowing the width. This principle was popularized by Rose and later Thompson and occasionally is used in some clinics even today.

For instance, at Johns Hopkins Hospital about 1944, John Staige Davis, one of America's pioneer plastic surgeons, straight as a ramrod, although in his 80's, was preparing to do a secondary cleft lip procedure on a 13-year-old girl. Lamont of California recalls:

I had long ago learned how to be a good observer. I had spent a couple of years in St. Louis before World War II. . . . Dr. Davis sat at the head of the patient and made the appropriate markings with gentian violet. The incisions on each side of the scar were to be a modified diamond, which was supposed to lengthen the distance between the base of the nose and the vermilion. . . . As Dr. Davis prepared to lower the blade of the scalpel toward the lip, his intention tremor became apparent and suddenly he stopped and turned over his shoulder and asked, "Dr. Lamont, what would you do for this case?" "Dr. Davis, I have been observing your preoperative measurements, Sir, and whatever it is you plan to do I hope that someday I am able to do it half as well." He turned back to his surgery, the tremor disappeared as his scalpel made a precise incision down the lip, and the operation had begun. It was during the suturing that he again turned toward me and asked, "Do you have any plans for lunch?"
Z-PLASTIES AND OTHER TRANSPositions

A more popular method of dealing with this contracture today involves excision of the vertical scar and the use of some kind of Z-plasty. This solves the problem of the straight-line contracture and shortness of vertical height but at the cost of an unnatural scar crisscrossing normal lines of the lip. There was a time when such violation of principle was acceptable, but the sophistication of this surgery has progressed.

GINESTET

The dynamic and forthright Jean Gustave Ginestet, founder of the maxillofacial center in Foch Hospital, was a pioneer in secondary deformities of clefts.

For a more severe peaking contracture, referred to as the “chapeau de gendarme” deformity, Ginestet advocated an oblique flap based inferiorly to be transposed into the defect along the mucocutaneous line after the vermilion retraction has been released. When the cupid's bow has been destroyed, this procedure offers a possible means of contracture correction, but beware of creating a long lip.
Another dexterous maxillofacial surgeon of l'Hôpital Foch, Paris, is L. C. Merville, who has carried on the secondary cleft work of Ginestet. He has the skill to handle delicate instruments and the ability to develop corrective procedures. In 1966 he described the sliding of full-thickness lip flaps in the form of a Z for correction of a straight-line contracture and shortness of the lip. To facilitate his advancements and to remove subalar scarring, he used circumalar crescent excisions. Although an improvement over the original primary scarring in the case demonstrated, in principle this approach produces an unnatural zigzag and possibly even excessive vertical lip lengthening.

TRAUNER

In 1955 in Stockholm, Richard Trauner presented a secondary transposition he termed a Z-plasty of interchanging flaps at the entrance of the nose for reoperation of unilateral clefts. This enabled him to draw the lateral end of the alar wing upwards if it lies too far downwards . . . lengthen the lip at the line of the cleft on its upper border, lengthening at the same time the columella on the side of the cleft and narrowing the entrance of the nostril.

This approach was used first as a secondary procedure and then primarily by Trauner and copied by others.
Sidney Wynn's use of the vertical scarred flap for transposition high in the rotation incision under the columella is similar to the Trauner design and has aspects of the rotation-advancement principle which are beneficial in partially correcting the straight-line deformity.

Claude Dufourmentel of l'Hôpital St.-Louis, tall and aristocratic with the air of an English gentleman, a second-generation plastic surgeon and the 1975 host-president of the International Congress in Paris, has long been interested in "harelip sequelae." In 1974 he forwarded a report of a case illustrating his rendition of the principle of medial transposition of a lateral vertical flap. As he kindly explained in English,

Of course, this has to be adapted to each case and combined with several other technical procedures.

The principle is an asymmetric Z plasty which lengthens the distance between the apex of the nose and the lip, on the cleft side, and shortens the transverse width of the nasal threshold. The lateral vertical flap, cut on the external side of the scar is shifted into the opening of the horizontal incision of the naso-labial angle.
Thus the foot of the ala nasi is elevated and rotated inwards and no contraction of a vertical scar of the floor of the nostril can develop.

Z-plasties across the natural lines are contraindicated unless scars are already present. Each case must be considered from its specific aspects. Of course, the transpositions of Trauner, Marcks, Wynn and Dufourmentel are high in the lip and therefore less noticeable. In the straight-line scar, whether the mucosal peaking be moderate or severe because of vertical shortening, if there is still sufficient cupid’s bow present, the rotation-advancement principle will serve better as a secondary maneuver.

**A SECONDARY LeMESURIER**

Straight-line closures in which the cupid’s bow has been destroyed partially may offer the best opportunity for the use of the Hagedorn-LeMesurier principle. The cupid’s bow is gone, so now the construction of an artificial one is justified. In most cases, however, the design of a LeMesurier as a secondary procedure would call for too much additional excision of tissue and too much tightening of the free border of the lip. Yet, in certain cases, probably incomplete clefts originally, there is still a relaxed full-bodied upper lip which can afford a LeMesurier operation and will be benefited by it.

In this specific case, operated on in 1956, there was enough cupid’s bow vestige left for use of the rotation-advancement principle as a secondary procedure. Yet the transverse retention stitch mark scar transgressing the potential column line on the
cleft side required excision, and this then created a natural LeMesurier design which produced an artificial cupid's bow and a reasonably natural result.

In 1968 J. L. Grignon of Paris improved the standard LeMesurier procedure for secondary corrections of unilateral clefts by adding an exaggerated alar advance which he clings to with bulldog tenacity. He refers to his combination as a double locking transposition of a quadrilateral flap with an external rim as in the LeMesurier, for the inferior part of the lip ... disinsertion and forcible rolling up of the ala nasi, with a locking into the sub-columnar notch, for the nasal region and the region below the nose. ... The results obtained, going back over a period of 7 years ... and after a study of a series of 125 operations, have been judged sufficiently interesting. ...
In 1966 M. V. Mukhin and A. P. Agroskina, of the Stomatology Department of the Kirov Military Medical Academy, Leningrad, noted,

After cheiloplasty carried out in children at an early age for congenital clefts, some inaccuracies. . . , though little perceptible in the first years, become increasingly conspicuous in a child of eight or ten. Such deformities develop even after completely successful cheiloplasty.

They prefer a one-stage operation for repair of upper lip, columella and ala nasi, and their general design seems to consist in modifications of Trauner and Marcks' secondary flap for the nose and Tennison's for the lip.

SECONDARY ROTATION-ADVANCEMENT

Crude straight-line cleft lip closures without finesse often leave the natural landmarks of the cupid's bow. In that event use of the rotation-advancement principle can be effective. In 1960 I noted the availability of this principle secondarily:

When a cleft has been closed previously by the crudest paring of the edges without destruction of the cupid's bow component the result may be inferior but is amendable by the rotation-advancement principle. A more radical paring of the edges will have destroyed the natural vermilion portion of the cupid's bow leaving the dimple and skin curves present but askew. Here repositioning of this element may be achieved by scar excision, rotation and advancement. . . . In fancier methods where all vestige of the cupid's bow has been ravaged then the advancement portion of the . . . principle is still available for nasal correction. Gillies more than once has expressed his approval of the rotation-advancement principle in secondary cleft lip correction stressing its value in the nasal distortion.
This eight-year-old girl from Panama had a straight-line closure in infancy, healing with what seemed to be little more than a preliminary adhesion. Scar excision was followed by rotation with a back-cut and advancement of flap c into the columella. The alar base was freed from the lateral advancement flap and from the maxilla and flap l was inserted into the vestibular defect. The cleft side alar cartilage was lifted and sutured onto the septum. Mucosa, muscle and skin closure of the lip was standard.

This 19-year-old girl from Ecuador had excision of her straight-line scar and a rotation-advancement of her lip. She also had a cleft lip rhinoplasty and Silastic sponge implants under her alar base and in her chin.
This cleft was closed primarily in Ecuador in a straight line which widely scarred the skin, partially ruined the cupid’s bow and flattened the dimple.

Secondary nasal procedures used included columella lengthening on the cleft side along with alar cartilage lift with nylon suture to the septum, alar base advancement across the nostril sill, denudation of alar rim web and transposition of this flap into the weakened area in the tip. Secondary partial lip scar excision followed by rotation and advancement did give better balance but did not achieve the result of which a primary rotation-advancement is capable.
This patient is reported to have had a wide complete cleft which partially separated after a simple straight-line closure. The width of the primary scarring and stitch marks magnified the problem, making complete eradication of all scars quite impossible. Partial scar excision with rotation and advancement of the lip improved the nasal base, the lip conformity and the cupid's bow.

Here is a standard use of the rotation-advancement principle carried out by University of Miami resident Richard Greminger, following what seems to have been an inadequate straight-line closure in Cuba but with minimal scarring.
INTERNATIONAL CONFIRMATION

Among several surgeons who have pointed out the value of secondary rotation-advancement were the French surgeon Mer-ville in 1962, Pitanguy of Rio in 1963 and Rees and Converse in 1966. Also in 1966, Muir and Bodenham in *Modern Trends in Plastic Surgery* noted,

If the primary operation was simple, these cases can often be improved by applying the Millard rotation advancement technique, thus swinging the alar base into normal position and, at the same time, lengthening the columella on the cleft side.

In 1966 Onizuka of Tokyo, when discussing revision of cleft lip secondary deformities, said,

Millard’s technique can give good results if adequate tissue is available in the upper lip.

He advocated rotation-advancement plus the Tennison inferior triangular flap

(a) When scar is wide and irregular. (b) If there is paucity of tissue in the lower portion of the upper lip. (c) When the height of the upper lip is too short.

In 1968 Canadian Saul Hoffman with Wesser, Calostypis and Bernard Simon of New York’s Mt. Sinai Hospital endorsed the rotation-advancement principle in secondary unilateral cleft lip deformities. They described the ideal case:

The philtral scar on the cleft side is short and the cupid’s bow is pulled up toward the nostril. The nostril floor is wide and the ala is displaced laterally and downwards. . . . This is the ideal indication for its use, but, as we have demonstrated, other primary repairs have not precluded this type of secondary correction.

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Saul Hoffman
In describing their use of rotation and advancement, they stressed its advantages as to conservation of tissue in face of already existing deficiency, absence of rigid adherence to preoperative measurements due to the variability of the cases and proper realignment of the orbicularis oris muscle to eliminate distortion frequently seen during lip function.

In 1969 Wilkie of Vancouver referred to

... the recent availability of the Millard cleft lip operation, which can be used with as excellent results in secondary cleft lip deformities as in primary repairs.

It was Tessier's feeling in 1969 that

The Veau and Brown procedures, all linear, are easily transformed into a Millard or Petit. To the contrary, the Tennison and even more so the LeMesurier, with their imbricated incisions, can hardly even undergo later correction.

In January 1970 Henrik Borchgrevink of Oslo indicated his pleasure with the application of rotation-advancement in secondary unilateral deformities. He makes several important points in the Cleft Palate Journal:

Further, the key stitch can provide a considerable straightening of the columella and reshaping of the nostril, especially if one does, simultaneously, a little work to the deviating anterior septum and a Z-plasty inside the ala. ... I feel that the muscle closure in lip repair, especially the key stitch, should be done with non-absorbable sutures: I always use supramid.
[The drawings] show how the rotation-advancement operation ... in my opinion and experience, can provide a soft tissue platform for the cleft-side alar base almost eliminating the disadvantage of the cleft side bony defect. This, together with the reduction of the columella deviation, tends to counteract the tilting of the nose.

This is Borchgrevink's graphic comparison of the secondary lip and nose to a quaint little cottage sitting askew on a Norwegian slope threatening to topple into the fjord, which, after rotation and advancement, sits straight, safe and sound.

In 1971, Igor A. Kozin wrote in *Acta Chirurgiae Plasticae*, Since 1965 the modification of Millard or a Z-plasty has been used at the surgical department of the Moscow Scientific Institute of Cosmetology for correction of the residual deformity in the upper lip after linear cheiloplasty.

Then, in a kind personal note in 1973, Kozin added,
I have operated on more than 200 adults with secondary deformities of the lip using your method with several additions. Results of the operation in most cases have been pleasing.

The more radical the straight-line closure, however, the more destruction there is of natural landmarks, especially the cupid's bow. Of course, the effectiveness of the rotation-advancement as a secondary procedure is reduced. Yet, even when the straight-line closure has destroyed a portion or all of the bow, the rotation-advancement principle can still be of some value in reducing the wide nasal floor and aligning the flared alar base. The natural cupid's bow can never be resurrected, but it can be simulated by the Gillies cupid's bow operation.

**TIGHT LIP**

Of course, radical paring of the cleft edges, as in so many early straight-line designs, not only destroyed the cupid's bow but created a side-to-side tightness which compared unfavorably with the conformation of the lower lip. A case having this result deserves the introduction of new tissue in the form of the lip-switch flap.
44. Secondary Correction of Triangular and Quadrilateral Flap Methods

FIRST Z

As pointed out by Borges, New Zealander H. P. Pickerill was the first to apply the Z-plasty principle to the linear scar of cleft lip. Pickerill was one of the colonials serving under Gillies at Sidcup during World War I, and this is not his only first. In 1924 he wrote:

I devised what I have called the "zig zag" or "triangular flaps" method. This gave such satisfactory results that I have employed it subsequently in practically every civilian case of harelip baby or adult which has come under my care.

THE VERY INFERIOR TRIANGULAR FLAP

In lips closed primarily with the Mirault-Blair-Brown-McDowell triangular flap, which is placed as low as possible along the inferior edge of the medial element, the cupid's bow has been destroyed. The vermilion tubercle invariably is situated to the cleft side of the midline where the mucosal interdigitation has been performed.

To correct the unnatural vermilion free border, a horizontal ellipse can be excised from the off-center bulge and a small V-Y posterior roll-down of vermilion will create a midline tubercle.
The absence of a cupid's bow is eye-catching and deserves correction. The modified cupid's bow operation can be used to create the effect of an artificial bow and can be employed unilaterally or bilaterally.

SECONDARY ROTATION-ADVANCEMENT

Because of the loss of the cupid's bow, the rotation-advancement method is not usually indicated in secondary correction of a Blair-Brown result. It does have some advantages to offer, but the end result shows only moderate improvement, as demonstrated by the following case.

This patient was first seen at age 19 years after two operations which ended up with a Blair-Brown type of closure; it was more of a straight line than usual. It was tight along the transverse axis, and the unilateral nasal deformity was typical. Although the cupid's bow had been destroyed long ago and was only painted with lipstick, a scar excision with rotation-advancement closure achieved nasal base improvement and tightening of the lip in the upper portion with relative relaxation in the lower part.
A follow-up 13 years later revealed maintenance of the labial and nasal improvement and a slightly better scar position, but as the cupid's bow had been discarded primarily, there was still no evidence of one.

An eight-year-old boy from North Carolina with a Mirault-Blair type of lip closure had developed a long lip on the cleft side with an asymmetrical cupid's bow and tubercle. A rotation-advancement procedure in the upper portion of the lip and a one-sided cupid's bow at the mucocutaneous ridge achieved better labial and nasal balance.

It has always been surprising to me how many of these Blair-Brown cases end up eventually with a relatively tight upper lip. Evidently, the lateral triangular flap has been advanced so far across the medial lip element that not only is the cupid's bow vestige destroyed but in a large percentage of complete clefts, and even in incomplete clefts, the free border of the upper lip is short of tissue, tight and overpowered by the relatively protuberant lower lip. Here the lip-switch flap can be used to advantage both to relieve the upper lip tightness and reduce the lower lip protuberance and to create the central semblance of a philtrum and a cupid's bow.

Here is an example of an inferior triangular flap of the Blair-Brown type after 27 years which might be considered reasonably good if lack of a cupid's bow and philtrum is of no concern. The skin scar, mucocutaneous junction join and vermilion "whistling" deformity needed minor revisions. A diamond-shaped excision of the skin scar, an interdigitation of the white roll flap and a posterior V-Y of central mucosa seemed to improve the discrepancies.
Yet the “blah” effect of a lip without its artistic curves, hollows and columns may one day motivate the patient to a small, shield-shaped Abbe. His lower lip, although not protuberant, can accommodate the philtrum needed. This case has not had its Abbe yet but others have and examples will be presented in Chapter 46.

THE LeMESURIER DISCREPANCIES

Probably the most common deformities of the LeMesurier operation are those associated with asymmetry of the cupid’s bow. If the operation has been designed correctly, the artificial cupid’s bow will be balanced and in the center of the lip. If not, it must be readjusted until it is. This could mean anything from excision of a full-thickness wedge to lift and equalize the bow to opening up the entire lip and revising the flaps so that when they are reassembled there is balance.

The LeMesurier method is constantly accused of causing an associated deformity, the vertically long lip on the cleft side. Many authors have complained about this, and its correction requires reduction of the height of the quadrilateral flap by horizontal excisions the exact amount of the extra length.

Of course, the excisions must vary according to the case and in these examples several adjuncts including the white roll flap were used. Whatever tricks are tried, however, once the philtrum
column line has been violated, the scarring will never be natural.

And again

Recently Converse has described a similar correction of this drooping lateral portion of the lip on the cleft side.

**QUADRILATERAL FOUNTAINHEAD**

Farkas and Lindsay of the Toronto Hospital for Sick Children, the birthplace of the LeMesurier method, took issue with this accusation of cleft side elongation. They studied 70 adult unilateral cleft lip and palate patients treated by the LeMesurier lip closure and reported:

The vertical length of the medial part of the upper lip in unilateral cleft lip and palate patients was similar to that of the controls. The average lateral vertical length of the lateral part of the upper lip, on the operated side, did not differ significantly from the average vertical length on the unoperated side. We disagree with some authors who have said that the
quadrangular flap usually creates too long a lip [Clifford and Pool, Trauner and Trauner] and this asymmetry is exaggerated by further growth and development [Bauer and Wang]. Our findings are similar to those of Williams.

These comments prove again that any method done correctly will show only the faults inherent in its design and need not be blamed for the operator's mistakes of mismeasurement and misalignment.

Although when correctly executed the LeMesurier quadrilateral flap could produce a symmetrical cupid’s bow, it did so at the sacrifice of half of the normal bow and the philtrum dimple, producing a rather flat unanimated lip. Of course, a common complaint with all the earlier methods was the lack of simultaneous nasal correction, which necessitated further excision of tissue primarily or later secondary procedures.

If the LeMesurier lip ends up tight in side-to-side dimension and is severely flat in relation to the lower lip, then again a midline lip-switch flap may be required to release the tightness and bring relative balance to the upper and lower lips. Examples will be shown in Chapter 46.

SECONDARY CORRECTION OF THE TENNISON RESULT

If the Tennison operation has been judged, marked and executed accurately, the cupid’s bow has been salvaged and only the zigzag of scars across the philtrum column on the cleft side is eye-catching. If the scars heal well, the result should be reasonably
pleasing. If not, the patient and the surgeon are in trouble, and scar excision and careful closure may be of some benefit.

Here is a Tennison-type procedure carried out by a skilled and experienced Boston surgeon who got the very best available out of the method. The scar is a Z, but it healed well and flattened the lip only slightly. The additional vermilion free border Z-plasty was less pleasing.

No matter what the method, if the vermilion is interdigitated in the anterior visible position, an irregular off-center cleft side excess "blob" often results, requiring later revision. This vermilion excess was trimmed and the midline deficiency filled out with a small V-Y at the same time the palate was pushed back and maintained with an island flap.

If the measuring has been off even a couple of millimeters, the ingenuity of the surgeon is taxed almost beyond reason. Certain corrections may be possible, but, in general, "the egg has been scrambled" and "all the King’s men cannot put Humpty-Dumpty together again." The same thing is true of all members of the zigzag family of lip closures, Z-plasties, interdigitations and double interdigitations.
For instance, take this Z-plasty which has placed the cupid’s bow in symmetrical position but has encroached upon the cleft side element so much that there is a one-sided “whistling deformity” and a severe transverse shortness of the lip as measured from the height of the bow to the commissure on the cleft side.

It is interesting to see this deformity with the Tennison approach when so many cry about its possibility in rotation-advancement and state preference for the Z because of it! Correction here will be indeed difficult. Note also that the flare of the ala has not been corrected simultaneously.

Again, if the upper lip is tight and flat, release with a midline philtrum-shaped lip-switch flap may work wonders. There is an interesting case in Chapter 46 to demonstrate this.

