

22. *Primary Forked Flap*

IN 1965 I decided to "go for broke." It was at Princess Margaret Hospital, Nassau, and I was preparing to close a bilateral cleft lip with David Maisels of Liverpool assisting. The circumstances were similar in many ways to what had been experienced in Jamaica, and I was prompted to say to Maisels:

David, the prolabium must be getting enough blood supply from the premaxilla. You know how it bleeds profusely when we dissect it free. Let's do a primary forked flap and get the nose right at the same time we close the lip.

We did and it went well.

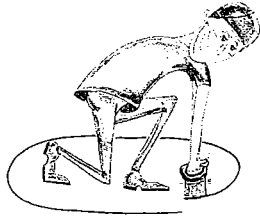
In 1967 the primary forked flap was published as a possible answer to the search for a bilateral cleft operation which closed the lip, reduced the prolabium and lengthened the columella all at the same time. As the prolabial edges must be freshened for lip closure anyway, there must be logic in this economy:

Rather than discard it, salvage it as a forked flap for the columella.


This approach also offered the advantage of avoiding the subsequent need to go back into the well-healed lip five years later to get tissue for the columella. Then too, it bypassed for the child all those flat-nosed years.

BLOOD SUPPLY

Of course, the main deterrent to the primary forked flap was the question of blood supply. As I wrote in 1967:



At first thought, it seemed the surgeon would be sawing off the very limb he had been sitting on all these years. It is true that in complete bilateral clefts, the main blood supply to the prolabium philtrum comes through the columella and the septum (frontonasal component) in the form of the posterior septal artery and, to a lesser extent, the lateral nasal and terminal branches of the anterior ethmoid vessels.



According to Slaughter, Henry and Berger, cleft specimen dissections usually indicate one well-differentiated vessel on either side of the premaxilla in the region where the incisive foramen should have been. Each of these vessels passes anteriorly and inferiorly into the philtrum and continues medially in an arc to anastomose across the midline in the inferior portion of the philtrum.

No mention is made of a direct blood supply from the premaxilla running forward into the midposterior prolabium. Yet, in surgery, while freeing the prolabium from the premaxilla, one invariably noted a generous bleeding. This to-and-fro vascularity between the prolabium and the premaxilla proved to be adequate to sustain the remaining prolabium even following its complete severance from the nasal tip and septum.

INDICATIONS

The primary forked flap was not advocated in all bilateral clefts. Three pertinent factors determined its plausibility:

1. Position of the premaxilla:

The primary forked flap operation may not be possible if the premaxilla protrudes severely.

2. Size of the prolabium:

The width of the prolabium determines whether the flap is possible and the vertical length indicates the amount of columella lengthening available. A large prolabium offers no problem, but it is surprising how small a prolabium can be and still serve the columella and philtrum successfully. For instance, if the prolabium is slightly more than 1 cm. wide, then allowance of 0.25 cm. for the width of each fork of the flap leaves a philtrum a little more than 0.50 cm. wide, which is about normal for an infant. If the

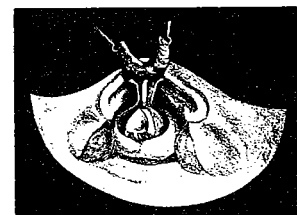
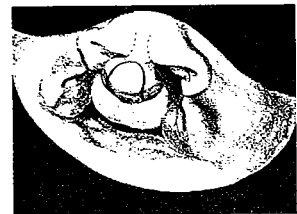
prolabium is truly minute, then mere attachment of the lateral lip elements to the pared sides of the prolabium will soon stretch this central non-muscular component into a reasonable size, one capable of accommodating a delayed forked flap.

