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.

Rotation-Advancement Equation
1 - 2 = 2 - 3  3 - 5 = 1 - 6
3 - 4 = 9 - 7  4 - 5 < 7 - 8

This paragraph still puts me to sleep... zzzz
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 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

OVER 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 septrum. 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 under­
mining of the muscles of the non-cleft side is not only un­
necessary 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 ROTATION INTO THE ROTATION FOR STRAIGHT SCAR

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 prolabium, 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 vermilion.
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
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 vermillion 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.
A N O T H E R 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 vermilion then it can be bolstered from [the] lateral lip vermilion either as an onlay flap (A), as a central tongue into a dart (B), or as a posterior interdigation (C). If the lateral lip segment is weak in vermilion then the mucosal flap [being pared] from the medial cleft edge can be used to interdigitate laterally (D). If both are weak in vermilion 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 vermilion 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 vermilion. In general, the visible vermilion 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 vermilion 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 everting the free border vermilion.

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.
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, Casaneda 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 Taddeo 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 scissor 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 scissor 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.

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**KRUGER**

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-advance-
ment 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 ver-
milion 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 columella 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. \( R' / R = L' / L \).
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 to it 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 unclifted 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.
22. Dissimilar Similarities

But optics sharp it needs, I ween,
to see what is not to be seen.
JOHN TRUMBULL

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 farfetched.

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 superiority 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 Récamiers, 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 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.
23. Basic Confirmation

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 [Skoog] 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.

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.