**INTERDIGITATIONS CAN BE STICKY**

As Musgrave pointed out:

If the surgeon who must perform a secondary repair had his choice of primary methods to correct, he would not choose to perform a secondary operation on the LeMesurier or Trauner or Tennison or similar procedures where quadrilateral or triangular flaps have been inserted into the medial side of the cleft and the scars are so difficult to revise. The Rose or Millard operations are easier to deal with secondarily.

I agree with this stand and have a case to prove it. Although the Tennison-type Z-plasty had symmetrized the cupid’s bow, the zigzag scar was eye-catching and difficult to correct. Careful revision of the scar *twice* was without improvement. Finally, even after reducing the amount of the Z to nearer a straight line and
using part of this skin as a "white roll" flap to interdigitate across the mucocutaneous ridge, only a slight improvement was obtained.

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**ROTATION-ADVANCEMENT ADVOCATED**

V. M. Hogan and J. M. Converse of New York University School of Medicine, in a rather insignificant little paragraph in Grabb, Rosenstein and Bzoch's book of 1971, probably gave the rotation-advancement its greatest secondary testimonial:

If the deformity is not minimal—for example, when there is a total imbalance of the medial and lateral lip elements about the cleft scar—then the previous quadrilateral flap or triangular flap repair is ignored and the Millard technique is utilized.
I might not have gone quite that far, but then they just might have something! In fact, there is a case in which I did try to scrap the interdigitation with a secondary rotation-advancement. Such an approach requires excision of more tissue than most lips can afford. The result shows moderate improvement but at least the alar base drift was improved, the cupid's bow placed in balanced position and the scar maneuvered into the philtrum column line; in time, it might be quite unnoticeable.
45. Secondary Lip Correction After Rotation and Advancement

NOT ENOUGH ROTATION

The most common complaint by surgeons using the rotation-advancement method has been shortness of the vertical height of the lip along the scar. This can occur temporarily in a carefully planned and well-executed case. Yet, within six months, the contracture will relax and the cupid's bow will settle into a balanced position. If this is not what happens, then either the primary rotation or the paring of the cleft edge of the lateral segment (or both) was inadequate. If the fault was in the lack of rotation, the rotation was not extended far enough across under the base of the columella and probably the back-cut was not used. In such cases there need be no panic as no landmarks or "bridges have been burned." Merely excise the total scar and re-rotate with a back-cut and then pare the lateral segment to match the rotation edge. Be careful not to shorten the distance more than a millimeter or two from the peak of the bow on the cleft side to the commissure as compared to the normal side.

Hogan and Converse state:

Correction of the lip repaired by the Millard technique, when the lip proves too short, may simply require the repetition of the operation with more attention to those details of the technique which can lengthen the lip such as separation of the vermilion from the lip on the lateral flap to increase the vertical distance of the lateral segment.

Of course, the surgeon's best chance is at the first operation, but here are a couple of secondary examples.

This patient had had an attempted rotation-advancement in 6 months later without surgery
infancy in New Jersey and at four years of age revealed inadequate rotation and advancement.

On re-rotation and advancement, a scar muscle flap was inserted high into the lateral element, iliac cancellous bone was grafted to the maxilla under the alar base, the alar base tip was denuded and sutured to the septum and alar rim revision was accomplished.

This four-and-a-half-year-old girl was born with a unilateral cleft of the lip. At four months of age the lip cleft was closed in New York with what was reported to be a rotation-advancement method. Inadequate rotation resulted in a straight-line scar and its contracture. At least the landmarks were present. Scar excision was followed by extension of the rotation with a back-cut, advancement of flap c into the columella, mucocutaneous white roll ridge interdigitation, alar web excision and excision of mucous pits of the lower lip.
NOT ENOUGH ADVANCEMENT

An Oriental boy from a Caribbean island who, after a rotation-advancement procedure, revealed adequate rotation but insufficient advancement.

Scar excision, unilateral columella lengthening, independent alar base and lateral lip advancement and trimming of the vermilion free border produced a more natural result.

This type of secondary drift of the alar base finally stimulated the procedure of suturing the denuded tip of the alar base to the septum.

TOO MUCH ROTATION

If the rotation has been too extensive, again total scar excision will allow the medial element to be de-rotated partially and sutured in correct position. The vertical height of the lateral
element then may have to be reduced to match the rotation edge. This maneuver can be done by a horizontal excision of the required amount of lip just under the nasal base.

In all my rotation-advancement cases only one is recalled that was actually rotated a little too far. At two and a half years, this patient presented about 2 mm. over-rotation, and at three and a half years the discrepancy persisted. A deep transverse elliptical excision of skin, scar and subcutaneous tissue along the lip join with the nostril sill and alar base achieved a long-range lift of the mucocutaneous border, as seen at age seven years.

It is better to excise a scar that is already present and pull up rather than have a little easier lift but at the cost of a scar along the upper edge of the mucocutaneous ridge or, worse, remove the ridge itself.

**LATERAL ELEMENT TOO LONG**

Another possible problem can occur if the lateral lip element is left too long in the vertical dimension. This is far more likely in incomplete clefts.

An incomplete cleft without severe discrepancy in the height of the bow peaks on the non-cleft side presented a long, full-bodied lateral lip element. During the rotation-advancement closure the cleft side nostril floor–alar base was cut as a flap. After denudation of its medial tip, the flap was advanced across and sutured to the septum, maintaining excellent permanent alar
base position. During the primary procedure the robust lateral element was pared sparingly and turned out to be too long.

Two and a half years after primary surgery, the rotation scar was excised for access to the lateral muscle bulge, and the muscle was freed on both sides. A high transverse elliptical excision of skin, scar and muscle just along the lateral lip join with the nostril sill and alar base allowed the entire lateral lip component, including the muscle, to be lifted into slightly better symmetry. The excess vermilion along the free border was trimmed to balance the normal side.

In my own primary cases, there has never had to be a total secondary scar excision with a de-rotation or re-rotation, but one of the dividends of this approach is that such is always possible.
RADICAL PARING OF LATERAL ELEMENT

It is important not to pare too far laterally along the lateral lip element. Here is a rotation-advancement, seen in our clinic recently, which was pared too far, resulting in shortening of the distance from the bow peak to the commissure on the cleft side along with purse-string tightening of the free border of the upper lip accompanied by relative protrusion of the lower lip.

IN ARTISTIC SCAR PLACEMENT

If the surgeon does not understand the artistic plan of the rotation, he may cut his rotation incision too straight or too oblique, thus placing the scar of union in an unattractive, unnatural position. This is the surgeon's fault, but the correction is not so easy. Such placement is better avoided than corrected.

Another danger in rotation is failure to ascend to the base of the columella. If one cuts across too low in the lip, a great advantage of this method is lost, and scars are placed in far more noticeable positions.

It is also important that the circumalar incision of the advancement flap hug or slightly infringe upon the alar base so that the scar lies in the normal nasal alar crease.

Onizuka, in 1966, after many hundreds of rotation-advancements, diagramed simple excisions for correction of minor scar
deformities that seemed to occur postoperatively for him. The most common error was located in the area of flap c, which acted as a trapdoor when used in the lip.

Of course, when flap c is shifted into the columella, as is now advocated, it is less likely to cause these problems.

**MAKING THE LIP TOO LONG**

Misunderstanding previous descriptions of the rotation incision, and in an effort to achieve enough vertical height, some surgeons have extended the rotation, not as a true rotation with a cut-back, but straight across the columella base and into the philtrum column on the normal side. This extension will give two secondary deformities. First, it will spoil the balanced effect of the philtrum because the scar on the cleft side does not correspond to the normal side and meet in the midline at the columella base but instead overrides the cleft side with an unnatural oblique scar. Second, and even more distorting, is the true lengthening in vertical height of the entire lip beyond what is normal for this lip.

Correction requires, again, total scar excision and de-rotation and de-advancement, with a suturing together of the incision that transgressed into the normal side. After this draw-back, the cut-back is used to gain unilateral length and the lateral segment is freshened to match this length.

If the total vertical height of the upper lip is the only deformity noticeable, the lip can be shortened by a transverse full-thickness excision of lip along its join with the nose where
scars are already present and can be camouflaged in the natural nasal creases. The only other way to shorten the lip is by a modified Gillies cupid’s bow procedure, but if the bow and free border are relatively normal, this approach is too radical. When there is no bow present, there is more justification as some symmetrical bow is better than no bow.

**A RELATIVELY TIGHT UPPER LIP**

It has been noted repeatedly that most of the standard primary lip operations can end up with a tight upper lip in relation to the protuberant lower lip. When the discrepancy between the two lips is noticeable, the possibility of a lip-switch flap must be entertained. Straight-line and Blair-Brown triangular flap closures, in my experience, produce the greatest number of tight upper lips requiring lip-switch flaps. A tight upper lip occurs occasionally in a LeMesurier or a Tennison, but the need for a lip-switch here is far less. I have not yet found a lip-switch flap necessary after rotation-advancement, but why some lips are tight and others not is still a mystery and the possibility always exists. *The lip-switch is the flap of last resort.*

**OTHER SECONDARIES**

My personal secondary corrections have involved a myriad of minor revisions including partial scar excisions, midline vermilion tubercle increase or reduction and other revisions of the redundant or deficient vermilion free border. These have been noted again and again in the unilateral cleft case histories, and constantly the primary design was modified to stack the odds against their recurrence.

**MUSCLE DISCREPANCIES**

As already pointed out, not only does the lateral lip element have an abnormal bulge of its muscle but the fibers run parallel to the cleft edge, sweeping up toward the nasal ala. The muscle,
however, is often attenuated in the area just below its join with the alar base. As this area is vital in rotation-advancement, correction of the discrepancy during the primary operation has been developed and described. If that has not been accomplished initially, then secondary correction, although more difficult, is still indicated and has been discussed in Chapter 41.

Here is a case in which the original cleft deformity must have had a lateral element with a hypertrophic muscle bulge and a muscle and contour deficiency above it. Rotation-advancement in Wisconsin positioned the cupid's bow, but no provisions were made for primary correction of lateral lip contour. As the alar base required further secondary medial advancement, this provided an incision which gave access for skin undermining, the turning of a thinning flap from the muscle bulge up into the area of depression with a mutual leveling of contours.
Here is a relatively early case, reported in *Plastic and Reconstructive Surgery* in January 1964, in which advancement of the deficient lateral lip element into the rotation gap presented, postoperatively, attenuation of the cleft side vermilion free border and slight contraction of the skin scar with a lift of the bow peak on the cleft side. As the vertical skin length had been fashioned correctly, time released the scar pull and balanced the bow but the vermilion attenuation persisted.

First, a bilateral mucosal advancement from the upper sulcus gained some improvement, but a tertiary V-Y roll-down of posterior mucosa was necessary to achieve free border symmetry.
This three-year-old Cuban boy first had an adhesion to see whether any improvement would follow such late action. As expected, the change was minimal, so eight months later a rotation-advancement procedure was carried out which resulted in slight cleft side vermilion deficiency. A simple secondary wide V-Y posterior mucosal flap rolled out the free border into reasonable symmetry. Final nasal correction awaits maturity.

**ENHANCING THE TUBERCLE**

In some instances the vermilion free border is well balanced on both sides but the midline tubercle is deficient. Then the mucosa, just superior and posterior to where the tubercle should be, is advanced down in V-Y fashion to produce a fullness.
Experience with the rotation-advancement method and study of consistent minor secondary problems over the years have caused the incorporation of refinements, extensions and now improvements in the detail of the primary surgery in order to bypass subsequent secondary disparities. Consequently, they are appearing less and less.

**TIMING AND SECONDARY SURGERY**

In incomplete lip clefts, minor revisions can be completed at six months or preferably at one year after primary rotation-advancement. In complete clefts, secondary revision of the lip and nose can be accomplished during the hard palate closure at about 18 months, and any obvious further revisions should be completed before school at about five to six years. The final corrective nasal surgery should be postponed until about 16 years of age, and the last lip touch-up work, of course, can be carried out at this time.
ALTHOUGH the need for a lip-switch flap is more common in bilateral clefts and was originally described by Robert Abbe of New York specifically for this condition, it also has value in unilateral secondary deformities. The lip-switch principle will be presented in Volume II on bilateral clefts, but its specific application in unilateral clefts is discussed here.

The shaping and the positioning of the Abbe flap are so closely interrelated that the surgeon should know where it is going before he tries to decide the shape to cut it.

Most surgeons, however, cut the Abbe flap to fill the defect they envision in the upper lip. Since the majority see it as a triangle, the usual shape of the flap has been a pie-wedge inserted unilaterally after excision of the scar. Some surgeons have seen the defect differently, and consequently some bizarre shapes have evolved.

ODD-SHAPED ABBE FLAPS

An Abbe flap can be used for more than release of side-to-side tension or restoration of a philtrum. In 1963 a case with unilateral upper lip radiation scarring but attenuation of the entire vermilion free border inspired a three-pronged variation in the shape of the Abbe flap. The lower lip possessed comparatively voluminous vermilion, so an Abbe flap was designed with horizontal projections of vermilion taken not only to reduce the lower lip but to bolster the thin upper lip from behind. This
fleur-de-lis-shaped flap was rotated on the coronary vessel, achieving the correction desired, and in 1964 I published the case in *Plastic and Reconstructive Surgery*.

Intrigued with the possibilities of other odd-shaped Abbe flaps, I reasoned that the Abbe could be cut in an asymmetrical skin pattern to correct a unilateral shortness at the same time it achieves release of tightness.

At Kingston Public Hospital, Jamaica, about 1963, a tight unilateral cleft lip with extensive crosshatch scarring required excision of much lip on one side. It was thought that if a small releasing incision was made on the medial side of the defect an asymmetrical Abbe flap sporting a corresponding unilateral triangular projection might create a cupid’s bow in the spirit of LeMesurier. The pedicle was divided after my departure from the island, and the patient never returned to register her happiness or displeasure.

Although this specific patterned Abbe is a utilitarian space filler to replace missing tissue in specific areas, it has so little artistry in its patchwork effect that I became disenchanted, particularly because about this time the value of the central Abbe as a philtrum became clear. Usually unilateral local lengthening can be achieved during the midline splitting of the upper lip without the addition of side flaps. However, some secondary cleft deformities are so grossly scarred that the multi-pronged Abbe as a one-shot corrective measure has appeal.
Genrikh Vladislavovich Kruchinskiy, professor at Byelorussian Institute for Physician Training and a prolific writer, in 1969 while at the Moscow Clinic of Stomatological and Reconstructive Surgery ingeniously extended the principle of the double-axis Abbe in 15 cases and presented one. He wrote:

Especially in patients with repeated surgery for congenital clefts of the upper lip and palate, the lip is often extremely sunken, diminished not only in the transverse direction but conspicuously shortened as well . . . is often accompanied by narrowing of the nostril on the side of the former cleft . . . . To make possible a simultaneous enlargement of the upper lip in both transverse and longitudinal direction it was proposed to cut out from the medial part of the lower lip . . . a wedge-shaped flap of skin, muscle and mucosa which had three opposite, transversely oriented tips . . . . Before cutting the flap it was necessary to measure accurately the size of the defect of the upper lip . . . . The basic mass of the flap was cut out in its entire thickness together with the mucosa, the lateral wedges comprised of skin and partially of muscle of the lower lip. The wedges on both sides of the basic flap were cut at different levels to a premeditated plan . . . . The wedge-shaped flap . . . was rotated 180° and the upper lip was cut in its entire thickness along the old scar . . . two horizontal non-penetrating incisions were carried out on both halves of the lip corresponding with the length and level distribution of the additional skin wedges on the wedge-shaped flap . . . . Observations confirmed that wound across the red was later on replaced by a scar pulling inward. It was usually possible to avoid this pull if the incision line in the red was broken . . . after 10-12 days the nutrient “pedicle” was cut off.
When the nostril was narrow on one side, Kruchinskiy directed the medial tip of the main flap into the nostril:

If the nose vestibule was narrowed, the nostril was cut through and, in order to form the nose vestibule, the flap was cut a little longer in the area of the chin.

Closure of his donor area varied with the pattern of the flap.

One cannot but be impressed by the intriguing designs of these flaps, suggestive of atypical stars cut by a special Soviet sickle. It is even possible to conjecture that Kruchinskiy enjoys his series of the world's most unusual Abbes much as he does his collection of rare and valuable stamps and postmarks.

**UNILATERAL POSITIONING OF THE ABBE FLAP**

For years expediency of flap placement has held more enchantment for the surgeon than the artistry of the lip construction. If the defect was in the left of the upper lip, the flap was simply taken from the left side of the lower lip and that was that. In fact, Hogan and Converse seemed to make good sense when they said,

The Abbe flap should come from a portion of the lower lip which corresponds to the defect in the upper.

Robert Chase of Stanford, accepting this premise, turns to higher mathematics and calculates his donor area according to the projected strategic position of the pedicle when the flap has
been transposed. This solution would be brilliant if the first premise were true.

Ian McGregor comes closer, but not for the reasons I think are of prime importance. He said in his Scottish brogue,

It is usual to make the flap symmetrical about the midline of the lower lip. . . . Of course there is no theoretical reason why the flap need be made in the middle of the lower lip, but it does make it easier to match the thickness of its red margin when the two sides of the lower lip are being sutured together.

General acceptance of the automatic off-center positioning of the Abbe flap among the high echelon of plastic surgeons was further confirmed by Paul Tessier of Paris, who as late as 1969 wrote in *Annals de Chirurgie Plastique*,

With the bilateral, the result of the Abbe is better than with the unilateral, since the flap is midline and simulates a philtrum (even the scars give this illusion), and because it restores the appearance of a cupid's bow. On the other hand, with the unilateral, the symmetry of the lip remains mediocre.

A unilaterally placed Abbe flap, of course, will release tightness and form an adequate lip but without the slightest hint of artistry and with no construction of natural conformity; even after multiple minor revisions, including a cupid's bow procedure, it still probably will not create a curvacious lip.
A UNILATERAL BUT ASKEW POSITIONING

When there has been excision of the natural cupid's bow during the cleft edge freshening for a straight-line or a Blair-Brown closure, some tightening of the upper lip will take place, especially along the free border. Such a case is benefited by the introduction of a composite flap from the lower lip.

The off-center insertion of the flap seemed logical on account of the unilateral position of the original scar. Yet observation of cases treated in this manner had been universally disappointing. In one tight upper lip, described in the January 1964 *British Journal of Plastic Surgery*, the unilateral scar was excised and the medial lip component rotated, with the releasing incision extending under the columella base. The tail of the lower lip flap was transposed into the rotation gap and the vermilion border of the flap set at an angle to simulate the missing half of the cupid's bow. As often happens with midline lower lip flaps, there was a dimple, which is coveted for a midline position but abhorred off-center. Midline subcutaneous tissue and muscle were excised, and the skin was held for a time in depressed position by sutures tied over a piece of rubber.

The early result looked quite promising, but eventually, on account of the equal length of the two sides of the Abbe flap, the bow effect straightened out. If the lateral side of the Abbe could be made shorter than the medial to give a bow peak heist, the result would be better. The final result was an improvement, but the surgery was too complex to be practical. Nevertheless, I prefer this setting of the Abbe flap slightly askew to balance out the effect of a cupid's bow rather than use all or half of the Gillies cupid's bow procedure.
Whenever an Abbe flap is introduced unilaterally, the results will be unnatural. A method of camouflaging the off-center insertion of the lip-switch flap is the one-sided use of the Gillies cupid's bow operation. Gillies used this principle for multiple problems. In 1963 the dour and diligent Ian McGregor of the Royal Infirmary, Glasgow, Scotland, specifically advocated unilateral insertion of the lower lip flap and secondary correction in this manner:

Usually half of a cupid's bow is present on the normal side of the lip and a cupid's bow type operation is then required to match the line of the flap with that of the remainder of the lip.

He emphasized:

The line of the cupid's bow is made in the usual way but instead of merely excising skin, the excision is carried deeply, including muscle down to mucosa. This enables the whole wedge of red margin to be brought up, moving like a door on the hinge of mucosa.