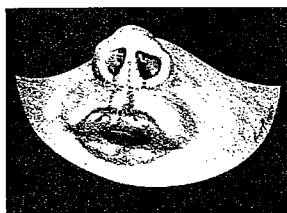
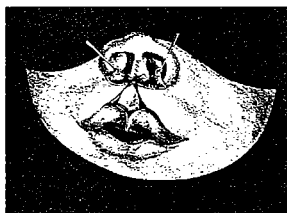
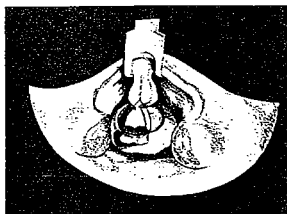
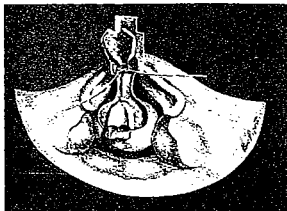
3. Columella length:

The actual amount of shortness of the columella is one final consideration. This discrepancy must be measured not only in the actual length in millimeters of the columella but also with an estimate of the patient's desired final length. The natural flatness of the Negro nose demands less columella length than, for instance, the high-bridged aquiline nose filling the Royal enclosure at Ascot. Some surgeons claim that the flat nasal tip, even without columella lengthening, improves with growth. This has never been impressive to me but early release of a tethered tip, even if not to quite the ideal extent, might give subsequent growth a chance to make up the difference.

In the preparation of *A Primary Forked Flap*, a film for the 1967 International Congress in Rome, a little local color was incorporated. As introduction to the film it was suggested that all participants at future congresses bring scenes from their native lands on the premise that knowledge strengthens bonds of friendship. It was explained to the learned audience that the procedure being described had been executed first in the Bahamas and later in Miami and Jamaica, justifying the film's opening with a skiing scene in tropic waters scored with a background of calypso music. One frame from the end of this short clip combined my Texas roping with Florida slalom skiing on Biscayne Bay. Ron Pigott, who did these drawings for the film, was acknowledged when he also appeared for a short ski run.

The Pigott sketches portrayed a forked flap with its base on the short columella marked on the lateral sides of the prolabium with preservation of enough prolabium in the center to act as a philtrum. With the aid of a membranous septal incision carried over the septal tip and into the vestibule a short distance bilaterally, the forked flap was elevated and its forks were sutured together. It was gently tubed onto itself in its upper portion while the lower portion was left open to be sutured to the membranous septum. The lateral lip elements were dissected





widely off of the maxilla, and the freeing was extended by carrying the incisions up into the vestibule bilaterally. Circumalar incisions to the extent specifically required divided the alar base from the lip elements. The lateral edges of the cleft were freshened by turning down full-bodied vermilion flaps. The prolabium vermilion was turned down also. The key or cliff-hanger stitch picked up the points of the lateral lip elements, the periosteum of the premaxilla at the nasal spine and the superior tip of the prolabium. This suture brought the five points together but reduced tension on the prolabium. The alar base flaps were sutured to the sides of the septal base, reducing the alar flare and constructing the nostril sill. The tips of the forked flaps were sutured lightly to the lip flaps and the alar base flaps. The lateral mucosal flaps overlapped the turndown flap of prolabium vermilion to give a full-bodied free border and a suggestion of a cupid's bow.

THE AFTERMATH

Evidently, complete division of the prolabium from the nose turned it free to be tugged, stretched and shifted by the strong lateral lip muscle elements. In the earlier cases, the forked flap too was being dragged partially out of the columella back down into the lip. The key nylon suture, which later was used to tack the lip elements to the periosteum of the premaxilla at the nasal spine, was an attempt to prevent lip lengthening and columella drag-back. It was only partially successful.

Here is a case with adequate prolabium, short columella and extremely flaring alae. A primary forked flap reduced the wide prolabium and gave some length to the columella.



The *early* total division of the lip from the nose and the lack of muscle continuity across the cleft allowed the prolabium to be stretched, the lip lengthened vertically and the forked flap pulled partially back into the lip.



Secondary revisions shortened the lip, reduced the alar flare and even tried for a philtrum hollow.