There are two modifications that can improve this operation. First, the white skin roll ridge should be preserved and the incision for lifting the vermilion placed parallel with but just above it. Second, the elliptical excision of skin and muscle should not actually be cut off but only denuded of epithelium, cut as a flap with its base medial and transposed as a dermomuscular flap into a tunnel along the line of the missing philtrum column.
MIDLINE ABBE IN
UNILATERAL CLEFTS

Irritated into midline action

Utter unhappiness with off-center Abbe flaps stimulated my closer observation of the areas involved. Again, landmarks eventually crystallized the obvious direction of action. It was noted that quite often there is a semblance of a dimple or groove in the midline of the lower lip, and it was further noted that when the lip-switch flap was cut narrow this dimple seemed to become more obvious and persisted after transplantation. Its persistence made the flap unsuitable for unilateral duty but increased its value as a natural-looking midline philtrum. Thus, the spell was broken for me of the long-accepted off-center placement for all lip-switch flaps in unilateral clefts and it was suggested that the previous unilateral scar be ignored and the tight lip be split in the midline so that the dimpled flap can have a central inset.

It is also important that the tail of the flap, when switched, be inset all the way up to the base of the columella, philtrum-like. If it is inset only partway, it will look like exactly what it is: a stuck-on flap.

And so early in 1962, ignoring the unilateral cleft scars, I inserted several philtrum-shaped Abbe flaps into the midline of lips that were slightly tight, particularly along the inferior free border because of Brown-McDowell inferior triangular flap primary closure.

The midline Abbe flap results were encouraging, with relief of tightness, achievement of lip balance, creation of a philtrum and often a dimple and a rather surprising improvement in the untouched unilateral lip scar. Of course, this scar revision after the insertion of a tension-releasing flap offered an even better prognosis as seen.

Midline placement of both flaps and grafts was described in detail and demonstrated by the above pair of cases in the article “Composite Lip Flaps and Grafts in Secondary Deformities,” which was submitted to the British Journal of Plastic Surgery in
The patient returned 10 years later happy with her Abbe but requesting minor revision of her unilateral scar.
April 1963 but not published until January 1964. Subsequently, it came to my attention that in their book *The Essentials of Plastic Surgery*, which was published sometime in 1963, Peet and Patterson devote a short paragraph to this subject without photographs of results:

Some unilateral cases also require additional tissue in the upper lip to restore normal lip relationship. In these subjects it has proved best to divide the upper lip in the midline and not through the lateral scar line. The end result is a centrally placed flap with two vertical scars on the cleft side. Some months after the transfer, the narrow strip of skin between the two scars may, if necessary, be excised and the gap closed after adequate superficial skin undermining. This is the best way of producing a symmetrical upper lip.

As Peet preferred a straight-line closure of unilateral lip clefts, it is likely that he often had occasion to use an Abbe flap as a secondary procedure. This is not a popular method in this country, so there is little occasion to see straight-line closures and rare occasion to switch a lower lip flap into them. In the latter operation, the flap should be inserted in the midline.

*Others concur with midline position*

Professor J. Lachard of Marseilles also prefers the median placement of the Abbe flap in unilateral clefts. This fact was brought to my attention by the excellent 1970 medical thesis “*Traitement Chirurgical des Séquelles du Bec-de-lièvre*,” by Raymond Gola, an astute young oral surgeon of Marseilles.

Recently, other surgeons have joined the bandwagon of the *midline Abbe in unilateral clefts*. In 1970, Schuh, Crikeland and Cosman reviewed 50 Abbe flaps used between 1940 and 1965 at the College of Physicians and Surgeons, Columbia University, New York, and concluded:

A majority of the problems have been associated with asymmetrical lateral placement which draws attention to the most minor irregularity. Many difficulties would be eliminated if all flaps could be placed centrally.

By 1970 Onizuka was also using a midline Abbe in unilateral clefts. He showed various unilateral scar revisions followed by
vertical midline division of the upper lip and insertion of a small philtrum-shaped Abbe flap.

Hogan and Converse in 1971 devoted pages to the midline placement of the Abbe, repeating many of the points originally brought out in my first paper. They showed one early unfinished postoperative result.

A bull's-eye for Blair-Brown

The secondary cases that I began to find with tight upper lips had most often had a Blair-Brown triangular flap closure primarily. In these a small midline Abbe flap transposed from the middle of the lower lip has been a bull's-eye. Another aspect of the Blair-Brown result that lends itself specifically to a midline Abbe is the smooth convex "rainbow arch" of the mucocutaneous border without any remnant of a cupid's bow double curve. The typical asymmetry of the vermilion free border can be corrected prior to, during or after insertion of the Abbe flap.
Shaping the flap

The actual shape of the normal philtrum with its central dimple, if marked along each crest of the philtrum column and along the mucocutaneous junction line of the cupid's bow, is a slender shield of King Arthur's court sitting upside down. To simulate the normal philtrum, the lower lip flap should also, when possible, be reasonably slender and similarly shield-shaped. Unfortunately, the lower lip does not have the central skin peak of the upper lip bow, but there is a trick that will suggest this effect. Cut the flap narrower at the vermilion border so that it measures the transverse width of a normal bow from peak to peak. The flap's midline point between the two lateral lip elements will be strongly suggestive of the cupid's bow.

Speaking of dimples

The advantage of taking the shield-shaped Abbe flap from the center of the lower lip is to incorporate its normal midline groove and transport it to re-create the midline philtrum dimple of the upper lip. For example, although the accommodating dimple in this case was never required, as the rotation-advancement method preserved the upper lip philtrum, it was certainly present and available.

Reducing the pedicle

The transposition of the lip flap 180 degrees out of the lower lip and its insertion almost completely into the upper lip is facilitated by the least amount of pedicle. The pedicle can quite easily be reduced to a slim band of posterior, superior mucosa of the free border including the labial coronary vessels and a few protective fibers of the orbicularis oris muscle. In fact, this unit is, in essence, an island flap.

Role of white roll

Several surgeons have asked about using the white roll flap for bilateral mucocutaneous interdigitation during Abbe flap insertion. Of course, it is a possibility and can always be called upon secondarily. Personally, I have not found it necessary as primary
alignment can be extremely accurate, particularly if all apposing mucocutaneous white rolls of the upper lip and Abbe flap are stab-marked with a needle dipped in methylene blue before the incisions are made.

**Improving old scars**

By mere introduction of the lower lip tissue, the upper lip is released. This relaxation often simultaneously improves the previous cleft scar. If not, it can subsequently be revised with optimism now that the upper lip tightness is less. Abrasion may give the polishing touch.

It may be argued that a centralized Abbe flap adds two extra scars to the upper lip and one in the lower. Right, but if the operation is done with precision so that the scars are reasonably unnoticeable, the gain in normal conformity is more than worth the price of scars.

**Donor closure**

The slender shield shape of the lower lip flap offers a double dividend because the narrower the flap, the less the lower lip suffers distortion. Even when the upper lip is quite tight and the lower lip excessively protuberant, a slender flap is doubly effective as it relieves one while tightening the other. The shield-shaped donor area is closed with slight lengthening to offset any tendency toward straight-line contracture. A Z-plasty of the lower lip closure is as unnatural as any other scar crisscrossing natural lines. If the flap was long enough to cause the donor scar to extend from the lip well down into the chin, a straight-line closure is still the best primary bet. If the scar pulls a web at the lip-chin junction, then a small Z-plasty, as suggested by Ian McGregor, may be of value, but only as a secondary procedure.

**Return of function**

Investigators have reported that sensory, sympathetic and motor reinnervation of the flap occurs, requiring from nine months to two years.
Lights, camera, action

It would seem that the best way to explain my preferred method of shield-shaping and midline-placing of a lip-switch Abbe flap in a suitable secondary unilateral cleft lip is to do one and back it with cases. So here goes!

The nasal correction has been completed. The upper lip with its unilateral almost straight-line scar has no cupid’s bow, no dimple, no philtrum column on the cleft side and is relatively flat and tight as compared to the slightly protuberant lower lip. A perfect situation for a small shield-shaped Abbe flap placed in the midline. There is less danger if the Abbe flap is done under local anesthesia.

Vertical length of lip seems good, so measure it from columella base to mucocutaneous junction.

Duplicate measurement in midline of lower lip.

Mark incision for release and check midline position.

Stab-mark midline M-C junction with methylene blue.

Midline injection of Xylocaine-Adrenalin.

Midline incision.

Release with No. 11 B-P blade to columella.
Mark shield-shaped Abbe flap size of ideal philtrum, not size of upper defect.

Scoring the skin.

Dividing the free side of the flap.

Upper lip release shows eversion. Lower lip dimple to become philtrum.

Hemostasis obtained.

Crossing the opposite mucocutaneous junction.

Position of main coronary vessel noted.

Cutting the flap free.

Muscle closure with Mersilene.

Reducing the pedicle almost to the vessel.

Swinging the flap.

Mucosal closure of donor area.
Division of the pedicle

Eight to ten days later, the pedicle is divided under local anesthesia as an office procedure. In the series of Abbe flaps shown in this volume, the average time of pedicle division was 11 days. Actually nine days is sufficient and safe, but when a weekend was involved, the division was delayed a day or two with plus and minus advantages.
MIDLINE ABBE S I HAVE KNOWN

Postoperative results—Mirault-Blair-Brown-McDowell closure

It is not always possible to distinguish a Mirault-Blair from a Brown-McDowell except that in the latter the inferior triangular flap is smaller and the results are better. Cases that come to secondary correction consistently have the angled, unnatural scar with its straight-line extension directly into the floor of the nose. The mucocutaneous ridge is usually interrupted and makes a single arc with no evidence of a cupid’s bow, philtrum or dimple. The vermilion free border has a cleft side bulge and no midline tubercle. The lower portion of the upper lip is tight, exaggerating the relative protrusion of the lower lip. There is the asymmetrical nasal distortion.
Result after Blair-Brown type closure.

6-7-73. CL rhinoplasty alar cartilage lift, septal straightening, alar base advancement, septal cartilage strut in columella to nasal tip.

20 years

Improvement in the nose caused lack of lip landmarks to become more objectionable.

8-9-73. Midline 1.4 cm. shield-shaped Abbe flap. Division of pedicle after 8 days.

12-12-73. Minor lip revision.

20 years

21 years
This 12-year old boy had an angled scar and tightness along the inferior border of the upper lip, no cupid’s bow or philtrum and a flaring ala.

This Georgia boy had an angled scar and tightness along the inferior border of the upper lip, no cupid’s bow or philtrum and a flaring ala.

Cleft lip rhinoplasty and midline Abbe flap, in spite of minor discrepancies, achieved balance, function and a pleasant quality.
The patient was first seen at 10 months of age presenting typical unnatural angled scar, loss of cupid’s bow, philtrum and dimple, tightness along the free border of the upper lip with relative protrusion of the lower lip, wide nostril floor and flaring ala. At one year of age, a rotation-advancement revision of the upper scar with medial advancement of the alar base improved relations. The tightening action of the upper portion of the lip reduced the relative purse-stringing along the lower border. The early destruction of such landmarks as the cupid’s bow and philtrum was still objectionable at 14 years so a midline Abbe flap was inserted to create a philtrum.
This 36-year-old man had a slightly tight upper lip with a single mucocutaneous arc and no residual cupid's bow, philtrum or dimple.

This 27-year-old journalist and musician had his lip closed at one month of age in 1946 in Indiana when the Blair-Brown procedure was popular. Excerpts from the patient's letter to me are self-explanatory:

My primary operation has left a number of irregularities and conspicuous scars of the lip. I have a tight upper lip of abnormal appearance which is unbalanced and unshapely with an excessively full lower lip, an irregular left nostril and an extremely deviated nasal septum. My upper lip will probably require reopening and the Abbe flap may be necessary.

I realize that there are a number of different adjustments possible and some of them are not easy, but if performed correctly they should improve the appearance tremendously.

This operation is likely to be a momentous, once-in-a-lifetime event for me even though I can't expect perfection.

The patient arrived with the previously described secondary unilateral deformity of his lip and nose and in addition revealed protruding ears, a receding chin and a prematurely receding hairline sprinkled with healing hair grafts.
The first surgery included a Silastic sponge implant to the chin and a cleft lip rhinoplasty, including reduction of the normal alar cartilage, piggy-back onlay graft of this cartilage to the cleft side, bridge lowering, bilateral osteotomy, submucous resection (SMR) and alar base advancement. Two months later a bilateral otoplasty and midline Abbe flap were done.
This 12-year-old girl’s unilateral cleft had been closed by Ferris Smith of Grand Rapids, who as a pioneer did his own thing in cleft lip. It is difficult to type the method used, but it was probably a variation of the Mirault-Blair operation. Then, as Smith worked with Gillies at Sidcup during World War I, he must have been influenced to use the Gillies cupid’s bow procedure in an attempt to re-create the cupid’s bow lost during the primary surgery. This secondary procedure destroyed, with irreversible scarring, the mucocutaneous junction, justifying in this case Barrett Brown’s criticism of the method.

At age 13, normal alar cartilage was reduced and the cleft side alar cartilage lifted and fixed with a nylon suture to the septal bridge. At age 14, all lip scars were abraded. At age 17, reduction rhinoplasty, SMR, two septal cartilage struts inserted in the columella for nasal tip support and alar marginal sculpturing gave some further improvement.
This teenage girl with slight tightness of the upper lip and relative protrusion of the lower lip expressed particular consciousness of her lip scar. On closer study it was noted that the interruption of the mucocutaneous white roll ridge, the lack of a cupid's bow, philtrum and dimple, along with the relative tightness, rather than the scar, branded this lip abnormal.

It was decided that, although the patient was concerned about her one scar, release of tension and improvement in conformity with the creation of a cupid's bow and philtrum would justify the addition of three more scars!
Cleft lip rhinoplasty reduced normal alar cartilage, lowered hump, narrowed nasal bones with osteotomy, released vestibular lining with Z-plasty, bolstered cleft side alar cartilage with onlay graft from normal side and denuded tip of alar base flap sutured to septum. An SMR was done, and two septal cartilage struts were inserted into the columella to support the tip. This set the stage for an Abbe flap.
This patient had Brown-McDowell type lip closure at two months of age in Cuba, resulting at eight years in a tight lip without landmarks.

A 21-year-old Australian girl who had had closure of a unilateral cleft lip in infancy is shown at a stage in her reconstruction.

Result after Brown-McDowell type lip closure. 8-23-73. Scar revision, mucocutaneous adjustments, midline 1.5 cm. shield-shaped Abbe flap. Division of pedicle after 13 days.

Comment. Conformity more important than scars. Lower lip revision to follow.

A 21-year-old Australian girl who had had closure of a unilateral cleft lip in infancy is shown at a stage in her reconstruction.
When first seen in Miami, she had improved but still had a relatively tight upper lip, absence of landmarks and the asymmetry of a cleft lip nose.

At age 21 both nose and lip were corrected at the same time. Cleft lip rhinoplasty involved reduction of normal alar cartilage, septal shortening, rotation of cleft side alar base and SMR with cartilage struts into the columella to support the tip. A midline Abbe flap was inserted into the center of the upper lip.

7-24-64. At 10 years. Scar revision, alar base and rim revisions, midline shield-shaped 1.5 cm. long Abbe flap. Division of pedicle after 13 days.
6-17-70. At age 16. CL rhinoplasty with alar lift and septal strut in columella to tip.

6-16-72. Mandibular osteotomy for class III malocclusion by University of Miami Professor S. Kline.

Comment. Scar excision at same time as the Abbe flap is unusual but seemed successful. Note new balance of the upper and lower lips with creation of a cupid's bow, philtrum and dimple. It is interesting that function of the lip is good except at the site of the original cleft closure, where the muscle fiber arrangement is still slightly askew.
This boy, one of twins, was born with a unilateral cleft while his twin had a bilateral cleft. A primary inferior triangular flap closure resulted in a central vermilion notch with a flattened lip lacking a cupid’s bow, philtrum or dimple.

Result after Brown-McDowell type lip closure.

At 7 years. Midline shield-shaped Abbe flap.
Division of pedicle after 9 days.

Postoperative Hagedorn-LeMesurier result

The quadrilateral flap method presents an unnatural scar line, the lip has no evidence of a philtrum or dimple and, in some cases, the method fails to create a cupid’s bow. The inferior border of the upper lip may be tight and compare unfavorably with the protuberant lower lip. There is the usual asymmetrical distortion of the cleft lip nose.
This 18-year-old Cuban girl had a tight upper lip lacking natural landmarks and an asymmetrical cleft lip nose. At age 19, cleft lip rhinoplasty reduced normal alar cartilage, lifted the cleft side alar cartilage to the septum with nylon suture, reduced normal alar base and rotated flaring alar base. SMR supplied cartilage struts which were inserted in columella to support the tip, and Silastic sponge was implanted beneath alar base.

The lack of the natural landmarks of cupid's bow, philtrum and dimple prompted a lip-switch flap which seemed to put the lip at rest in this 27-year old man.
This 15-year-old girl had a LeMesurier primary lip closure resulting in a lack of natural landmarks and contour of the lip and asymmetrical distortion of the nose. A cleft lip rhinoplasty included normal alar cartilage reduction, lift of cleft side alar cartilage to septum, transposition of flaring alar base and reduction of the normal alar base. Then the Abbe flap was switched.

Result after LeMesurier type lip closure.

Result after LeMesurier type lip closure.

At 16 years. Midline shield-shaped 1.5 cm. Abbe flap.
Division of pedicle after 10 days.

Result after LeMesurier type lip closure.

6-12-63. At 13 years midline shield-shaped Abbe flap.
Division of pedicle after 13 days.
9-11-63. CL rhinoplasty, hump removal, septal shortening, bilateral osteotomy, SMR and septal strut in columella to tip.
At age 43 the upper lip was split in the midline and a shield-shaped Abbe flap inserted. Division of pedicle after 10 days.

This 42-year-old woman had her lip closed primarily in Chicago and later revised with a secondary LeMesurier procedure. The lip was slightly tight in transverse dimension, comparing unfavorably with the lower lip. In spite of the secondary quadrilateral flap, the mucocutaneous ridge spanned in a single arc with no suggestion of a cupid's bow, and, of course, there was no philtrum or dimple.

Insertion of an Abbe flap released the upper lip which improved its relationship with the lower. It also created a philtrum with dimple. Puckering of the orbicularis oris musculature of the upper lip seven months after operation revealed balanced wrinkling on either side of a quiet but natural central philtrum.

A Z-PLASTY PROBLEM

Z-plasty closures seldom require an Abbe flap, but when they do there can be problems. Here is an example:

This 17-year-old boy had had a type of Mirault-Blair closure in infancy and some sort of Z added to it later which resulted in the worst of both. He had a tight lower portion of the upper lip, unnatural scars zigzagging everywhere, no natural landmarks and a typical asymmetrical cleft lip nose.
Insertion of an Abbe flap produced a natural-looking dimpled philtrum, but there was still something wrong! After repeated observation, it was realized that the lip Z-plasty had strangely disarranged the hair-bearing areas.

Less than a year after the Abbe flap operation a reverse Z-plasty redistributed the hair-bearing and non-hair-bearing areas without lengthening the lip. An expendable area of non-hair-bearing lip skin was used as a free skin graft to construct a mucocutaneous white roll ridge across a flattened interruption of the ridge.
A CASE OF SPECIAL INTEREST

This patient was born in Fairmont, West Virginia, on 9-10-44 with an incomplete cleft of the lip, and his pediatrician sent him straight to V. P. Blair in St. Louis. Blair, whom the mother remembers as being kind and charming, employed his inferior triangular flap. Ten years later J. B. Brown did a lip revision and the mother recalls how impressed she was with Brown who, when attending a convention, took the time to see her son. He told them that the boy should wait until he was 29 or 30 years old to have further work, and that it should be his own decision.

In 1974, at age 29, the patient revealed slight relative protrusion of the mandible and some asymmetry of the nose, and an inferior triangular flap constricting the free border of the lip, causing tightness.

This is one of the rare times that it has been possible to excise secondarily almost the entire cleft scar and intervening tissue, and keep the Abbe in philtrum position. This was possible probably because the original cleft was incomplete.
47. Anatomy of the Secondary Deformity of the Unilateral Cleft Lip Nose

The asymmetrical nasal deformity of unilateral cleft lip is notorious for its subtle resistance to surgical correction. It is très difficile, engorroso, eine teufliche sache, a sticky wicket or just damned difficult! The inherent nasal discrepancy of cover, support, lining and platform almost tempts the surgeon, like a tailor facing an extensive alteration, to scrap the misfit and start again. Fortunately the surgeon need not be quite so drastic. Mere perusal of the literature reveals a staggering variety of attempts at correction of the cleft lip nose and, as noted by Musgrave, there is no simple panacea.

Origin of the Nasal Deformity

A majority of surgeons have always considered that the basis of the cleft lip nasal deformity is a secondary manifestation of a divided orbicularis oris muscle and a deficiency in the maxillary platform. Stenstrom and Oberg even pulled and jerked on cadaver noses to prove that this action duplicated the cleft lip deformity. In 1948 in Professor Kilner's clinic at Alton, England, as already mentioned, I saw a 12-year-old boy with no history of cleft lip. He did have the slight unilateral skin ridge of a "congenital scar" but no disturbance of the main orbicularis oris or the maxilla. He had a typical moderate degree of cleft lip nasal deformity, including septal deviation, dislocation of the alar cartilage at the tip with slumping and overhang of the alar rim and deficiency in the nostril floor with a slight flare of his alar base. At the time I was shocked because it was obvious that
the existence of a lip cleft had not been responsible for this nasal distortion.

Since then I have seen several similar cases, but of course many others have noted the existence of the typical cleft lip nose without an apparent cleft lip. In 1968 Boo-Chai and Tange, in Chinese and Japanese, reported five such cases, and since the alar cartilage was normal in size and shape but displaced, they surmised:

It is, therefore, unlikely that the condition is due to an intrinsic defect within the alar cartilage.

Other observers, such as Rees and Tulenko, consider the mesodermal inhibition-deficiency theory compatible with the occurrence of this anomaly, but specifically applied to the cartilages of the nose.

**Nasal Deformity Persists After Lip Closure**

All cleft lip methods prior to the rotation-advancement made little attempt simultaneously either to lengthen the cleft side columella or to correct the alar flare. Thus nasal measurements of late results of the LeMesurier method should rank about equal to those of the other standard procedures.

Farkas and Lindsay in 1971 studied adult Canadian unilateral cleft lip patients after a LeMesurier closure and reported:

The length of the columella in unilateral cleft lip and palate patients is significantly shorter on the cleft side than on the non-cleft side and is significantly shorter on the cleft side than in normals. The non-operated side of the columella was almost the same length in patients as in controls.

It would seem that Leslie G. Farkas, once of Charles University, Prague, and now of the University of Toronto, has been very busy making morphological measurements of normal and cleft lip and nose anatomy since his transplantation to the Western world. He has done this work in cooperation with William K. Lindsay, and their studies have been quoted regularly. Using anthropometric techniques, they compared 70 adults after
LeMesurier unilateral cleft lip closure in childhood with 100 normal Canadian adults. They reported an interesting and possibly unexpected finding:

It was surprising to find that the so-called "normal" side of the face in patients with unilateral cleft lips/palates was always narrower, in many cases abnormally narrower. . . . The "abnormally" developed non-cleft side in the patient with a unilateral cleft lip/palate might suggest that the anomaly influenced the development of the face equally on both sides. The work of Fraser and Pashayan suggests that, in a certain number of cases, this is a familial trait.

This certainly suggests that there is more to this anomaly than was dreamt of in our study of just the lip or just the nose or just anything!

PATHOLOGICAL ANATOMY OF THE NOSE

Before we can treat pathological anatomy intelligently, we have to know exactly what we have. In 1949 William Huffman and Dean Lierle of the University of Iowa Hospitals studied the "pathologic anatomy of the unilateral hare-lip nose." Since no case presented all deformities equally, a complete composite diagram was charted. They noted: (1) nasal tip deflection, (2) cleft alar cartilage dome retroplaced, (3) obtuse angle between medial and lateral crus of alar cartilage, (4) inward buckling of ala, (5) absence of ala-facial groove with alar attachment to face at an obtuse angle, (6) real or apparent deficiency of bony development, (7) overly wide dorsal extremity of naris, (8) a naris circumference greater than that of its fellow, (9) more dorsal position of entire naris, (10) shorter columella on cleft
side, (11) medial alar crus inferiorly placed in the columella, (12)
columella slanted obliquely with the dorsal portion of the septum
dislocated off the nasal spine and presenting in the normal nostril
with the anterior septal tip leaning over the cleft. The entire
tip of a unilateral cleft lip nose is often dependent, but more
worthy of attention is that the cleft half is even more dependent
than the normal half. To this list Berkeley has added the bow­
string contracture of the interior of the nostril extending from
its apex along the upper border of the lower lateral cartilage
to the margin of the pyriform sinus.

I would like to emphasize a common deformity. The normal
alar crease discontinues when meeting the bulge of the normal
alar cartilage, but in the cleft lip nasal distortion, the crease is
unopposed and continues forward across the impotent alar carti­
lage even to the alar rim, with evidence of kinking and nicking.

As in all unilateral deformities there is the exasperating aspect
of asymmetry. Possibly the most distracting asymmetry is the
vertical axis of the normal nostril as opposed to the transverse
axis of the cleft side nostril.

In its more extreme form the unilateral nasal deformity pre­
sents all of the above-mentioned pathology but in exaggeration.
The excessive length of the cleft side of the nose produces a
twisted hemi-hook which all but rests upon the lip. This slump is so severe that the nostril is not only lying in a horizontal axis but is squashed into flattened obscurity.

**MAN-MADE DEFORMITIES**

In addition to inadequate correction there can be exaggerated over-correction, resulting in odd man-made deformities. For instance, bitter experience with persistent lateral alar drift probably provoked the over-closure of this contracted nostril.

**TWO-FACED ASPECT**

The deviation of the anterior septum leaning over the cleft does not support the nasal tip, and since the attenuated, flattened cleft side alar cartilage has never risen to its balanced perch beside its mate at the tip, there is a slump of the entire cleft side of the nose, presenting a hemi-hook. In fact, the left and right profiles look so unalike, they appear to be two different faces.
The normal side of the nose stands as a flaunting challenge to the abnormal side, forcing a constant comparison. At the same time, however, it presents a model by which the deformed side can be fashioned.

When the original deformity has not been treated directly except for some medial advancement of the alar base during primary closure, then there will not be much improvement with age as reflected in the residual secondary deformity.
A basic deformity in the unilateral cleft lip nose is the deviation of the septum which actually leans over the cleft. This is accompanied by anterior dislocation of the septum from the vomerine groove and presentation, along with the displaced nasal spine, into the normal nostril and nasal floor.

Myron Metzenbaum of Cleveland, Ohio, was an amateur sculptor who used his artistic talent in his otolaryngological surgery. In 1929 he wrote a paper, "Replacement of the Lower End of the Dislocated Septal Cartilage Versus Submucous Resection of the Dislocated End of the Septal Cartilage," in which he summarized the advantages of correcting the lower end of the dislocated and deviated septal cartilage in unilateral cleft lip nose. The lower end of the septum will be brought into a straight line, the columella supported, the depressed nasal tip raised and the airways rendered patent and equal.

As noted by Holdsworth in 1970:

When seen in adolescence, one constant deformity is deviation of the bridge away from the cleft. Though less than in childhood, it is a stigma, and calls for straightening. Some (Steffensen, 1947; Hogemann, 1965) will operate on the septum in childhood, but most surgeons prefer to wait until much of the facial growth has taken place.

One person, probably more than any other, has pioneered in early septal correction. J. P. Reidy began this work as early as 1948 and in 1968 did a follow-up study of eight cases of excision of the vomer at the time of palate closure around one year of age or less. He found these cases to be free of nasal obstruc-
tion, and the external nasal bridge was central and symmetrical within normal limits, but he noted:

There is no doubt therefore that partial excision of the vomer at so early an age (1 year) does contribute to maxillary recession. . . . Finally, it would appear that the vomer is essential for general nasal growth and for downward and forward growth of maxillae up to seven years.

Reidy summarized:

The typical secondary nasal deformity in the unilateral cleft of lip and palate becomes more apparent at 7–8 years. There is partial obstruction due to lateral displacement of the inferior border of the nasal septum by the projecting maxillary ridge formed from the vomer. In the unilateral complete cleft, the forward maxillary part of the vomer is attached to one side only. The abnormal position and the partial maxillary attachment exert abnormal stress on premaxilla and on growth of nasal bony bridge.

Nasal obstruction is frequently present at 7–8 years in cases of repaired unilateral cleft lip and palate and merits surgery (partial submucous resection and straightening of bony bridge) to relieve nasal obstruction.

He diagramed the effect of removal of whole bony spur.

Reidy’s clinical findings were confirmed by the research of B. G. Sarnat of California, who did experimental studies of growth of the snout in young rabbits. He found that dislocation of the cartilaginous nasal septum did not grossly affect snout growth, but resection of the cartilaginous nasal septum produced both severe and striking snout growth arrest.

In 1974 Harold McComb of Perth reemphasized the importance of septal cartilage realignment in the unilateral cleft lip nose. Concerned about growth, he postpones the correction until the age of 17 or 18 years. At that time he frees the inferior septum from the vomer, scores it on the concave side, dissects a pocket over the nasal spine area behind the columella and positions the distal end of the septum into the midline. Fixation is obtained by passing a wire through the distal septum down into the upper sulcus and hooking it over a wire eyelet on the opposite upper canine tooth and maintaining it for four weeks.

Bill Berkeley of Charlotte, North Carolina, who is renowned for his primary nasal correction, during his early experience advocated primary septal correction. More recently he has indi-
cated a willingness to postpone the septal work until the tissues are fully grown and easier to manipulate.

This is also my feeling. The septum of the infant is friable and easily injured but is not so easily dissected or effectively corrected. If all other nasal components are positioned as near normal as possible primarily, the septum can be straightened at the time of corrective rhinoplasty along with nasal bone osteotomies (at about 16 years of age). If there was no previous septal surgery, there will be minimal scarring, which now facilitates the important final correction. A submucous resection, leaving the usual L-shaped scaffold for support, will obtain enough cartilage to make the several 0.5 × 3 cm. struts needed for tip support. The remaining front of the L can be freed from its dislocated position, centralized and fixed with a nylon suture. The displaced nasal spine is best resected. Such a procedure was done for this 30-year-old woman: a submucous resection, correction of the anterior limb of the L and insertion of a septal cartilage strut in the columella from spine to tip. Other illustrations and examples will appear in Chapter 53.

ANTERIOR SEPTAL FLAP

There is a clever septal trick, suggested by Ross Musgrave of the University of Pittsburgh and presented in Melbourne in 1971, that might be of use in specific cases when the nose is too long and the nasal floor on the cleft side is slightly depressed. He shortens the nose by shearing a narrow flap of the distal septum, cutting it from above down with its base maintained at the nasal spine area. This cartilage flap, shorn of mucosa, is turned 90 degrees and threaded under the nasal floor of the depressed cleft side to give additional support.
TRUETO the principle of placing the normal into normal position, a number of surgeons have advocated variations of medial and upward rotation of the slumped composite half of a nose, including skin, subcutaneous tissue, cartilage and mucosa as one component, and advancing the flared alar base into the wake of the rotation. This was bold surgery since it necessitated external nasal incisions.

Erickson in 1885 devised a secondary nasal correction of the unilateral cleft lip nose which used a columella splitting incision that extended to the nasal tip. With the aid of sutures, he slid the down side upward and aided the whole maneuver with a triangular excision of skin and possibly scar from the floor of the nose on the cleft side near the base of the columella. This evidently was the original application of a general principle that later had many followers with almost as many modifications.

BLAIR

The homespun wisdom of Blair shines through the literature repeatedly and the more brightly when the dates are noted. In 1925 Blair admitted:

At first glance, the correction of the spread nostril would seem somewhat simple; but after some years of more persistent effort with very indifferent results, I concluded that it was not as easy as it seems.

Blair's basic approach to all problems probably explains his greatness as a pioneer. He concluded:
Until I came to appreciate that no change in the direction of the long axis of the nostril, rather than the real or apparent increase in the width of the floor was the key to the deformity, and until means were taken to correct this rotation of the axis, the operative results fell short of what they have since. To correct the condition, the columella was split in the midline, the cut swinging outward along the line of the junction of the floor of the nostril with the lip, and the whole nostril with its broad ala was rotated into a more normal position.

Blair’s design for primary nasal correction in unilateral lip clefts with rotation of half the columella was included in his 1930 article with Barrett Brown.

SHEEHAN

J. Eastman Sheehan approached the cleft lip nose correction in a manner similar to that of Blair. This flamboyant showman of plastic surgery, born in Dublin but practicing in New York, seemed to have a penchant for joining wars. He eventually was recipient of both the French and the Belgian Legion of Honor, Order of the British Empire, Military Cross of Spain after joining Franco for a time and the New York Police Department Legion of Honor. He served under Gillies at Sidcup during part of World War I and evidently also participated in World War II, if there is any authenticity to the story Lamont once heard while dining with Jack Tough at a quaint restaurant close by Lord Lister Hospital in Glasgow:

J. Eastman Sheehan had been a friend of Sir Winston Churchill, and had been brought into Scotland by submarine during the war to carry out some type of hush hush mission.

Neither did Sheehan shirk the battle of the cleft lip nose, for in 1925, he agreed with Blair’s concern about the long axis of the nostril rather than the width of the nostril floor.

He resorted to rather drastic measures, as he described, to accomplish his purpose:

An incision is made around the ala and deepened to the bone. With a blunt scissors the tissues by which the ala adheres to the bone are separated...
from the bone, and on both sides of the incision. The incision is now carried across the floor of the nose; then upward, splitting the columella... An excision is made from the tissues over the nostril of the affected side to admit the apex of the nostril to be drawn up level with its mate. A V-shaped excision from the floor of the nostril to reduce the width facilitates approximating the ala to the philtrum. The freed tissues of the ala and columella are now swung around, the aperture is conformed to the one on the other side and the base of the ala is established in its new position.

Ivy in 1932 diagramed the Blair rotation adapted to the primary nasal correction at the time of lip closure. In 1961 Royster readvocated the Blair procedure in primary nasal correction.

Earl Padgett, one of the early students of Blair, in his 1948 book with Kathryn Stephenson, described his modification of Blair's hemi-rotation in the unilateral cleft lip nose.
In 1930 King George V bestowed knighthood upon H. D. Gillies for his World War I reconstructive work. By 1932 Sir Harold Delf Gillies, the first knight of plastic surgery, was already writing, with T. P. Kilner in *The Lancet*, on an aspect of civilian plastic surgery, the flat ala in cleft lip:

Hitherto this has proved a stumbling block to all surgeons. Optimism in this connection, however, is justified, for the structural defects underlying the deformity are gradually being made clear and accurate diagnosis is therefore becoming possible. *Cure seldom anticipates diagnosis*, but is usually *quick to follow it*. Except from a viewpoint directly below the nostrils, one to which patients are seldom subjected except for the preparation of surgical textbook illustrations, the nostrils can be made to appear symmetrical.

Gillies and Kilner pointed directly to the deviation of the septum and the underdevelopment of the maxilla as fundamental causes of the nasal deformity. They described septal correction and nasal bone osteotomies and then turned directly to the alar cartilages:

The distorted alar cartilage must be mobilized in order to allow it to slide forward into symmetry with its fellow, and it must be fixed in this new position by suture. When the distortion is mild in degree, incisions may be entirely intranasal.

This involved freeing the skin from the alar cartilage to allow better position and then fixing it with mattress sutures to the opposite cartilage through the medial crura. For more severe deformity a more radical shifting was designed:

In severe cases an incision must be made in the midline of the columella, separating one mesial crus from the other, and carried forwards into the tip of the nose curving towards the normal side. It is sometimes necessary to prolong the incision backwards, carrying it around the out-turned extremity of the mesial crus and coming out into the vestibule. In all cases the intranasal incision through membranous septum and arching around the skin of the vestibule, must be made in addition. The mesial crus, having been thus freed, is slid forwards into correct position and held there by skin sutures in addition to mesial crura mattress sutures. It is to be noted
that the sliding forward of the half columella in this manner in unilateral cases is comparable to the sliding forward of the whole columella in bilateral cases. . . . In cases in which the half columella has been advanced, care must be taken to free the alar base from the maxilla—in order to free the alar base still further it may be necessary to carry the incision into the alar groove. A deep catgut suture now approximates the deep tissues of the alar base to the tissue covering the septum and nasal spine. . . . The defect left on the outer wall must be covered by either a Thiersch graft or a small transposed flap usually found to be available in the floor of the nose.

SCHJELDERUP

The precise Halfdan Schjelderup of Bergen, Norway, a devoted student of Gillies, in 1963 reported his satisfaction with the Gillies hemi-columellar shift after 13 years experience and 90 cases. Shifting the long skin edge of the cleft side along the short edge of the sound side produced an excess at the upper extremity of the incision which was accommodated by a crescent excision of dorsal nasal skin curving toward the normal side of the tip. In less severe cases the excess pig’s ear of the shift was removed as a triangle in the tip just above the alar arch. Schjelderup wrote in 1963:
Forrest Young of the University of Rochester also preferred the principle of hemi-nasal rotation in unilateral clefts. He was a plastic surgery maverick with a mustache and a rambling gait, reminiscent of Charlie Chaplin. Young loved to play the violin better than others liked to listen to him. One of his house officers recalls the winter of 1946, when the snow in Rochester was over 100 inches deep and the doctors got snowed in at the resident staff quarters and all had to listen to the screech of his violin for three days! Eventually Young became bored with plastic surgery, which for him was mostly reconstructive work, and eventually retired to California and went back to general surgery. In 1949, well after all strains of the snowstorm had faded, he published his version of a Blair-Gillies approach utilizing the

In 1969 Tessier approved the hemi-nasal rotation principle when he wrote:

Gillies and Kilner have described an admirable procedure which has been taken up by Schjelderup and which can still be further simplified by preventing continuity between the labial and columellar incisions.

Young

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same medial and upward rotation of the short half of the columella and separately, into the wake of this shift, advancing the flared alar base. Execution of this action in one combined sweep, as Blair suggested, seems more logical unless the nostril floor is not well constructed. In that case Young’s two-step action, like that of Gillies, could correct the floor discrepancy in the process.

EXTERNAL CRESCENT EXCISION

In 1931 the incredible German, Jacques Joseph, father of modern rhinoplasty and pioneer in intranasal incisions, indicated the difficulty of the unilateral cleft lip nose by advocating, obviously in desperation, a contradictory midline columellar incision extending over the dome of the lower lateral cartilage in a curvilinear fashion. Joseph resorted directly to excision of an ellipse of skin, subcutaneous tissue and mucous membrane from above one dome in order to elevate the forward roll of the lateral alar cartilage. This was a bold solution at the upper extremity of the incision, being used previously for hemi-rotations of the slumped side in order to allow adequate shifting and to equalize the pig’s ear discrepancy.
CRIKELAIR

George Crikelair, with Ju and Symonds of Presbyterian Hospital and the College of Physicians and Surgeons, Columbia University, in 1959 concurred with Joseph’s skin excision:

If there is marked abnormality, if the skin over the ala is thick and in great excess, or if an intranasal approach has been unsuccessful, then Joseph’s method may be quite reliable... The obvious objectionable feature to this approach to the "drooping ala" is the external scar. However, in all cases, the scar has been an even, soft, fine line, neither depressed nor elevated and has not been objected to by the patients, their families, or by the surgeons.

DINGMAN

In 1960 Reed Dingman, Chief of Plastic Surgery at the University of Michigan, published a paper on mandibular ostectomy for secondary deformities in the cleft lip palate syndrome. The overall results were quite dramatic, but Berkeley’s jealous eye spotted the symmetry of the noses. As Berkeley subsequently wrote in 1971:

Although not mentioned in the paper, the nasal deformities were corrected according to the Joseph technique. Personal discussion with Dingman revealed that the curvilinear incision was at a level between the upper and lower lateral cartilages and extended into the mucous membrane fold in the interior of the nose. An ellipse of skin, and sometimes an even larger ellipse of mucous membrane was removed.

COMBINING THE COLUMELLA SHIFT WITH THE CRESCENT EXCISION

Evidently Kilner continued to use the Gillies alar shift operation but modified it by adding the Joseph crescent excision to facilitate the shifting of the ala in a circular and upward direction. He taught this to Peet, and in 1963 Peet and Patterson diagramed the modification with the tip portion of the incision
curving over to the cleft side and including an elliptical excision of dorsal nasal skin.