NOT IDEAL FOR GENERAL USE

A small series of primary forked flaps was done. The blood supply from the premaxilla proved adequate although occasionally the prolabium would turn slightly blue for a few hours. There was a rumor that one or two surgeons had lost a prolabium; if true, this tragedy was probably due to an incorrect key stitch and the application of too much tension to the prolabium.

In complete clefts the results immediately after surgery were impressive, but within a few months, in some, there was too much vertical lip length.



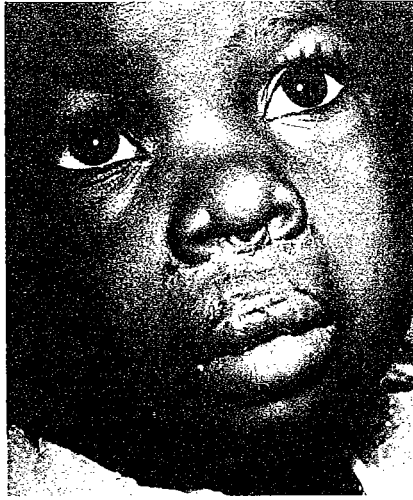
Take this Jamaican case, for instance. The prolabium was short but wide enough, the columella nonexistent and the premaxilla moderately protuberant. A primary forked flap redistributed tissue in what seemed quite reasonable nasal and labial proportions.



Then in time the early division of lip and nose and the lack of muscle continuity allowed the lip to spread and stretch and the forked flap to pull wide and back into the lip.



A high transverse excision of lip and readvancement of the columella and alae achieved a shorter lip and a better columella and improved the position of the alae.



Again in time some of this gain was lost, but the tissues are now well proportioned and can be improved satisfactorily prior to school age.

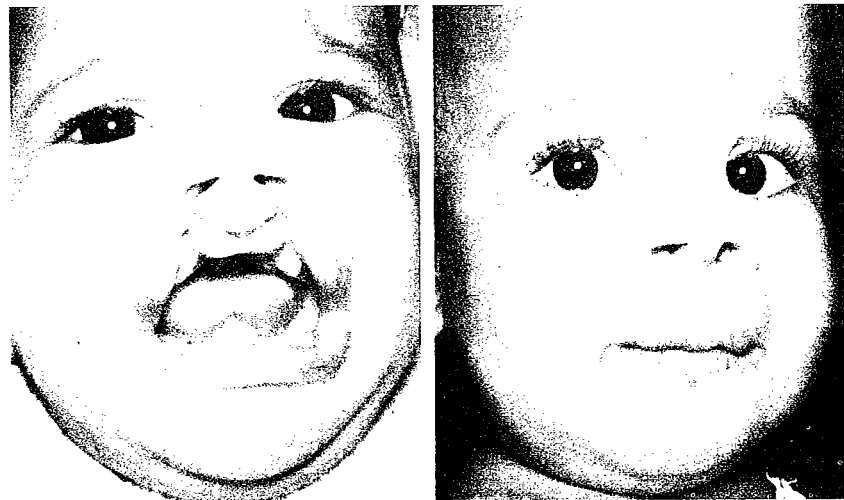
A primary forked flap in this complete bilateral cleft went well during the initial surgery. There was even the creation of a philtrum dimple.