WILKIE

In 1969 astute Theodore Wilkie of Vancouver revisited the alar shift operation, pointing out the possible reason for its fading into obscurity. He blamed the medical artist for carrying

... the upper end of the skin incision across the nose tip to the non-cleft side, so that many surgeons were no doubt led astray...

and repeated it that way as did Barsky, Kahn and Simon in 1964 and Denecke and Meyer in 1967. Yet the original surgeons had designed it as diagramed, for in their text they stated plainly:

... and carried forwards into the tip of the nose curving towards the normal side.

I think I see the impish Puck in Gillies curving the incision away from the expected into the normal. It must have gallied Kilner, for he informed Wilkie in 1961 of his regret at never having published his change. In fact, it is unfortunate for all of us that Kilner wrote so little.

Intriguing points made by Wilkie were that the corrected design does erase the "hare look nose" and that
Millard's operation is founded on the identical plastic principle as is Gillies and Kilner's alar shift, rotation of the medial component and advancement of the lateral component, utilizing all the tissues and placing them in their proper positions, with a minimum of interference with anatomical landmarks. It is a natural corollary that the two procedures can be combined in certain patients who need correction of both nose and lip deformities.

Wilkie forwarded this example of his combined operation on an 18-year-old student nurse with a cleft lip nasal deformity with a microform lip cleft which he published in January 1969 in the British Journal of Plastic Surgery.

Of course, the true hang-up for many surgeons, including myself, is, as admitted by Wilkie:

Against the procedure is the fact that an incision is made on the visible portion of the nasal tip.
Wilkie, like others who use the external tip incisions, argues:

The improvement of form has more than compensated for the presence of a surface scar, which in any case usually fades nicely.

It is interesting that J. Manuel Velasquez and Fernando Ortiz-Monasterio of Mexico City more recently have begun using this similar combined approach. They advocate primary simultaneous hemi-rotation of the nose through an external incision and rotation-advancement of the lip adding Guerrero-Santos' denuded vermilion flap. They find the nasal scar unnoticeable but admit that two years is too soon to evaluate any effect on nasal growth.

BERKELEY

It would seem to me that Berkeley has put his heart and mind into cleft lip nose, and his 1971 article in Grabb, Rosenstein and Bzoch's book is the best yet written on the subject. As he admitted, Royster in 1961, with the Blair-type secondary correction, set him off in this direction, and he has now gone into orbit on the subject and from "up there" has combined what he sees as the best of all worlds:

To correct the lateral displacement, the entire ala is mobilized beginning in the midline of the columella and extending across the floor of the nostril at the junction of the floor of the nose and the lip, according to the technique introduced by Blair. A triangle of tissue is excised in the nasolabial region to adjust the long and short sides of the incision. As the cartilaginous septum is almost always displaced toward the normal side, it must be straightened. . . As the nasal spine is usually present in the floor of the normal nostril, it becomes necessary to resect the nasal spine. . . A submucous dissection is accomplished through the midline columellar incision. Vertical, parallel, partial-thickness cuts on the concave side of the exposed cartilage allow the cartilage to be brought to the midline without rebound action.
Thus has Berkeley combined Blair with Metzenbaum’s septal straightening influenced by the cartilage work of Gibson and Fry. To this he added the method of Joseph:

When the cleft lip-nose deformity is severe, with a wide-set ala and extensive forward rolling, a combination of the Blair and Joseph techniques is indicated.

This, in fact, is the same as the description by Peet and Patterson of Kilner’s design. Berkeley notes the importance of other corrective rhinoplastic procedures and winds it all up with the same defensive conclusion:

The commonest objection that has been raised to the technique involving the external incision over the dome of the nasal tip is the resulting scar. This wound does mature in time without significant scar, so that it has not been necessary to resort to dermabrasion.

Even Berkeley admits that there are degrees of deformity which require variation in the extent of surgery. When there is severe distortion and the method chosen does not adequately place normal into normal position, the inadequate attempt has been well tagged by Berkeley as “another incident on the road to frustration.”

In preparation for Bill Berkeley’s visit to Miami, a unilateral cleft which had had a straight-line closure was readjusted with a rotation-advancement procedure, positioning the alar base in symmetrical position. Special attention was directed toward leaving the remaining secondary nasal deformity intact.
In 1971 Berkeley used the hemi-rotation of Joseph through a columella-splitting incision which extended up over the nasal tip curving around in the alar crease. No excisions were made, but the tissues were slid, lifted and sutured in more normal position.

The resulting conformity was good; the scar was quite visible when observed directly but by no means objectionable and hardly discernible in photographs.
A GRAPHIC EXPLANATION

Alexander Limberg of the Post-Graduate School of Medicine, Leningrad, in 1966 in *Modern Trends in Plastic Surgery* explained just what is happening to the skin surface during the hemi-rotation. With seemingly complicated sketches of models, he quite simply described the process of bringing together edges of angled incisions with coordinated movements of lateral shift and rotation of flaps, resulting in the closing and opening of angles. When a skin angle is closed, a standing cone or "pig's ear" is created, and when opened, a lying cone or wrinkle forms. Limberg then charted graphic application of this action in the hemi-rotation of the nose with evidence favoring the shifting toward closure of an angle on the cleft side nasal tip to form a rising cone rather than crescent excision of that cone. He accompanied his diagrams with this legend:

Pre- and post-operative stages of rotation-advancement of one half of the columella to correct the depressed ala deformity secondary to a harelip; the wound edges are equalized by excision of a triangular area from the lip scar.

TO SCAR OR NOT TO SCAR?

There is no question but that the total upward rotation and lift of the entire slumped half of the unilateral cleft lip nose as a composite unit is the easiest to perform and the truest to the principle of moving normal into normal position. To achieve this action effectively, the rotating incision must extend over the tip of the nose, resulting in a scar which usually heals well. When one pits *improvement in contour* against a *good scar*, there is a real temptation. Yet, if we reflect a moment on the scar, it may reflect back an oracle. At best the scar will be a line or a crease, but it may be discolored or show slight humping in contour or it may be smooth and shiny, catching and reflecting light. There are, at this time, these undeniable facts about scar: it is unpredictable, unnatural and, therefore, undesirable. Although Peacock predicts control of scar by 1980, until that time, in most unilateral cleft lip noses, I pass up the external tip scar and continue to search for an equally effective undercover method.
50. Intranasal and Marginal Incisions for Correction of Nasal Tip, Alar Rim and Base

INCISIONS FOR CARTILAGE SHIFTING

SOME surgeons have tried for the same effect of upper rotation of the slumped half but, to avoid the external tip scar, have resorted to marginal and intranasal incisions for exposure of the alar cartilages. This is an attempt to achieve the corrective action by independent maneuvers without moving the entire half of the nose as a composite unit.

MARGINAL FLYING BIRDS AND BATS

Erich

There is another direct exposure to the tip cartilages with more subtle external scarring. The quiet, reserved and dignified John B. Erich, who started in Gordon New’s first group of plastic surgery residents at the Mayo Clinic, in 1953 described a unilateral cleft lip nose correction through a “listing sea gull” incision. He then independently divided the medial crus of the cleft side alar cartilage and lifted it into balance with the opposite side and sutured it there. The excess alar rim skin on the cleft side was tailored, which leveled the “list of the gull.”

After 40 years Erich is still a most dextrous surgeon but remains as conservative as ever, seldom changing his techniques.
and never appearing at meetings. In 1974 he reported still using the cleft lip nose technique exactly as originally described. However, he admitted that the value of this approach is limited in situations where there is a short columella.

**Gelbke**

Heinze Gelbke of Gottingen, Germany, in 1956 used a similar transverse "flying bird" or "bat" incision across the tip with the point of the V extending down into the columella. This presented excellent exposure of the deformed alar cartilage, which he sutured up to the normal side. The skin closure advanced the V to a Y out of the columella into the tip, with bilateral "pig's ears" perking up at the sides of the tip, requiring triangular excisions and more external scarring. Since facial dueling scars were a mark of honor in old Germany, this approach may have been found more acceptable there than elsewhere.

**Figi**

Fred A. Figi, also at the Mayo Clinic, in 1952 designed a flying baby bird incision across the upper columella with extensions in the vestibule under the alar arches which actually hid the scars better than the standard "flying bird incision." This approach never became popular but has advantages.

**Stenstrom**

Sten Stenstrom, of the University of Umea, Sweden, with Oberg, pulled a unilateral deformity in a number of cadaver noses to show that the basic pathogenesis of the cleft lip nose is the pull of the lateral facial muscles unopposed by an intact orbicularis oris. In 1961 they concluded that through a modified Rethi "flying bird" incision, similar to Erich, the slumped alar cartilage should be freed and sutured to its opposite medial crus and to its own upper lateral cartilage. They admitted that in certain underdeveloped alar cartilages it was necessary to transplant a small cartilage taken from the normal ala in the Musgrave spirit to "redress the balance between the two." In 1975 Stenstrom added a tiny skin incision high on the dorsum through which to lift the alar cartilage with multiple suture loops.
In 1938 the adroit New Zealander, Archibald McIndoe, while still in association with Gillies in London, evidently became disenchanted with the external scars of the hemi-rotation that Gillies and Kilner were using. He turned to intranasal incisions and started the shift in the opposite direction, clockwise for a left cleft and counterclockwise for a right, with parallel vestibular incisions that formed a chondromucosal bucket-handle flap, which when freed could be advanced upward and medially. McIndoe sutured the apex of his strap to the normal cartilage of the opposite side in a lateral to medial action.

In principle, this approach promises advantages, but its maintenance of a lateral tethering probably explains why in practice the ultimate results were less than dramatic.

Potter

Big John Potter, quiet and sincere student and friend of Wardill in Newcastle-upon-Tyne, continued the cleft work in Stockton-on-Tees. In 1954 he discussed the unilateral cleft nose deformity:

... the height of the medial (columellar) crus on the affected side is lower than the normal side. The lateral crus on this side, therefore, joins the medial crus at a lower level, compared to the normal side and passing laterally forms a lower flatter arch on this side. ... It has been frequently
noted during the operations when the cartilages are exposed, that the height of the medial crus is \( \frac{1}{4} \) inch lower on the affected side. The lower flatter arch formed by the lateral part of the alar cartilage is the cause of the unilateral flattened nostril. The lateral part of the alar cartilage is frequently distorted into the lumen of the nose, the outer surface of the cartilage, which is normally immediately beneath the skin, is rotated inwards towards the nasal cavity. It there presents as a ridge, covered by nasal mucosa and causes varying degrees of obstruction to the nasal airflow.

To obtain a balanced nasal tip the cartilage must be put into its correct position to balance with its fellow of the opposite side.

On this basis Potter designed an operation in which he elevated the skin of the columella and extended the vestibular incisions to expose the entire alar cartilages. He then freed up the entire lower lateral cartilage laterally on the cleft side and advanced it medially, suturing it to its normal mate and closing the lateral defect intranasally in a V-Y fashion. He reports today that he is still happy with the results of this procedure.

This principle is sound, and although it does not offer the complete answer to the problem, it offers advantages which have been used in modified form by many surgeons and included as one component in the total nasal correction approach used by numerous other surgeons.

*Merville*

In 1961 L. C. Merville of Foch Hospital, Paris, presented at the Seventeenth French Congress of Stomatology, his marginal incisional exposure for the cleft lip nose. Complete freeing of the lateral wing of the cleft side alar cartilage facilitated its lift and
suture to the opposite side under direct vision. The nostril was then splinted with an endonasal prosthesis for three months. Merville kindly forwarded to me this example published in *Revue de Stomatologie*, 1962.
Rees

The suave Thomas Rees of New York University, with Converse in 1966 added an addendum to McIndoe and his synchronous lip-nose repair. A Potter-type chondromucosal flap was elevated, the cartilage scored on its superior surface and the entire flap advanced medially and sutured to its mate. The lateral vestibular defect was not closed in V-Y fashion, as proposed by Potter, but additional tissue as a full-thickness retroauricular skin graft or composite chondrocutaneous graft was added with the aid of a stent mold for one week and splinted several weeks later with an acrylic mold.

Takahashi

In 1963, at the International Congress in Washington, Takahashi and Yamazaki of Jikei University in Tokyo made a complicated study of the cleft lip nose, concluding:

It is necessary to raise, curve and rotate the lower lateral cartilage in an antero-medial direction, as well as to lengthen and lift the medial crus antero-medially.

They outlined their surgery, which included wide undermining along the margin of the pyriform fossa, wide exposure of upper and lower cartilages through incision along the margin of the columella and anterior rim of the nares, freeing the nasal skin up to the root of the nose and freeing of the medial crus on the deformed side from the septum. The lower cartilage of the deformed side is repositioned and fixed to the upper cartilage, and the adjacent parts of the medial and lateral crura of both sides are approximated and sutured to each other.
Uchida

A somewhat similar approach was described by the late Jun-Ichi Uchida of Tokyo in 1971, with freeing of the cleft side alar cartilage through a transcolumellar incision. An incision through the foot of the medial crus and between the alar and upper lateral cartilages along with undermining from the skin achieved sufficient freedom of the alar cartilage so that it could be lifted equal to the normal side and fixed with sutures. The shortness of the plica vestibularis along the rear wall of the vestibule was relieved with a double Z-plasty. Reduction of the wide nasal floor with a skin excision completed his nasal correction except for surgery of septal deviation several months later.

Reynolds and Horton

Those suffering the concern about skin scars must have found the method described by the Virginians appealing. Charlie Horton, of Norfolk, modified the alar lift operation, and in 1965 he and Reynolds published their design. Access was obtained by intercartilaginous incisions in the vestibule along the dotted lines. Portions of the upper and lower cartilages were reduced somewhat as indicated by the cross-hatching. To lift and rotate the cleft side alar cartilage, a 4-0 chromic catgut suture was placed in its upper medial tip and then across and through the anterior medial tip of the normal upper lateral cartilage as indicated by the arrow. Tying this suture lifts the involved side into more normal position:

After the fixation suture is in place, if the airway is compromised by webbing or deficient mucous membrane, the redundant inferior tip of the
abnormal upper lateral cartilage, with its lining is not discarded but is inserted into a relaxing incision in the lower lateral cartilage.

Variations of this general design have enjoyed some popularity. At least there is no gamble on the happy healing of external nasal scars. Interested in senior author John Reynolds' current thoughts on this method, I wrote him in 1973 in Chattanooga, Tennessee. He answered,

Initially, Charlie and I were not satisfied with the results we were obtaining by former methods. . . . At that time, we were working essentially with young adults in the Navy and there were literally dozens of young boys walking around with a nicely repaired cleft lip and a flat unsightly nose. However, since 1967, I have not seen near the volume of this type of problem and have done perhaps no more than six or seven. . . . However, I can state that,

1) Yes, I am still using this procedure and am satisfied with it.
2) I still consider it one of many procedures that can be used, depending on the specific problem.
3) I am not as opposed to an external incision (transverse, and at the base of the columella) to gain direct access to the cartilages, as I was when this original article was written.

Spira

Diligent Melvin Spira, with Baron Hardy and Frank Gerow of Baylor Medical College, Houston, in 1970 combined a nasal quinella. They used a modified Erich-Figi "flying bird" incision, suspension sutures of 4-0 Mersilene from the slumped alar cartilage and the upper lateral cartilage where it abuts the nasal bone on the same side, alar base retention suture to the septum and dissection of a pocket under the alar base over the maxillary hypoplasia for the insertion of an appropriately tailored implant of "soft silicone rubber, silicone gel, cartilage or bone."
Here is an interesting step-by-step series of photographs of a case by Spira.

**MID-COLUMELLA INCISION**

Recently Gustavo Colon and Mel Abend of Tulane University advocated, along with the usual septal correction, normal alar cartilage reduction and onlay alar cartilage graft to the cleft side, a midline vertical columella incision with exposure of both domes of the lower lateral cartilages. The lateral crus of the cleft side alar cartilage is completely freed from lining and skin and is lifted and sutured to the remaining portion of the opposite normal dome.
LATERAL VESTIBULAR LINING SHORTAGE

In the original cleft deformity, the ala arches across the cleft, and the alar base is attached to the usually deficient cleft-side maxilla in flared and retroposed position. If, during the cleft closure, there is no release of the alar base from the maxilla or, if released, no extra lining is introduced, then there results a secondary deformity, described by Berkeley as a bowstring contracture of the interior of the nostril extending from the tip along the upper border of the lower lateral cartilage to the margin of the pyriform opening. Berkeley prescribes a primary Z-plasty for this discrepancy. This lateral shortness of vestibular lining is best corrected by the introduction of lateral vermillion paring of flap L during the primary lip operation. If this has not been done, then take your pick from the horde of secondary procedures. There is Uchida's double vestibular Z, O'Connor's or Borchgrevink's single Z, Potter's or Matthews' V-Y and Rees' free graft.

SPLITTING AND SHIFTING PORTIONS OF THE ALAR CARTILAGES

Numerous surgeons have devoted much time and thought to ways of splitting and shifting portions of the cleft side alar cartilage in an attempt to correct the asymmetry by lifting the freed limb. Almost as many have tried turning portions of the normal alar cartilage over to build up the slumped side. Few, if any, of these methods have stood the test of time because the alar cartilages, certainly on the attenuated cleft side and even on the normal side, do not have the stiffness or body to lift and support the unilaterally flattened tip. Graham Humby of England, in The Lancet in 1938, described paring off the upper portion of the normal alar cartilage a flap which he swung over the cleft side cartilage to give additional contour.

Arthur Barsky of New York in 1938 split off the upper half of the cleft side alar cartilage and transposed it with a lift up
along the nasal bridge, fixing it with sutures. Both this and the Humby procedures, when studied as diagrams, have appeal and are tried by each new generation. I had a swing at it but was disappointed. These methods have never become popular and, in my experience, just do not get the job done, except possibly in a minor deformity.

DIVIDING AND TURNING UP ALAR CARTILAGES

Varaztad Kazanjian of Boston in 1939 prescribed treatment for the unilateral cleft lip nose with its distorted flat nostril and bent nose. He, like others, advocated septal resection, nasal bone osteotomies, hump removal and cartilage grafts for general harmonious contour. He then stated:

The most important step is the correction of the distortion of the nostril itself. . . . A curved incision freeing the wing of the nostril from the base of the nose . . . [is made and] a vestibular incision is now made bilaterally along the anterior border of each of the lower lateral cartilages . . . [and] is carried vertically down through the lower border of the septum. The skin over the tip and lateral cartilages and nasal bones is undermined . . . the tip of the septum and median crus are exposed.

The inferiorly placed lower lateral cartilage was carefully dissected from the septum, and both cartilages were trimmed and sutured together at an even level. If the nasal tip was broad, a pointed tip was constructed by cutting through each crest of the alar cartilages about 5 to 10 mm. from the median plane, dissecting these cartilage flaps from their mucosal lining and joining them together with catgut sutures. Advancement of the alar base was facilitated by triangular skin wedge excision of the lip side of the nasolabial junction. Here Kazanjian followed Blair and Joseph, in principle, with an external excision which he described thus:

Excision of a semilunar piece of skin, about 3 mm. above the margin of the nostril is the most satisfactory method. The external scar on the tip of the nose is not conspicuous.
Louis T. Byars, one of the Big B's of St. Louis, an A.O.A. and Regent of the American College of Surgeons, was a skilled, ambidextrous technician with a well-organized mind and a soft voice. Although better known for his work in hypospadias and parotid tumors, during the 40's "Bill" Byars also did a lot of noses. In 1947, he proposed utilizing the columella portion of the underdeveloped alar cartilage on the cleft side to restore symmetry of the nasal tip. It was divided near the foot of the medial crus and lifted up to overlap the opposite alar dome.

In 1952, Gillies suggested that the alar cartilage on the cleft side can be shaped, scored and lifted, and the normal alar cartilage reduced.

... so that when the depressed ala is brought up and sutured to it, the two will ride evenly together on top of the septal crest. At the same time the flared alar base can be moved in by reducing the wide nasal floor. One method is to transpose the alar base and the nasal floor as a Z plasty. . . . In late reconstructions when the nasal bridge is deviated the septum is freed from its vomerine groove and an osteotomy performed through the frontal process of the maxilla so that the entire nose swings around straight on the face.

Sidney Wynn of Milwaukee in 1974 modified the Humby principle of turning the upper half of the normal alar cartilage under the upper lateral but over the cleft side alar cartilage in an attempt to achieve nasal tip symmetry.
Dennis Whitlow, while still a resident, and John Constable of burn fame, from the Massachusetts General Hospital, wrote a paper on secondary unilateral cleft nose, a subject on which even the experienced hesitate to editorialize. In 1973 they published a design which on paper or to the inexperienced might have appeal. They refer to:

An upsilon-shaped incision (T) with its base in the anterior part of the columella and the limbs gently curving out over the alar domes.