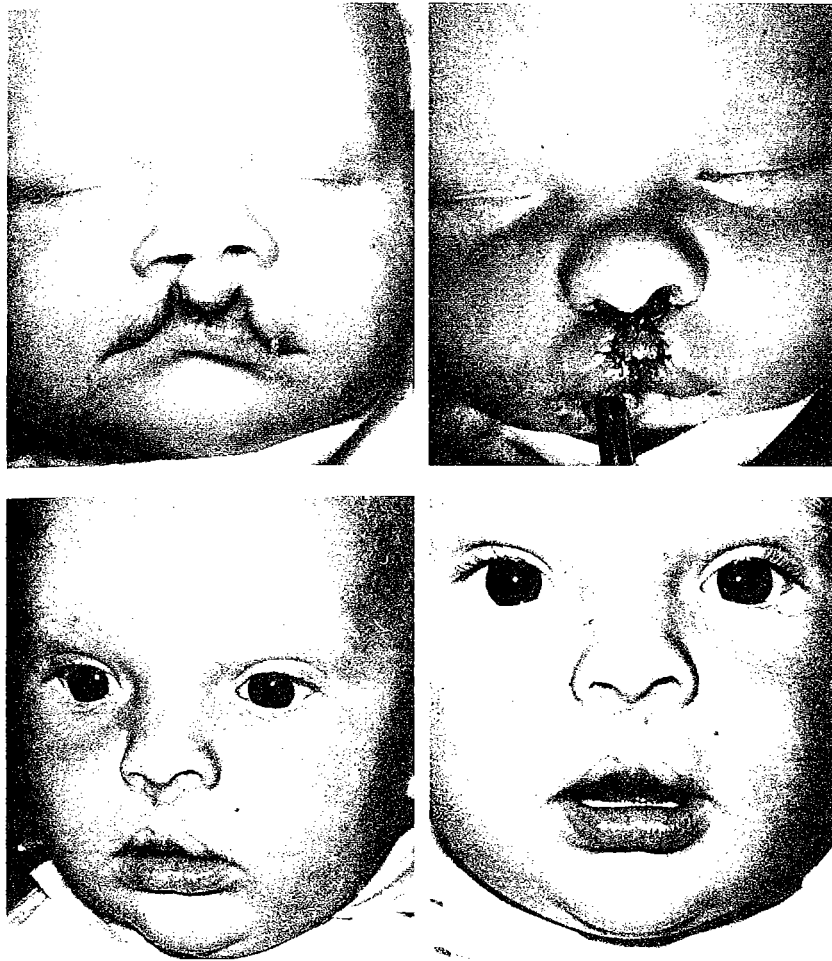
Then gradually the forked flap pulled back into the lip and the lip lengthened. This defect was corrected by readvancement of the forked flap into the nose and shortening of the lip, preserving the philtrum dimple.



In incomplete bilateral clefts there seemed to be less consistency as to what was going to happen postoperatively. This severe incomplete cleft developed a long lip, but the forked flap remained up in the columella almost too much for the child's age and nasal development.



On the other hand, in this incomplete bilateral cleft, the lip maintained reasonable length but the forked flap tended to drift down out of the columella back into the lip. Revision is in order at school age.



STRUTTING THE FORK

It is becoming more and more apparent that with the absence of adequate septal projection and the flattening and spread of the alar cartilages in bilateral clefts, even after forked flap release of the depressed nasal tip, the cartilages are not sufficient as skeletal structures to hold up what has been lifted. Primary homologous (child) and autogenous (after 16 years) septal cartilage struts are indicated at the time the forked flap is formed to prevent it from slipping back into the lip.

A SERENDIPITOUS DIMPLE

In another incomplete bilateral cleft, the primary forked flap produced a result with another unexpected but greatly appreciated philtrum dimple and flanking eminences.



In retrospect, this specific occurrence was accounted for in my 1967 primary forked flap article by a cause-and-effect study:

The remaining philtrum-shaped piece of prolabium was smaller than usual and, of course, maintained its attachment to a premaxilla that was not unduly protuberant. The larger muscular lateral lip elements were joined to the sides of this diminutive prolabium and also were joined to each other above the upper pole of the philtrum. It was an incomplete bilateral cleft and great tension was not involved. This created a modified three-fourths circle of muscle around a tiny tethered mid-philtrum which, in cooperation or out of desperation, inverted into a dimple and persisted as such.

Such serendipity led to the conjecture that if the upper labial sulcus is late in its formation prolonged adherence of the prolabium to the premaxilla could be a factor in dimple formation. Monie was asked to review his bilateral cleft specimens to determine the time of upper labial sulcus formation and see whether the prolabium-philtrum is still totally tethered to the premaxilla while the groove and eminences are being formed. Unfortunately, Monie's specimens were cut on the transverse plane with a view of the philtrum but not of the sulcus.