Editor McDowell placed one of his notorious notes in their margin which recalled,

This incision is not totally unlike the "bat-wing incision" used a few decades ago. It was discarded because the resulting scar was objectionable in some cases.

Whitlow and Constable, through this incision, dissect and criss-cross cartilage flaps cut from the upper two-thirds of the lateral crura with their bases at the domes. Since the exposure is not adequate for permanent buried sutures, external pull-out stitches are used and maintained for two weeks.

Anyone who has had much experience with shifting deficient alar cartilage knows it is friable and not very effective either for lifting, support or contour. Even Whitlow and Constable noted:
Should the base of the flap be weakened at this narrow point, a non-absorbable mattress suture can be placed to reinforce the point of divergence.

They reported 10 cases, with photographic records of only one, which still required secondary nasal correction.

Harold McComb of Princess Margaret Hospital, Perth, Western Australia, in 1974 reemphasized the importance of the excess unilateral length of the nose on the cleft side and advocated shortening this side without external skin excisions. He uses intranasal bucket-handle strap flaps for exposure and excision of mucosa along with portions of the upper lateral and alar cartilages. By not dividing the upper lateral cartilage on the cleft side from the septum, support is retained for alar cartilage lift. He does not bury his lifting suture but depends on mattress sutures brought out through the dorsal skin and tied over a bolus for five days. McComb also advocates Humby’s trick of turning the lateral crus of the normal alar cartilage to overlap the deformed cleft cartilage. To this he adds septal straightening, nasal bone osteotomies and alar base positioning, and he presents respectable results with this regimen.

**SIMPLE MARGINAL EXCISION AND INCISION**

There have been other surgeons who have been content to treat specific aspects of the total nasal deformity, and often these procedures have involved marginal incisions.

*Ombredanne*

Ombredanne of Paris in 1921 described nostril rim excision to correct the cleft lip nose overhang.

*Gillies*

In addition to their hemi-rotation of the columella with advancement of the alar base, Gillies and Kilner in 1932 offered other suggestions for the unilateral cleft lip nose:

There often remains an excess of nostril margin and lining which renders the result still imperfect. This can be corrected by excision of an ellipse
of the free margin of the cartilage . . . and lining, the broadest part of this excision is near the junction of the two crura . . . when the defect is closed, the suture line lies inside the nostril. . . . An unsightly kink in the nostril margin, caused by excess of lining, may be treated by excision of an elliptical area of vestibular skin at right angles to the margin and with its upper angle high up in the vestibule. The outside skin is not touched. Closure of the defect by sutures produces a pleasantly rounded nostril. This little operation is similar to that described by Ferris Smith for the treatment of collapsed ala.

**Kilner**

The technique of crescent excision of lining under the alar web and in-rolling the alar skin margin was used by Kilner routinely and even became known as the "Kilner roll." This procedure is based on the premise that there is excess lining which actually is incorrect. There is a primary deficit of lining with possibly a slight relative excess of external skin. Although I have used a modified form of this approach, excising a crescent of external marginal skin, with reasonable success in many cases, a better plan has been evolved and will be described.

**Brown**

Brown and McDowell in 1941 suggested a nostril rim incision to remove any forward roll of the lower margin of the deformed alar cartilage, and they combined this with the reduction of the normal alar cartilage.

**Straith's z-plasty**

Claire LeRoy Straith of Detroit did thousands of corrective rhinoplasties during his career and was completely at home with the nose. He organized the operation into steps one to ten and took an average of 20 minutes per nose, but his record for a reduction rhinoplasty and submucous resection of the septum was seven minutes!

In 1946 the indefatigable Straith described a Z-plasty of the alar web for the purpose of elongating the nasal columella. A piece of preserved cartilage was inserted into the area of flatness at the tip. It was typical of this efficient surgeon to design a simple, quick solution to a complicated problem. Although his
aspirations were often realized, the results with this approach often had a slightly unnatural effect.

**COMPOSITE EXCISION**

Hoyt DeKleine of Buffalo in 1955 advocated marginal excision of skin and cartilage along the rim of the slumped ala together with advancement of the alar base.

**MARGINAL OVERLAPPING**

A Portuguese Bonaparte of plastic surgery, Ivo Pitanguy, short but powerful in stature, stands like the Sugarloaf of his city of Rio de Janeiro. He was once described by Simona Morini for *Vogue* as:

A brief neck supporting a round, proud head with huge black eyes that extend almost to his sideburns... reminding one of nineteenth-century German lithographs of Brazilian Indians.

In 1967 he approached the unilateral cleft lip nose at its alar margin. The characteristically flattened edge of the deformed nostril was abraded with a sanding machine over an elliptical area. Then an incision was made along the superior limit of the
freshened area and a pocket dissected under the skin over the alar cartilage. The undermined alar margin overlapped the denuded area, which combined a lifting with a bolstering on the cleft side. When the cleft side alar cartilage was smaller, cartilage resected from the normal side was used as an onlay graft for additional contour as prescribed by Musgrave.

**INFOLDING THE RIM**

In 1973 Rodolphe Meyer of Lausanne refined the method of infolding the alar web in a modification of the method of Petrali. Avoiding an external incision but gaining access through a marginal incision, he thins the skin of this area, removing subcutaneous tissue and cartilage to facilitate infolding the edge to raise the margin of the nostril. A small Z-plasty is placed at each extremity of the marginal incision, and the vestibular lining is completed when necessary with a composite graft from the ear. Both the infolding and the graft are fixed with mattress sutures over a plate.
Meyer forwarded an example in 1974 of an extremely scarred unilateral cleft lip nose which had been corrected in a child by inrolling the margin and adding an auricular composite graft for extra lining and support, which he explained is barely visible as a "white corner" in the final photograph.

**ALAR RIM TRANSPOSITION OR FREE GRAFT**

The omnipresent Onizuka of Tokyo, constantly reappearing out of the blue in his relentless attack against the unilateral cleft, suggests kamikaze courage. In 1972 he advocated transfer of the excess alar rim web but this time to the underdeveloped medial crus area of the columella base on the cleft side to bolster its contour. He proposed a transposition flap from rim to sill as first choice. Yet he realized that after the flap takes a 140-degree shift, there may be either an objectionable "pig's ear" at the turn or the pedicle may have been cut dangerously narrow. He admitted making the flap into a composite graft on occasion and published a good case example.
POSITIONING THE ALAR BASE

Not only do the nasal tip and columella show secondary deformities, but the alar base, beginning in flared position, unless effectively corrected primarily will remain flared. The most common method of dealing with this problem has been inartistic excision of tissue at the entrance of the nostril. Several more-sophisticated methods have been developed.

Collis swung lateral lip skin into the floor of the nose, which achieved some alar base correction. Blair utilized a similar principle as have others.

Trauner, of Graz, in an extension of the Collis flap, achieved alar base positioning with his vertical lateral lip flap transposition across the base of the columella. Mustarde exaggerated Trauner's approach by carrying the flap completely across the columella base well into the opposite side in an attempt to tie the ala and prevent lateral drifting.

Grignon, of Paris, devotes the major part of his energy toward disinsertion and forcible rolling up of the ala nasi, with a locking into a sub-columnar notch . . . for satisfactory positioning and fixation of the ala nasi and the nasal wall . . .

The original design of the rotation-advancement principle had, as one of its prime advantages, the medial advancement of the alar base. The same action was found effective as a secondary procedure. Here is a case in which a secondary rotation-advancement corrected the lip, straightened the columella and advanced the alar base almost enough. An alar rim excision achieved reasonable nostril symmetry.
The occasional less than perfect medial advancement of the alar base or its secondary lateral drift precipitated other alar base maneuvers to “bring about and secure this flapping jib.”

At the Rome Congress in 1967 and in the 1968 extensions of rotation-advancement, I advocated a circumalar incision and advancement of this alar flap on top of the lip flap in an advancement on an advancement. Although it achieved excellent alar base positioning, this correction was not always maintained perfectly. Thus, a further modification was added to the primary surgery to tie the alar base in once and for all.

When sufficient alar base is present, its distal end is denuded and advanced under the side of the columella to the septum at the nasal spine and fixed. Otherwise, a subcutaneous pedicle is dissected in continuity with the alar base and advanced in the same manner. If the alar base is too thick, it can be thinned by cutting a subcutaneous flap out of it and its sides sutured together for a slimmer base. The subcutaneous flap, still attached to the distal alar base, is used as a tether, which can be advanced subcutaneously under the side of the columella and fixed with nonabsorbable suture to the septum at the nasal spine.

Of course, these same tricks are available and effective for secondary alar flare when primary alar base positioning has been inadequate.

A POSSIBLE BACKFIRE

In the rotation-advancement procedure, there is always a chance of a novice advancing the alar base too far. It is even conceivable that an old pro can get a nostril too narrow in the incomplete cleft with an almost normal width of nostril on the cleft side.

BACKWARD ADVANCEMENT

When the alar base had been advanced too far medially, the nostril size is reduced to a comparatively constricted opening. A reverse action is in order. A V-Y of the alar base will correct the constriction and open the airway. The eager and energetic E. N. T. surgeon, Richard Farrior of Tampa, published 60 pages.
on secondary cleft lip nose correction in *Laryngoscope* 1962 with a great part devoted to shifting the alar bases medially. Evidently a few got shifted too far in, resulting in an abnormally narrow nostril. These must have stimulated Farrior to design his V-Y lateral advancement of the alar base, which quite effectively reopened the nostril as demonstrated by his diagrams and one of his secondary cleft lip rhinoplasties.

FREE COMPOSITE GRAFTS

Another effective method of opening a comparatively small nostril is the use of a free composite graft from the helix rim. Still another possibility is a modification of the 1954 trick of Max Pegram of Beverly Hills, California, who advocated alar base composite free grafts to lengthen a congenitally short columella. When the normal nostril is quite wide, Pegram’s principle could reduce the normal side and free graft the composite wedge into a releasing incision at the base of the narrow side. This would serve two purposes with one graft, provided the constriction was not too great.
51. Cartilage Grafts

The cleft side alar cartilage is notoriously "weak-kneed" and even when shifted into normal position does not possess the body and character to stand up against the depressed dorsal skin mold. Consequently, surgeons have turned to additional onlay and strut cartilage grafts.

In 1932 Gillies and Kilner recognized the need for a supporting graft of cartilage in the nasal tip. Barrett Brown preferred preserved L-shaped costal cartilage for nasal bridge and tip support and later used cadaver cartilage preserved in merthiolate. Ed Lamont of Hollywood, California, in 1945 suggested severing the cleft-side alar cartilage at the arch and dissecting the lateral crus to let it slide and then introduced a piece of alar cartilage from the opposite side into the gap. Lamont also advocated rib necrocartilage preserved in formalin and merthiolate for nasal bridge and columella struts. He reported 62 cases with such cartilage, some of which still appeared intact and responsible after as long as three years.

For severe alar slump Gillies, by 1952, had transferred his preference to onlay grafting:

When the deformed alar cartilage is too flimsy to support the nostril arch, it prolapses across the nares. . . . It seems a better principle to reinforce the flimsy cartilage with an additional piece overriding it. Dissect a tunnel under the nasal skin but over the sagging alar cartilage and insert a relatively long strip of autogenous auricular or even ox cartilage, which as a bow-spring arches from a little pocket at the base of the ala to the nasal tip. . . . Needless to say the general improvements in the nose, such as removal of an objectionable hump, will improve the ultimate result. Do not forget the value of shortening the whole nose in cleft lip.
MUSGRAVE

In 1960 Ross Musgrave, artist, actor and sports aficionado, with his chief, Milton Dupertuis of the University of Pittsburgh School of Medicine, wrote a classic on the cleft lip nose. They proposed taking a large part of the superior and lateral portion of the bulbous alar cartilage on the so-called normal side and using it as an onlay graft on the cleft side. This was carried out through a rim incision along the margin of the involved side allowing excision of any excess skin and cartilage on that side. In Melbourne in 1971, Musgrave, dressed in his usual Esquire attire, gave details of the latest fashion in technique of his onlay plan:

It is now almost routine to excise completely the cartilage of the lateral alar crus on the uncleft side, even extending this excision into the alar dome. This tissue is subsequently used as a two-layered "life-boat" cartilage graft holding this in its previously marked location by a mattress suture of 4-0 chromic catgut tied over a ball of cotton.

This tiering of the alar cartilage has become popular and has been copied in various ways.

COSMAN

From 1961 to 1964 Bard Cosman, at St. Albans Naval Hospital and later with Crikelair at Columbia-Presbyterian Medical Center, reported a series of 26 cases, receiving multiple independent maneuvers to correct the unilateral cleft lip nasal deformity. Not once was reference made to Crikelair’s earlier advocation of the
Joseph dorsal external skin excision. Possibly the stigmata of the scar turned the tide. Or was it the indifferent results? In their 1965 paper they outlined a series of interesting procedures, which included septal straightening with a dorsally hinged septal flap, excision of the dome of the normal alar cartilage, total excision of the lateral crus of the cleft-side alar cartilage, free grafting in piggyback fashion of the alar cartilages to the cleft-side alar dome, alar base rotations and excisions and cleft-side alar rim excisions. Total excision of the cleft-side alar cartilage was justified by them because onlay grafting or dissection and lifting seemed to do

. . . nothing to remove the buckle in the middle of the depressed S-shaped abnormal ala . . . and a pronounced tendency for recurrence of this defect seemed to exist. . . .

They even went so far as to suggest cautiously:

The application of these measures in children can produce striking results but further time must pass before the permanence and the consequences of this early success can be judged.

ANOTHER QUINELLA

Victor Spina of Brazil in 1968 described what he considers a winning quinella in the unilateral cleft lip nose. He combined the marginal alar web excision which I described in 1960, Potter's V-Y advancement of the chondromucosal flap of the vestibule, scoring of the cartilage in the medial portion as proposed by Rees and Converse, bolstering of this cartilage in its lateral portion with an onlay graft from the normal ala as advocated by Musgrave and a Weir half-moon excision of the alar base with a V-Y medial advancement.

ALAR BASE SUPPORT

In 1964 I noted that even after successful rotation-advancement, there could be relative asymmetry in the position of the nasal floor and alar base:
This seems due primarily to a lack of bone in the supporting platform which allows the lip to fall in and the nose to tilt.

A secondary refinement was suggested for certain cases, with acknowledgment to Schmid, Johanson and Schuchardt:

A partial remedy for this problem is the addition of new bone and the method used is a slight variation of that described by Brauer, Cronin and Reaves. The bone of the maxilla on each side of the cleft is exposed by turning mucoperiosteal flaps in to line the nasal side. Then an autogenous rib graft is strutted across the alveolar gap with bone to bone approximation . . . it also balances the nasal tripod and gives the lip and its vermillion the support it needs for symmetry.

Thus, it was slightly puzzling to me when after six priorities had been given up to 1964, Jack Longacre, with Halak, Munick, Johnson and Chunekamrai in 1966, reported "A new approach to correction of nasal deformity following cleft lip repair" using split rib grafts under the alar base.

In 1969 Igor Kozin, of the Moscow Research Institute of Cosmetology, described his combination of corrective procedures for unilateral nasal deformity at the time of secondary rotation-advancement correction of the lip. He reported having operated on 121 noses with all patients over 15 years of age, and the case he published was impressive.

Using what he referred to as a modified Pauer incision in the shape of a bird along the free edge of both nostrils, he freed up the flattened alar cartilage. With the aid of an S-shaped septal incision, he straightened the anterior portion and fixed it between the normal alar cartilage arch and the advanced flattened arch from the cleft side with "kapon mattress sutures." Kozin also placed homologous cartilage grafts in two strategic positions. One was used to fill the lateral defect after medial advancement of the alar cartilage. The second was a craftsmanlike half-cone with a step he described in 1971 as:

The shape of a narrow and bent triangle with a notch at its base facing forward and downward with its apex facing backwards.

He advocated its insertion into a tunnel under the alar base to build up
the insufficiently developed pyriform aperture and alveolar process of the maxilla.

In 1972 Kozin repeated this general plan in three rare cases of unilateral cleft lip nose without cleft lip. His interpretation is interesting:

The rare deformity of the nose as in unilateral congenital cleft of the upper lip, but without any sign of cleft in that lip, explains how such a deformity may develop even after successful primary cheiloplasty.

This is why most patients who had a successful cheiloplasty performed in their childhood, require surgical correction of the nose at an adult age.

UPRIGHT SEPTAL GRAFTS

In 1964, after another plea for primary correction of the nose as occurs spontaneously with the rotation-advancement lip closure, I described a secondary nasal procedure which has been effective in certain cases:

When the rotation-advancement approach has not been used primarily and the nose reaches maturity with the original classical cleft characteristics then the correction is more difficult and calls for a five-point plan. (1) The anterior septum can be freed, weakened, shifted and fixed into the midline. (2) A modified rotation-advancement can correct the columella shortness and slant and, at the same time, reposition the alar base and
narrow the nostril floor. Usually an elliptical excision of the wide nostril floor is sufficient. 

3. Three-fourths of the normal alar cartilage is used as a free onlay graft to bolster the flat side and is inserted through (4) the alar web excision. 

5. Because of the poor quality of the flattened alar cartilage on the cleft side and the need for actual thrust in the tip support, a **septal cartilage strut** has been found most effective.

Septal cartilage removed during the usual submucous resection is cut into two long (3 cm. X 3 mm.), slender strips. Through a stab at the base of the columella on the flat side a narrow pocket is dissected just under the skin anterior to the medial crus up over the alar arch. The inferior blind end of the cul de sac presents a dependable platform for the thrust of the strut. When one or two septal strips are forced into the pocket the spring of the cartilage lifts the slump out of the alar arch. The combination of septal correction, nasal floor excision, alar web excision, alar cartilage onlay graft and septal cartilage strut is preferred to methods requiring external incisions such as the unilateral columella-tip advancement or the external excision of Joseph.

**Reduction rhinoplasty.** Of course, in addition to these specific actions to correct the asymmetric deformity, any unattractive aspect of the nose whether hump, hook, length or width deserves the service of osteotomy and septal shortening. Any or all aspects of reduction rhinoplasty are available and should be used to shape the cleft lip nose to its best potential.

**Two septal struts**

A nine-year-old boy with a reasonable LeMesurier lip closure, presenting the usual secondary nasal deformity, had medial advancement of his alar base and excision of his alar rim web. Then, at 16 years, three-quarters of the normal alar cartilage was resected and grafted as an onlay over the cleft alar cartilage. A submucous resection opened the airway and procured enough septal cartilage to shape two struts to be inserted into the columnella. One was inserted exactly vertical as central tip support,
the second was longer shunting under the slumped cleft side for extra support.

In fact, there are cases, such as these shown in profile from the cleft side, in which the reduction rhinoplasty will play as important a part in the final improvement as did the alar lift, alar base advancement and septal cartilage strut to the tip.

Yet, it is the combination of reduction rhinoplasty and specific cleft lip nasal procedures plus lip correction that produces the best results.

Here are four cases demonstrating this combined action which were published in *Plastic and Reconstructive Surgery* in August 1964.
This young woman had a reduction rhinoplasty plus an alar web excision, septal cartilage strut to tip in columella pocket, alar wedge excision on normal side and small midline Abbe flap.

This 63-year-old woman suffered with this secondary deformity until alar web excision, alar cartilage onlay graft, nasal floor reduction, septal cartilage strut through columella pocket to cleft-side nasal tip and lip revision were carried out.
A Jamaican boy with tight upper lip and difficult nasal deformity was corrected with osteotomy, septal shortening, alar web excision, alar cartilage onlay graft to cleft side, alar base positioning, septal cartilage strut through columella pocket curving under cleft side ala to support tip and midline Abbe flap.
This young woman had a reduction rhinoplasty with bridge shaping, osteotomy, three-quarter normal alar cartilage used as onlay graft to cleft side through alar rim incision, septal cartilage strut in columella pocket to support slumped tip and a small midline Abbe flap.

Muir and Bodenham, for Gibson's *Modern Trends in Plastic Surgery*, gave this septal cartilage strut approach a vote of confidence:

Ear cartilage often lacks the necessary rigidity to have the desired effect, and the Millard (1964) septal cartilage graft is stiffer and preferable. ...