OTHER SURGEONS DARE TO USE THE PRIMARY FORK

In 1967, at the International Congress in Rome, Maisels and Littlewood of Liverpool presented their experiences with the

primary forked flap. They expressed approval of the natural shield-shaped philtrum in preference to the previous square patch and commented on the simplicity of the simultaneous lip closure and columella lengthening. They warned, however:

It is not possible to repair the anterior palate at the same time as the primary forked flap. In one case when an overambitious attempt was made at anterior palatal repair, the premaxilla was circumferentially denuded of soft tissue. It is of interest to note that the vomerine intra-osseous blood supply was sufficient to ensure survival of all the premaxilla apart from incomplete loss of the skin of the prolabium.

In 1972 the results and feelings of several surgeons on the primary forked flap were brought to my attention. Gracious Shojiro Takahashi of the Tokyo Dental School wrote:

I reported my experience in bilateral cleft lip repair by using of Millard's forked flap method at the general meeting of the Japanese Society of Oral Surgeons on October 1st 1971 in Tokyo. I successfully repaired a bilateral complete cleft lip (14 year old girl) by a primary forked flap in Indonesia in January 1970.

He included photos of the case.



Shojiro Takahashi



Takahashi prefers to use an adhesion prior to the forked flap but did this primary fork as it was a "one chance" case in a foreign land.

When at home and at leisure Takahashi first creates what he refers to as a preliminary Randall adhesion. Its sole purpose seems

to be to restrain the premaxilla much as the rubber band does. Then at a second stage he does a forked flap which is identical to and just as radical as my primary forked flap procedure. He forwarded me photographs of one of his cases which showed the original bilateral cleft condition, the situation one month after the adhesion, the marking of the forked flap and the immediate postoperative result.



Also included were the result at 10 days



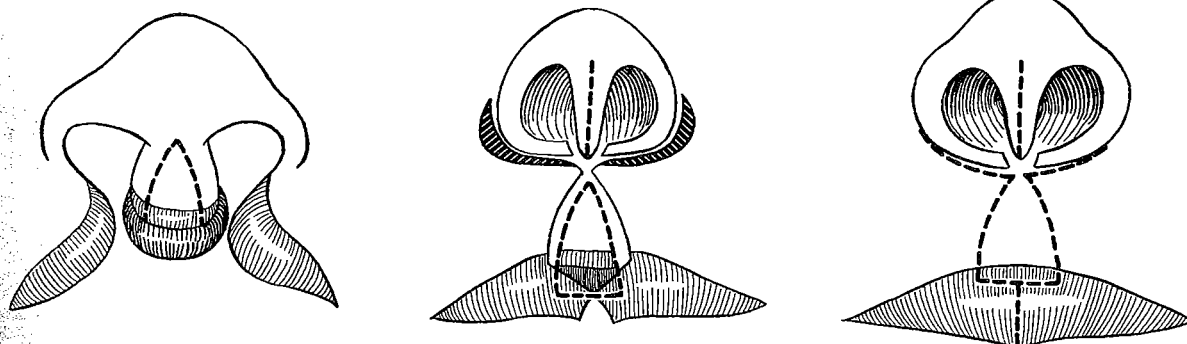
and finally at 1 year.

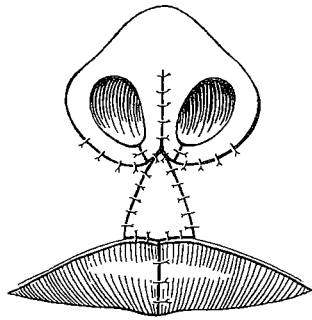


In countries where there are many clefts and relatively few surgeons, a one-stage procedure offers appreciable dividends. Whereas in the African or even the Oriental the short columella is of less importance, in certain East Indians with high nasal profiles the proud columella is more demanding.

S. S. Sethi of Maulana Azad Medical College, New Delhi, India, in 1970 and in 1973 approved the one-stage primary forked flap at six months of age when the premaxilla is not protruding and the prolabium is not very small. His only modification from my original description was preservation of slightly more vermilion with the mucocutaneous junction line of the prolabium. Another interesting aspect is Sethi's use of this principle in the adult. As he wrote for the Copenhagen Congress:

In the grown up unoperated cases, the circumalar skin excisions help the moving in of the lateral lip triangular flaps. These triangular flaps meet together proximal to the tip of the prolabium island. The prolabium sinks down in line with the vermilion of the lateral lip elements, to form a nice cupid's bow and does away with any notching in the midline. This procedure forms a broad and protruding lip, a columella, a philtrum and narrow nostrils. . . . The only snag in this procedure is the delayed healing at the base of the columella where the tips of the too many flaps meet.





A suggestion for Sethi would be to turn the toes of the fork outward to join the alar bases lateral to the "five points" for improved healing.

Also in 1972 Don Kapetansky of Southfield, Michigan, forwarded to me early results of his execution of a primary forked flap.



In the same year, from the Permanente Medical Group in Oakland, California, George Scrimshaw wrote:

In bilateral clefts, I prefer the one-stage forked flap advancement in spite of some drawbacks.

James Hendrix, Jr. of the University of Tennessee, Memphis, at the Cleft Palate Symposium at Duke in 1973, presented a complete bilateral cleft lip and palate which had an early premaxillary setback by vomer resection. This was followed in 10 weeks by a primary forked flap for columella lengthening at the time of lip closure. The result shown at one year was promising.

PRIMARY FORK PLUS ADHESION

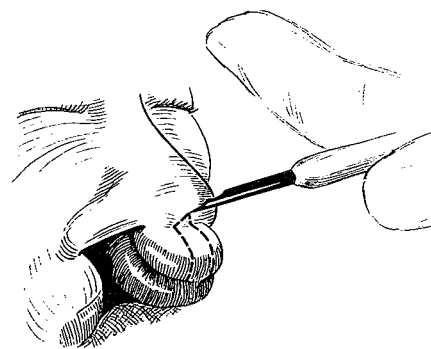
Peter Randall, influenced by Pennsylvania youngsters' constant first request, "Please fix my flat nose," has been experimenting with early forked flaps in complete bilateral lips. In 1971 Randall was "lengthening" the columella at the time of the definitive lip surgery but with minimal effectiveness as judged by the photographs. By 1972 he indicated his change by shifting the forked flap into the columella during the primary adhesion procedure. He wrote:

In bilateral clefts only one side is done at a time. At the time of the initial adhesion, a forked flap lengthening of the columella has worked well in a number of cases.

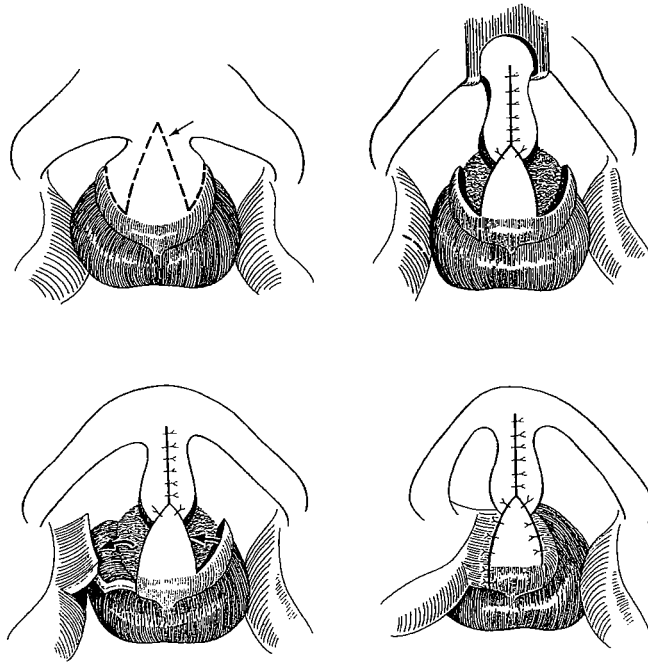
By the 1973 Copenhagen Congress, Randall, with Arthur Brown, elaborated:

In severe bilateral complete clefts of the lip the steps in repair have been first a forked flap reconstruction of the columella and a unilateral lip adhesion at the same operation. Secondly, a lip adhesion on the opposite side sometimes in association with closure of the soft palate. These two operations are usually carried out at three and six months of age. . . . The early reconstruction of the columella has led to marked improvement in the position and growth of the nasal tip. It uses tissue which is otherwise likely to be scarred in many of the procedures currently used for bilateral lip repair. The lip adhesion has been a considerable help as a gentle dynamic force for repositioning the protruding premaxilla.

In 1974 in Seattle, Randall, with Dennis Lynch, expressed his approval of placing nasal tissues into more normal position to facilitate growth rather than worrying about whether early scars might discourage normal growth. Peter Randall and I had a chance to discuss personally and at length what he has been doing. In his first case in 1965, he shifted *one* fork at a time and brought about what he referred to as "an unnecessary amount of distortion." It could be added, "and a limited amount of columella lengthening." Since then he has carried out 20 more so-called primary forked flaps and has varied his approach using a different timing of procedures in each group of two or three cases. In one he did the standard primary forked flap which I described. His other combinations included a one-sided primary forked flap with definitive lip closure which ended in a crooked result, as might be expected. In still others he did a lip adhesion, then a primary forked flap and finally, in the third stage, a definitive lip closure. In some he did a primary forked flap and a lip adhesion on both sides. The combination he seems to favor is a primary forked flap accompanied by a lip adhesion on only one side. He emphasized maintaining the ligamentous attachments of the prolabium by extending the V-shaped incision at the base of the columella farther up into the nasal tip to preserve for the prolabium the columella-lip angle with "its underlying fibrous attachment to the nasal spine." When the premaxilla is protruding, Randall closes the raw donor area of the forked flap on one side with sutures. On the other side he creates a unilateral adhesion by turning the undisturbed vermillion from the side of

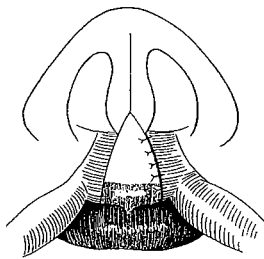


the prolabium under a mucosal flap lifted from the cleft edge of the lateral lip element.



The second adhesion is accomplished several months later. Hinting lack of total faith he added:

Sometimes a buried fixation suture at this point can help.



I predict from experience that this will not prevent down-drag of the lip with vertical lengthening, and even Randall already admits both lip lengthening and obliteration of the columella-labium angle in certain cases. In fact, in three he has found both loss of the columella-lip angle and lip elongation and in another two just lip lengthening, for a total of five. In my series of primary forked flaps, of course, not all lips were pulled long and a buried fixation suture was used. When it did happen, however, this sequela daunted my compulsion for early release of the lip from the nose.

Randall candidly enumerated the other secondary deformities occurring, but with so many varieties it is impossible to tell which caused what. Besides the 10 wide prolabiums and the five long lips already discussed, three had to have secondary columella

lengthening and another four deserve it. Two columellas were atrophic, two were bulky, five were retracted and one was hanging. Only two, in fact, had none of the defects noted, but remember, the nasal tip was more or less up and this is a nasal advance.