The method has been modified, is still found of value and will be described in detail.

In 1969 Paul Tessier spoke of his sagittally split septal graft:

Even in favorable cases, it is always worthwhile to assure the projection of the point with a solid support.

In this regard, septal cartilage is irreplaceable. For the last three years, the "fleur de lys" graft which fills out the domes has given us results quite superior to those obtained previously. This bilateral graft is preferable to the unilateral graft since the normal side suffers from the shortness and retraction of the cleft side.

**Another Effective Combination**

For the unilateral cleft lip nose, Neuner also combines several procedures in his striving for correction. He splits the tail of
a one-sided forked flap, which is transposed as nostril sill, being interdigitated with the tip of the alar base. To this he added a Potter V-Y of intranasal mucosa and cartilage, scoring of the deformed alar cartilage dome and suturing of the medial crura. As an extra crutch, he used the nasal hump as a strut inserted into the columnella to support the unilateral slump of the alar dome, similar in principle but different in angle to my septal cartilage graft.

**Gorney's Gull Wing Graft**

In 1972 artistic Mark Gorney, with Edward Falces of St. Francis Hospital, San Francisco, presented the gull wing auricular conchal graft for nasal tip support. The first cases were done at Children's Medical Relief International, Saigon, in 1970.

In 1973 Gorney noted:

Sometimes one is faced with the fact that whatever you do to a post-cleft nasal deformity, by whatever technique, falls short of the ideal. We feel that this happens for two reasons:

1. There is not only a deformity of shape and position of the alar cartilage; there is not enough of it.

2. Most techniques for repair are based on the principle of suspension and do not take into account gravity and growth. One can overcome these objections by adding what is missing and providing structural support to the nasal tip simultaneously. One also substitutes and repairs with nearly ideal material—imitating exactly the normal anatomy. We have found no better way of adding "thrust" to the nasal tip to bring it above the level of the dorsum, and to give the missing fullness on the abnormal side in unilateral cases.
Gorney makes an incision inside the helical rim around the antitragus and stops short of the tragus, but he admits the cartilage graft can also be taken through a posterior incision. He takes a cartilage graft shaped like a jai alai basket with the lowest conchal cupped portion to be the alar lift; he uses the left ear for a right unilateral cleft lip nasal deformity, or vice versa.

Here is one of Gorney's cases in which the auricular half gull wing graft was used during the primary rotation-advancement closure of the lip.
Another unilateral half gull wing or jai alai basket graft was used as a tip support during a secondary lip correction.

This example of Gorney’s gull wing graft, even in half proportion, is really flying high, with his alar base advance, alar rim revision and unilateral auricular cartilage tip lift. Mark’s early result is dramatic.
EARLIER NASAL CORRECTION

In this personal case, the alar rim in the original deformity was so severely creased that even after rotation-advancement lip closure and minor nasal correction, the residual knock-kneed posture was still unacceptable. Rather than wait until 16 years for a septal cartilage strut, at 9 years a half gull wing auricular graft was inserted from the upper columella around the sharp angled alar arch to round out the curve and improve the tip contour on the flat side. Advancement of the alar base completed the nasal revision. An early photo was taken before he returned to Puerto Rico.
Norbert Schwenzer, of the University of Tubingen, West Germany, uses rib cartilage for his extra support. In 1973, considering the total deformity as one unit, he advocated simultaneous nasal and labial correction and presented several cases, one of which had had a nasal correction and a unilateral placement of an Abbe flap. He noted his preference of Rethi’s 1929 decortication technique for “open reduction” of the cleft lip nose, agreeing with Sercer and Mundnich that this incision affords a clear view and thus justifies the disadvantage of visible scars. From this exposure, he sutures the alar cartilages together and the slumped alar cartilage to the upper lateral (triangular) cartilage. Schwenzer uses Cottle’s septal correction, Trauner’s one-sided columella lengthening, Ragnell’s scarred muscle flap and Straith’s alar rim Z-plasty. In severe deformities, he states:

Very often parts of the cartilaginous structure must be replaced. The required material is either autologous rib cartilage, especially where osteoplasty must necessarily be done, or otherwise a homologous preserved rib cartilage. The preservation is done in cialite, an organic compound of mercury. The cartilage implant serves as a partial or total replacement of alar cartilage, for re-lining nasal dorsum or for improvement of the tip...

BEWARE THE FOREIGN BODY STRUT

Beware the use of stiff foreign body struts, such as Silastic, in the columella as a royal road to tip lift and support. If well covered, they may serve as quiet contour bolsterers, but when they are called upon to do work, look out! In general, the pocket is too superficial, but more important, there is the danger of perforation when the strut has a lifting work load. Sooner or later the strut will pierce its way through the skin of the nasal tip.
52. Combined Nasal and Labial Unilateral Cleft Corrections

The simultaneous correction of secondary labial and nasal deformities had been done by surgeons for many years. Gillies and Barron taught me this combined approach in 1948. George Pap of Frenchay Hospital, Bristol, England, advocated the combination of rhinoplasty, septal correction and lip revision in 1955.

Anglo-American

Sir Archibald McIndoe of London and East Grinstead and Tom Rees of New York, two of the smoothest operators ever in plastic surgery, combined forces in 1959 on the synchronization of lip and nose correction of secondary cleft deformities. They outlined the steps:

1. Complete "take-down" of the scarred lip with excision of all scar tissue.
2. The preparation of flaps for a satisfactory lip repair.
3. A nasal reduction with shortening of the nose if necessary, removal of bony and cartilaginous hump and infracture of the nasal bones.
4. Remodeling of the nasal tip by total bilateral mobilization and symmetrical realignment of the distorted alar cartilages.
5. Submucous resection of the distorted septum, if this is necessary, to centralize the nose or clear the airways.
6. Dental extraction of hopelessly involved teeth.

**BRAZILIAN**

Pitanguy of Rio, a bold surgeon flanked by his capable adjutants, executes his daily operative schedule like a Napoleonic campaign and probably does more cases a year than any other plastic surgeon. It would be logical for him to combine the labial and nasal correction in a secondary operation. In 1963 he described his combined approach with the lip skin incisions utilizing the rotation-advancement principle, including even the use of flap c for the nostril sill construction. Then, with the aid of alar base incisions and a membranous septal incision to lift the
columella along with a cleft-side paramarginal incision, an "open ceiling" exposure facilitated the freeing, shifting and suturing of the alar cartilages together for an improved nasal tip contour.

**SWISS**

A colorful, diagramatic nasal textbook, *Plastische Operationen am Kopf und Hals*, published in 1964, was co-authored by H. J. Denecke, an otolaryngologist in Heidelberg, and Rodolphe Meyer, a plastic surgeon in Lausanne. As I wrote in reviewing the book for *Surgery, Gynecology and Obstetrics*:

> From the natural rivalry of these two specialties it might be conjectured that this successful union was due to, rather than in spite of, the distance between Heidelberg and Lausanne.

In Meyer's section there appear some wild but intriguing combinations of labial and nasal secondary corrections. As agile
as Rudy may be, he could never cut a path like these on one of his Alpine ski slopes, but in cleft lip and nose secondary work, problems faced are stranger than fiction, and variation in the corrective design must face up to each idiosyncrasy. Of course, the results will be no better than the principles of the methods used.

**SWISS**

In 1971 Neuner of Berne described a combined correction of the lip and nose along the forked flap principle. He improved the lip scar by raising a unilateral forked flap and split its tail. The membranous septal incision, which was used to facilitate

**FRENCH**

Paul Tessier of Paris, with Delbet, Pastoriza and Aiaich, in 1969 advocated a synchronized, simplified Schjelderup unilateral nasal correction along with a lip revision and small Z-plasty. If the lip was tight from side to side, then he augmented the lip with a unilateral Abbe flap inserted into the scar excision at the same time.
advancement of the fork, was continued up and all the way
around the vestibule, ending behind the alar base and turning
the latter into a flap. Then, with a rotary motion, the cleft-side
alar cartilage was elevated and sutured to the normal cartilage
as the fork advanced out of the lip into the columella and nasal
floor with its split tail encompassing the point of the alar base
flap.

U. S. ARMY ISSUE

Another combination of secondary nasal and labial correction
was described in 1971 by Norman Hugo, then of Michael Reese
Hospital, now at Northwestern University, and Colonel Wilfred
Tumbusch of Brooke General Hospital. First they placed onlay
rib grafts under the alar base to the maxillary defect of the cleft.
Then the old lip scar was picked up as a unilateral prong of
a forked flap which was incised first horizontally and then anteri­
orly up the middle of the columella and posteriorly in the
membranous septum. This developed a long flap which could
be advanced into the columella toward the nasal tip, with any
excess of the distal scarred flap being excised. This exposure
allowed dissection and suturing of the cleft alar cartilage to the
normal. The alar base was advanced medially. Hugo and Tum­
busch stated:

Closure of the defect symmetrizes the nostril floors and the incision heals
to resemble the cicatrix of a Millard cleft lip repair.

They admit less-good results with secondary cases in which
excessive scarring has been created in the columella base area
and in the vestibular lining of the lateral alar region.
At least their nasal scarring is limited to the mid-columella and does not extend over the nasal tip.

BACK IN TEXAS

There are obvious advantages to a simultaneous nasal and labial correction, since one helps the other. Gillies enjoyed performing these procedures, and in my early days, I must admit, I was rather pleased with such extensive taking apart and reassembling. It does not always work out for the best. Once, in 1951, as a resident at Jefferson Davis Hospital, Houston, due to limited main operating room time, I had finagled the use of a small minor surgery outpatient room well out of the way of hospital traffic. Only a snooping nurse ever wandered by, and a lot of work was being done. One day I was operating on an adult male daredevil clown from the Shamrock Hotel water show, who had a unilateral cleft lip with the typical secondary nasal deformity. His lip had been opened wide and his columella elevated, with excellent exposure for nasal correction. The osteotomies were being done, and it was a little more bloody than usual, but I was alone and working along quite happily.

"Doctor, what are you doing?"

came rather sternly from a faintly familiar voice. I looked up to see his majesty the chief, Dr. Michael DeBakey. "Oh, good afternoon, sir," I said, and then trying to get him involved, "You see, once I get the nose back together, these lip flaps will ap-
proximate so...” There was not a flicker of expression, and when I looked up again, he was gone. Word came down the next day through Baron Hardy that only minor surgery was to be done in minor surgery. The clown, however, healed up so well he gave up his clowning.

There are other reasons for reconsidering too much simultaneous surgery. At least for me, concentration on one main aspect well enough to get it really right is facilitated by having a minimum of distractors. Unless one operation is benefited by the simultaneous execution of another operation, I prefer to let the first one heal and return another time for the meticulous correction of a separate problem. The all-in-one shot often falls short of the mark, and its justification depends on the specific combination of deformities and the personality and aspirations of the operator.
It is contended that if the nose is corrected as described in the primary lip surgery, secondary nasal surgery, although probably still necessary, will be minimal. As already expressed, concentration on one major secondary problem at a time is preferred, particularly in the nose, which may require a very complicated combination of procedures. There are two exceptions to this general rule:

1. If the lip requires only minor revision, this can be carried out at the time of the rhinoplasty.
2. If by doing the lip the nasal correction is facilitated, or vice versa, then it is well to combine the procedures for the benefit of both.

Yet, a common secondary unilateral cleft lip reveals a slightly tight upper lip with no cupid’s bow or philtrum and a typical unilateral nasal distortion. Although a rhinoplasty often has been combined with an Abbe flap, it is now preferable to get the nose correct first at 16 or 17 years and then a month or so later to complete the lip with an Abbe flap. If the case is seen before 16 years, then the Abbe flap can be done first.

Specific Corrective Nasal Procedures

My present formula bank for correcting the unilateral cleft lip nose is a conglomerate of many methods, some personal, others part of a potpourri with a long and distinguished title—Aufricht, Barron, Blair, Brown, Farrior, Gillies, Holdsworth, Horton.
Joseph Kilner McDowell McIndoe Metzenbaum Musgrave Pegram Pitanguy Potter Randall Reidy Reynolds Straith Tessier. Of course, the trick is picking the right combination for the specific case.

Here are the corrective procedures which I have found beneficial in various combinations. (In the following descriptions each procedure is identified by a two- or three-part number code—in order, procedure, number, initials of section title and in some cases subsection number. Case summaries later in this chapter use the codes to refer back to these procedure descriptions.)

**INTRANASAL INCISIONS (1-11)**

The membranous septal incision is placed posteriorly flush with the septal cartilage to leave a columella deep enough to receive septal cartilage struts if indicated and to give direct exposure to the front of the deviated septum.

On the non-cleft side, an anterior vestibular (cartilage-splitting) incision is made three-quarters of a centimeter from the alar rim, but on the cleft side the incision is made a little higher, in relation to the cartilage, or more posteriorly but not as far up as the intercartilaginous line.

**ALAR CARTILAGES**

*Normal (2-AC)*

On the normal side, the alar cartilage is reduced markedly, leaving only a 3 mm. rim of distal cartilage intact. The resected cartilage is saved for possible onlay grafting.

*Cleft side (3-AC)*

On the cleft side, the alar cartilage is freed widely from the dorsal skin but for only a few millimeters from its mucosal lining. It is then lifted with 4-0 Mersilene sutures, one to the septal bridge and one to the opposite alar or upper lateral cartilage.
REDUCTION RHINOPLASTY (4-RR)

At this point, but before the alar lift sutures are placed, any standard corrective rhinoplastic procedures indicated can be accomplished, such as freeing the dorsal skin, removal of the hump, shortening of the septum and bilateral osteotomy.

SEPTUM (5-S)

A submucous resection of a 3 X 1 cm. piece of obstructing septal cartilage is removed and placed in a sponge moistened with saline. This cartilage can be sliced into struts later, if needed. It is important that a safe L-shaped septal cartilage skeletal support be retained. The anterior, slanted limb of the septal cartilage L is freed with a chisel from its abnormal position, its concave side is scored and its base is shifted to the midline, set and fixed with 4-0 catgut or 4-0 Mersilene suture.

ALAR BASE

Simple alar base resection is adequate if flare is minimal and nasal floor is normal (6-AB-1).
If the nasal floor is wide and the alar base is flared, they are taken as a flap and the end is denuded of epithelium so that it can be advanced medially and sutured to the perosteum at the nasal spine or to the septum if it requires this extra pull to keep it in line (6-AB-2). This action narrows the nostril and reduces the alar flare.

If the alar flare is wide but the nostril floor is nearer normal width, a subcutaneous flap is dissected from the undersurface of the alar base flap and this piece is advanced medially to the septum with resulting reduction of the alar flare (6-AB-3). The alar base skin flap then forms the nostril sill and columella base at its leisure and without tension.

If the alar base is thick, it is cut as a flap and turned up and a subcutaneous flap is carved out of its “heart,” maintaining an attachment to the tip of the alar base (6-AB-4). Closure of the alar base donor area, of course, reduces its thickness. The subcutaneous flap extension is then used as the alar base tether to
the nasal spine, septum or whatever is available in the midline to maintain symmetry and prevent lateral alar drift.

**IMPLANTS UNDER ALAR BASE (7-IAB)**

Deficiency in anterior projection of the cleft side maxilla often requires some type of implant to increase the contour. Cancellous iliac bone graft onlay beneath the maxillary periosteum under the retroposed alar base is best, but specifically shaped Silastic sponge implants inserted on top of the periosteum can be reasonably effective and can be used at an early age.

**NORMAL ALAR BASE**

A wedge resection from the normal alar base is indicated in certain cases (8-NAB-1).

Free graft of alar wedge from the normal side can be used to release or lengthen the cleft side (8-NAB-2).

**ALAR RIM**

If after the rhinoplasty there is still a skin web skirting across the cleft side alar arch, it can be excised (9-AR-1).

![Alar rim web cut as a flap](image)

Alar rim web cut as a flap is to be transposed along a releasing incision in the medial vestibule at the join of the septum and the sidewall to lengthen the columella slightly (9-AR-2).
It can be abraded, cut as a flap with its base medial or lateral and then transposed as extra contour in the tip or at the alar kink to round out the alar arch (9-AR-3).

It is better to save the skin of the web and use it for vestibular lining (9-AR-4). An incision is made along the desired position of the alar rim in symmetry with the normal side. The skin inferior to this incision is dissected thinly but in continuity with the vestibular lining, exposing the inferior edge of the alar cartilage. This portion of the cartilage can be trimmed off, or, better, turned over on itself to strengthen the weak area. The important thing is to get it out of the way so that the thin inferior skin-vestibular flap can be tucked up in the vestibule under the alar arch with 5-0 chromic catgut sutures. This takes excess dorsal skin back under for needed vestibular lining. The skin edges along the alar rim are sutured with 6-0 silk.
The entire alar margin may require strip excision to thin thick sidewalls or shorten long ones or just for marginal sculpturing. Upper portion of alar margin excision can be saved as a flap and folded in at the height of the arch to round out a sharp ala-columella angle and narrow a thickened sidewall (9-AR-6).

**Onlay Grafts (10-OG)**

If, during the alar rim surgery, there is still a weakness in the rim or a lack of convex contour of the cleft-side tip cartilage, then the resected portion of the normal alar cartilage can be used as a simple onlay or tiered piggyback for even greater prominence. Slivers of septal cartilage are also effective in supporting the alar rim.

**Septal Cartilage Struts**

Finally, if indicated, a stab at the base on the lateral side of the columella allows a pocket to be dissected with sharp Joseph scissors from the nasal spine to the nasal tip (11-SCS-1). One long, slender septal cartilage strut is threaded into this pocket to give that little extra lift of which the flattened cleft lip septum is incapable. The upper end of this cartilage can be split fleur-de-lis fashion.

If the cleft slump is still a problem, a second, longer cartilage strut can be inserted on the cleft side of the previous strut, up the columella and shunted well across the midline to arch under the cleft-side ala for extra spring support (11-SCS 2).
FINAL RESULT

Some cleft lip noses do better than others—the outcome is not always predictable. Yet, as with any nose, the final result is dependent upon the difficulty of the deformity, the quality of the nasal material available, the choice of procedures, the skill of the surgeon, the patient’s healing and lady luck, not necessarily in that order!

A COMMON COMBINATION

Complete unilateral cleft lip closed in infancy. At 10 years of age the boy had nasal revision to alar base and rim and midline shield-shaped Abbe flap.
GOOD BALANCE

A Blair-Mirault type lip closure resulted in a whistling deformity, wide stitch marks and a typical cleft lip nose with all the problems, including slumping of half the tip, alar flare and transverse axis of the nostril. Revision of lip scars and a V-Y roll-down of posterior mucosa to create a vermilion tubercle added to the final improvement.

15 years

1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift alar cartilage to septum (Mersilene).
4-RR. Hump excision and bilateral osteotomy.
5-S. Submucous resection, centralized front of septum.
6-AB-2. Suture denuded tip of alar base to septum.
11-SCS-1, 11-SCS-2. Two septal struts in columella, one in tip, one extended under cleft arch.

18 years

At 17 years. CL rhinoplasty.
NOT SO EASY

This Blair-Brown type lip closure resulted in the typical secondary lip and nose deformities.

At age 16 years.
CL rhinoplasty.
1-HI. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (nylon).
4-RR. Shorten septum.
5-S. Submucous resection.
6-AB-4. Subcutaneous thinning alar base flap sutured to septum.
10-OG. Septal cartilage to alar rim; nostril sill flap transposed to release vestibular lining tightness.
NEAR-PERFECT SYMMETRY

This 20-year-old college girl experienced the typical inferior triangular flap lip scar, with loss of landmarks, the usual asymmetrical nasal distortion and a radon seed in the nasal tip for a hemangioma.

At 20 years.
Radon seed removed. CL rhinoplasty.

1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (nylon).
5-5. Submucous resection, centralized front of septum; scoring of concave side.
6-AB-2. Suture denuded tip of alar base to septum.
8-NAB. Wedge resection of normal alar base.
11-SCS-l. Septal cartilage strut in columella to support cleft side tip.

Midline Abbe flap done later.
At 17 years. CL rhinoplastic.
1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (nylon).
4-RR. Septum shortened.
5-S. Submucous resection.
6-AB-4. Subcutaneous thinning; alar base flap suture to septum.
8-NAP. Wedge resection of normal alar base.
11-SCS-I. Septal cartilage strut in columella to tip.

At 20 years.
Four months later midline Abbe flap.
Nine months later reverse Z to lip.

**GOOD SYMMETRY**

This 17-year-old boy was extremely self-conscious about his secondary cleft lip and nose deformities. This combination of rhinoplastic procedures was successful, and a midline Abbe flap constructed a philtrum.
ANOTHER COMBINATION

An 18-year-old boy with a straight-line lip closure in infancy, which had resulted in a slightly tight upper lip lacking in landmarks and the typical cleft lip nose.

At 18 years. CL rhinoplasty.
1-HI. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (nylon).
4-RR. Hump excised; septum shortened.
5-S. Submucous resection, centralized front of septum.
6-AB-2. Suture denuded tip alar base to septum.
8-NAB. Wedge resection of normal alar base.
10-OG. Septal slice along alar rim.
11-SCS-l. Septal cartilage strut in columella to tip.

One month later. Midline shield-shaped 1.2 cm. Abbe flap. Division of pedicle after 11 days.
At 19 years, CL rhinoplasty.
1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Redirection of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (nylon).
4-RR. Hump excision; septum shortening; bilateral osteotomy.
6-AB-2. Suture denuded tip of alar base to septum.
7-1AB. Silastic sponge under alar base.

ALAR BASE IMPLANT

A 19-year-old Ecuadorian girl who had scar excision and secondary rotation-advancement of the lip, cleft lip rhinoplasty with Silastic sponge implants through upper labial sulcus under alar base and through lower labial sulcus to the chin.
GOOD NASAL BALANCE

This patient had primary lip surgery in Canada and a later revision in the United States, ending up with some type of interdigitation.

At age 25, the patient had lip scar revision and cleft lip rhinoplasty.

At 25 years. CL rhinoplasty.

1-II. Anterior vestibular incisions, higher on cleft side.

2-AC. Reduction of normal alar cartilage.

3-AC. Lift cleft alar cartilage to seprum (nylon).

5-S. Submucous resection.

6-AB-1. Wedge resection of cleft alar base.

7-IAB. Septal cartilage under alar base.

10-OG. Septal cartilage to nasal floor and under lip scar.

11-SCS-2. Septal cartilage strut in columella to cleft-side tip.
A COMMON COMBINATION

A Brown-McDowell type lip closure resulting in a tight lip and lack of cupid's bow and dimple.

At age 15, the patient had an Abbe flap with division of the pedicle after 10 days, which released the lip and created a philtrum.

At age 16, a cleft lip rhinoplasty was carried out.

At 15 years. Abbe flap. Division of pedicle after 10 days.

At 16 years. CL rhinoplasty.
1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (catgut).
4-RR. Septal shortening.
5-S. Submucous resections.
7-IAB. Septal cartilage under alar base.
This 17-year-old girl had secondary nasal and labial deformities following an inferior triangular flap closure.

9-AR-1. Alar base excised.
10-OG. Septal cartilage to alar rim.
11-SCS-1. Septal cartilage strut in columella to tip.

At 18 years. Midline shield-shaped 1.5 × 1 cm. Abbe flap.
Division of pedicle after 13 days and at the same time as CL rhi- no-plasty.
1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (nylon).
5-S. Submucous resection.
6-AB-1. Wedge resection of cleft alar base.
8-NAB. Wedge resection of normal alar base.
9-AR-5. Alar margin excisions.

There was improvement, but the cleft lip septum, with its deviation, does not offer true tip support. Had a septal cartilage strut been inserted through the columella into the tip as usual, there would have been finer nasal tip projection. Lip scar revision is pending.
This 16-year-old girl had a severely tight upper lip with typical unilateral cleft lip nose distortion. Cleft lip rhinoplasty was performed but she never returned for her Abbe flap.
COMBINED NASAL REDUCTION AND CORRECTION

Original straight-line lip closure carried out in Cuba was revised in Miami at age 17 years with rotation-advancement approach by resident, Richard Beck. The nose, however, not only suffered the usual cleft lip nasal distortion, it was severely humped and also hooked, witch-like, over a receding chin.

At 17 years. CL rhinoplasty.
1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (catgut).
4-RR. Hump excised; septum shortened; bilateral osteotomy.
5-S. Submucous resection.
6-AB-2. Suture denuded tip of alar base to septum.
8-NAB. Wedge resection of normal alar base.
10-OG. Alar cartilage onlay to cleft side.
11-SCS-1. Septal cartilage strut in columella to tip.

At 19 years. At the same time as the cleft lip rhinoplasty, a 7 cm. Silastic sponge implant was specifically cut to shape and inserted over the periosteum of the mentum through a 1 cm. incision in the lower labial sulcus.

17 years
19 years
A MODERATE REDUCTION

This 15-year-old girl had lip scar revision with rotation-advancement in the upper portion and free border trimming of the vermilion. Then, at 18 years, she had a cleft lip rhinoplasty with more emphasis on the reduction.
LeMesurier cleft lip closure without nasal correction by the age of 14 years revealed no great improvement in the nose, which presented an asymmetrical and difficult problem. By 15 years, attempt at correction seemed justified.

A DIFFICULT ONE

At 15 years. CL rhinoplasty.
1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (Mersilene).
4-RR. Hump excision; septum shortening, bilateral osteotomy.
5-S. Submucous resection, central-ized front of septum.
6-AB-2. Suture denuded tip of alar base to septum.
10-OG. Alar cartilage onlay graft.
11-SCS-l. Septal cartilage strut in columella to tip.
By 11 years, this boy seemed mature enough for conservative corrective surgery without disturbance of the septum. V-Y flap of posterior mucosa filled out discrepancy in vermilion free border as alar cartilage was lifted through marginal incision and de-epithelialized rim web flap was transposed.

At 12 years, tip of alar base was denuded and advanced to septum and alar rim tucking procedure was used.

VARIATION IN APPROACH AT ELEVEN YEARS

This 10-year-old boy had had a Tennison-type lip closure and later an Oxford V-Y palate pushback done in Thailand by Eric Peet. He presented a unilateral vermillion whistling deformity and the typical unilateral nasal distortion with flaring ala, asymmetry of alar cartilages, webbed alar rim, deviated septum presenting up front with its nasal spine in the normal nostril.

At 11 years. CL rhinoplasty.
3-AC. Lift cleft alar cartilage to septum (nylon).
9-AR-3. Alar web abraded and tucked as flap over alar cartilage.

By 11 years, this boy seemed mature enough for conservative corrective surgery without disturbance of the septum. V-Y flap of posterior mucosa filled out discrepancy in vermilion free border as alar cartilage was lifted through marginal incision and de-epithelialized rim web flap was transposed.

At 12 years, tip of alar base was denuded and advanced to septum and alar rim tucking procedure was used.
This six-year-old boy had a LeMesurier lip closure in Cuba, and since no primary nasal correction had been attempted, the severe distortion remained. A modified cleft lip rhinoplasty seemed justified to clear the airway and prepare him for school.

At 12 years.
6-AB-2. Suture denuded tip of alar base to septum.

At 6 years. CL rhinoplasty.
1-II. Anterior vestibular incisions, higher on cleft side.
2-AC. Reduction of normal alar cartilage.
3-AC. Lift cleft alar cartilage to septum (nylon).
5-S. Submucous resection of obstruction; centralized front of septum; scored concave side.
6-AB-2. Suture denuded tip of alar base to septum.
11-SCS-1, 11-SCS-2. Septal cartilage strut in columella to tip and shunted under cleft arch.
At 8½ years, CL rhinoplasty.

6-AB-2. Upper portion of lip scar excised as flap extension of alar base, denuded and sutured to septum.

9-AR-4. Ideal alar rim position incised with dissection of skin in both directions and exposure of lower border of alar cartilage; overfolding of cartilage with sutures followed by tucking skin flap as lining to fornix of vestibule and suture of skin edge along new alar rim.

Midline, shield-shaped Abbe flap by resident S. A. Wolfe.
Division of pedicle after 9 days.

**ALAR WEB TUCKING**

This eight-and-a-half-year-old boy had his cleft closed by the Blair-Brown procedure. The lip was tight without landmarks, deserving a midline Abbe flap, and the flare of the alar base and web of the alar rim seemed to justify early correction.
A TRULY CONSTRUCTED NOSTRIL

Result of Brown-McDowell type lip closure resulted in absence of cupid's bow, philtrum and dimple, tight upper lip, relatively protuberant lower lip and cleft-side maxillary hypoplasia.

At age 13 years.
Iliac bone grafts placed over maxilla and under cleft-side alar base.
V-Y lateral advancement of alar base on the constricted cleft side.

13 years

At age 14 years.
Midline, shield-shaped, 1.5 cm. Abbe flap.
Division of pedicle after 13 days.

14 years
The original unilateral scar and the persistently constricted cleft-side nostril remained the major problem. A modified cleft lip rhinoplasty and scar revision was done at 15 years.

Radical through-and-through release of the alar base from the lip, cheek and vestibule was filled with a composite auricular graft taken from the helix join with the lobule. The graft was unrolled with the portion of full-thickness skin being inserted into the vestibular lining defect. The other end, retained as a composite chondrocutaneous component, was added on as an extension to the end of the alar base in the nasal floor. This opened the nostril and, when the septum is straightened, will present a respectable nasal entrance. A minor reduction rhinoplasty of hump excision, septal shortening and bilateral osteotomies plus a submucous resection and use of the cartilage as a strut in the columella to support the tip has been postponed until age 16 years.
AN ODD SEQUELA

This boy, who had a complete cleft of the lip closed at nine days in West Virginia with what seems to have been a LeMesurier-type quadrilateral flap, was first seen at age 14 years. The nose is a mystery! The septum presented with the nasal spine in the normal nostril and was accompanied by the usual tilt over the cleft. Otherwise, the nasal deformity was totally atypical, with a sharp kink in the alar rim more suggestive of a cleft nostril than a cleft lip. The nostril was completely vertical, being more "up and down" even than the normal side, and the alar base not only had no flare, it went straight into the lip like a post without even the nicety of a nostril sill. Starting at age 16, three operations have been done so far in an effort to rearrange this bizarre disfigurement.
Six months later sidewall reduction by marginal excisions and Weir wedge resection was done.

At age 17 years unilateral chondromucosal flap from cleft side of membranous septal area was transposed to cleft-side vestibule for arch support.
AFTER EARLY ROTATION-ADVANCEMENT

At last, here is one of the first of my rotation-advancement lip closures who is now old enough for final secondary nasal correction. In 1956, in Miami, this North Carolina boy had a rotation-advancement without refinements and without primary nasal correction except alar rim web excision.

His nose persisted in its cleft side slump, so at age 17 years he returned for a cleft lip rhinoplasty.
After rhinoplasty.

After lip revision with “white roll” flap and alar base advancement.
CAMOUFLAGE ONLAY HINGE GRAFT

A 41-year-old married woman, who had had her lip closed in infancy and later a LeMesurier-type quadrilateral flap revision, resulted in a slightly tight upper lip without landmarks. The nose revealed an unbelievable deformity with such severe distortion that the usual maneuvers were bypassed.

The distortion was so great that a camouflage onlay graft of bridge and tip was necessary. Through a columella-splitting incision, a modified Gillies hinge graft was inserted, and even the nostrils straightened into reasonable symmetry.

At age 42 years. CL rhinoplasty.
4-RR. Bilateral osteotomy.
5-S. Submucous resection, centralized front of septum.
10-OG. Costal osteochondral hinge graft to nasal bridge and tip.

Four months later midline shield-shaped Abbe flap.
Division of pedicle after 10 days.
SHORT FORK

A 12-year-old boy with a Brown-McDowell type lip closure with absence of landmarks, asymmetry of the nose and notable unilateral shortness of the columella. A midline shield-shaped Abbe flap improved the lip, but the scars of inset were slightly ridged, and the columella shortness persisted to the extent of snubbing the nasal tip.

At 12 years. Abbe flap.
Division of pedicle after 9 days.

At 14 years. Forked flap.

A modified short forked flap revised the lip scars and at the same time lengthened the columella and elevated the nasal tip.
THE CHIN TOO

It is important not to stop short of the very best that can be achieved for each case. The goal is not just the normal but an aesthetic normal.

This 18-year-old girl had had her incomplete cleft lip closed in childhood.

The patient, rendered as near normal as possible, then received that little extra bonus of a Silastic sponge implant, trimmed to shape and inserted through a lower labial sulcus stab incision to enhance her chin and soften the protuberant lower lip.

At 18 years. CL rhinoplasty.
4-RR. Septal shortening.
6-AB-I. Wedge resection of cleft alar base.

V-Y posterior mucosal roll-down to form tubercle.
Abrasion of lip scars.
If the slumped lower lateral alar cartilage on the cleft side is reasonably wide, it can be split horizontally and the distal half freed from the skin with right-angled scissors. The proximal half is freed from the skin also and from its mucosa, so that it can slide over the distal alar cartilage. Two sutures, passed through the skin within the vestibule just under the alar rim, are carried over the freed distal alar cartilage, picking up the freed proximal alar cartilage and returning by the same route. Tying these sutures draws the proximal cartilage half on top of the distal half in an effective and efficient overlap, lifting the slump and doubling the contour of the flat tip. Any excess mucosal lining can be trimmed prior to suturing.

When the alar cartilage is narrow, then, through an intercartilaginous incision, the upper lateral cartilage is freed and pulled with sutures in similar fashion to overlap the lower alar cartilage.
A Backward Glance
and an Afterthought

As I gaze back over the variety of unilateral cleft lip methods that have been and are being proposed, without even thinking of those to come, I am filled with both awe and horror. Some are good, some are honest, some are grandstand plays, some are revolts against tradition and some are terribly bad.

Jack Penn of South Africa put it another way:

I do not think there is any operation in the book that has more modification than the repair of the cleft lip. It is important, therefore, for the trainee to be able to understand the difference between a principle and a gimmick. In this regard, attention must be paid not only to the cosmetic appearance and function, but also to the growth potential of the portion involved in the operation.

There are a multitude of methods which are individual modifications of a known standard when this standard has fallen short of the surgeon’s goal. Many of them have merit and indicate progress, but the majority come about because of the specific surgeon’s inability to execute the standard properly. His complete concentration on the failing point puts the entire picture out of his focus. His intentions are good, and his energy is unbounded. Finally in panic, ignoring principles and common sense, he makes a frantic effort to correct a minor aspect of the problem which costs more than it is worth, for two wrongs do not make a right. Such a design is more harebrained than suitable for “harelip.” Then he is allowed to publish it, and others follow the wild hare.
As a parting shot, I would like to paraphrase the often quoted words of Robert Browning, “A man’s reach should exceed his grasp, or what’s a heaven for,” to “When a man grasps beyond his reach he can be in for hell and in the case of a surgeon, so also can his patient!”

*Verbum sat sapienti est.*

A word to the wise is sufficient.
Abbe, R. A new plastic operation for the relief of deformity due to double
Adenwalla, H. S. Personal communication, 1972.
Adenwalla, H. S. In Memoriam, Charles Pinto. Hospital Trichur brochure,
Trichur, India, June, 1972.
Adenwalla, H. S. Plastic Surgery. 20th Year Souvenir. Jubilee Mission
Ahlfeld, F. Arch. f. Gynak. 7:210, 1875.
Altemus, L. A. The incidence of cleft lip and cleft palate among North
Anderson, H., and Matthiessen, M. Histochemistry of the early develop­
ment of the human central face and nasal cavity with special reference
Arrunategui, C. Personal communication, 1972.
Asensio, O. A variation of the rotation-advancement operation for repair
 of wide unilateral cleft lips. Commentary by Dr. D. Ralph Millard,
1:3–25, 1946.
Aufricht, G. Personal communication, 1972.
Baer, K. E. von. Über Entwicklungsgeschichte der Tiere. Beobachtung und
Reflexion, Part I. Konigsberg, 1828.
burgh: Green, 1904. P. 379.


Blair, V. P. Some personal observations of malarial and blackwater fever on the west coast of Africa. Courier Med. (St. Louis) 26:9-22, 1902.


Blair, V. P. Personal communication, 1950.


Boo-Chai, K. Personal communication, 1972.


Brauer, R. O. Personal communication, 1972.


Brown, R. F.  A reappraisal of the cleft lip nose with the report of a case.  


Bruns, Von V.  Handbuch der Chirurgischen Praxis.  Tübingen: Laupp, 1873.

Brunschwig, H.  Die ist das Buch der Chirurgia: Hautwirkung der wund Arzt.  
Augsburg: Schonsperger, 1497.

Buck, G.  History of a case in which a series of plastic operations was 
successfully performed for the restoration of the right half of the upper 
lip and adjacent portions of the cheek and nose.  Trans. Med. Soc. N.Y.  


Burian, F.  Chirurgie der Lippen-und Gaumenpalten.  Berlin: Verlag Volk und 

130-131.

Burkitt, A. N., and Lightoller, G. H. S.  The facial musculature of the 


Burow, A.  Methode der seitlichen Dreiecke zum Wiedersatz verlorenge-


Callister, A. C.  Technique designed to prevent lateral creeping of alar 


Carlisle, W. K.  Personal communication, 1972.

Celesnik, F.  Nos conceptions thérapeutiques des becs-de-lièvres et des 

Chase, R. A.  The management of congenital cleft lip and palatate deformity.  


Clarkson, P.  Use of the Abbe flap in the primary repair of double cleft 

Claret, E. G. M.  Des fistules et des kystes congénitaux de la lèvre su-
périeure.  Thèse No. 42, 1899.

Clifford, R. H., and Pool, R.  The analysis of the anatomy and geometry 


*Cincinnati Gazette*, March 29, 1780.


Cramer, L. M.  Personal communication, 1972.


Culf, N. K.  Personal communication, 1972.


Davies, D. Personal communication, 1972.


Demjen, S. Personal communication, 1970.


Elsahy, N. Personal communication, 1972.


Erich, J. B. Personal communication, 1974.


Franco, P. *Petit traité contenant une des parties principales de chirurgie.* Lyon: Antoine Vincent, 1556.


Fraser, F. C. Personal communication, 1974.


Galambos, J. Personal communication, 1972.


Guerrero-Santos, J.  Personal communication, 1972.


Hajnis, K. Anthropometric norms of the face in West German population from 15 1/2 to 18 years of age. In press, Prague, 1970.


Hay-Roe, V. Personal communication, 1968.


Hovey, L. Personal communication, 1972.


Kilner, T. P. Personal communication, 1949.


Lamont, E. Personal communication, 1972.


Lightoller, G. H. S.  *Facial muscles, the modiolus and muscles surrounding the rima oris, with some remarks about the panniculus adiposus.*  *J. Anat.* 6:85, 1925.


Longenecker, C. G., Ryan, R. F., and Vincent, R. W.  *Cleft lip and palate.*

Losken, H. W. Personal communication, 1972.


MacCollum, D. W. Personal communication, 1945.


Marcks, K. M. Personal communication, 1972.
Marino, H. Personal communication, 1971.
Masters, F. W. Personal communication, 1972.
Matthew. 22:40. (A.D. 90)
McIndoe, A. Personal communication, 1958.
Millard, D. R., Jr. A primary camouflage of the unilateral harelook


Monie, I. W. Personal communication, 1972.


Musgrave, R. H. Personal communication, 1967.


O’Connor, G. B. Personal communication, 1972.


Ohmori, S. Personal communication, 1971.


Orticochea, M. Personal communication, 1971.


Parsegian, A. To The Committee of One Hundred. Miami Beach, Florida,
December 2, 1969.


Penn, J. Personal communication, 1971.


Petit, P. Personal communication, 1972.


Récamier, J. Personal communication, 1955.


Reichert, H. Personal communication, 1972.
Reidy, J. P. Personal communication, 1972.
Rubin, L. R. Personal communication, 1971.
Sarnat, B. G. Postnatal Growth of the Face: Some Experimental Consid-


Sasaki, M. Personal communication, 1972.


Scrimshaw, G. C. Personal communication, 1972.


Slaughter, W. B., Pruzansky, S., Harris, H. L., and Berger, J. C. A new


Tagliacozzi, G. De curtorum chirurgia per insitionem. Venice: Gaspar Bindonius, Jr., 1597.


Tennison, C. W. Personal communication, 1951.


Thompson, H. G. Personal communication, 1972.


Trevaskis, A. E. Personal communication, 1972.


Veau, V. Personal communication, 1948.


Wilson, M. *Therapeutic Alphabet*. 1765–1787.


Woolhouse, F. M. Personal communication, 1972.


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