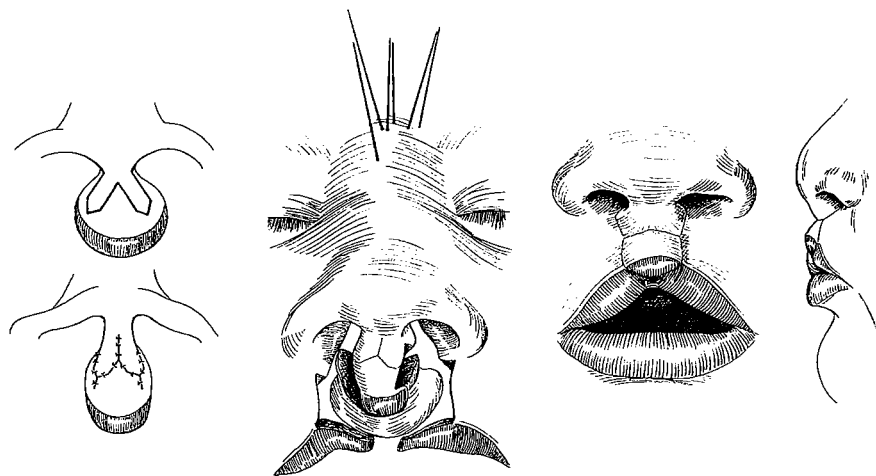
A TWO-STAGE PRIMARY FORKED FLAP

Australian Harold McComb of West Perth in 1975 presented his modification of the primary forked flap. His first step is presurgical orthodontic correction of the "displaced segments of the maxillary arch" stabilized by a sucking plate. At 6 weeks of age, the primary forked flap is advanced into the columella and sits on top of the remaining prolabium to gain a length of 5 mm. At 3 months of age, through upper buccal sulci incisions, all the skin of the nose is elevated, particularly over the alar cartilages. Silk sutures through the intercrural angles of the alar cartilages are brought out at the nasion and tied to correct the downward rotation of the alar cartilages and elevate the nostril margins and lining. This adjunct promises *an interesting lift*.

The remaining prolabium is interposed between the lateral lip elements without muscle-to-muscle approximation, while retaining its old vermilion.



Harold McComb

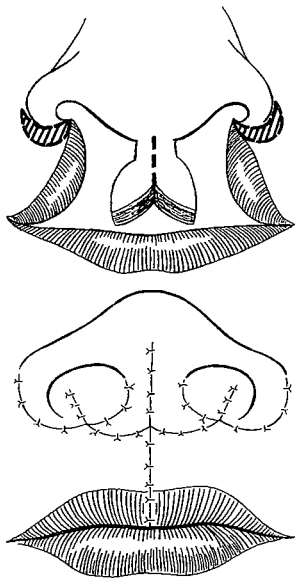


In fact, the nasal part of this procedure is superior to the labial part. Yet, the join of the columella to the lip shows an abrupt demarcation line, and further, this limited length of forked flap

does not provide sufficient release to the snubbed nasal tip. As noted by McComb, his results are too new for true evaluation.

FORKING THE ENTIRE PROLABIUM PRIMARILY

In 1973 Ivo Pitanguy of Rio in his own clinic publication, *Boletim de Cirurgia Plastica*, with Luiz Carlos Garcia, Guido Gandarillas Velarde and Gilson Dotto, adapted his 1967 secondary use of the total prolabium as a forked flap to create a columella in what is actually a primary forked flap without leaving any prolabium to construct the central philtrum. He slides the split prolabium partially into the columella as a forked flap and lets the tips splay, as I have suggested repeatedly, to form the nostril sills. He also discards circumalar crescent excisions, evidently to facilitate alar base rotation, and then joins the lateral lip elements to each other in the midline with one unnatural, potentially contracting, vertical scar. His justification for this rather radical action concludes:



By an extensive observation of 164 cases operated by the senior author, we have concluded that the fact of joining the two lateral inner sides at the medial line will permit us to join the muscle fibers of one side to the ones of the opposite side. This avoids the need of suturing the muscle to the prolabium for in reality, it does not bear muscular fibers. Thus, a real functioning muscular band is achieved, which will re-establish the force antagonism, which assumes a vital importance in the face edification, regarding the premaxilla reposition.

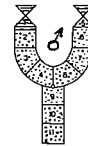
In my opinion this modification of the forked flap is no more functional and is certainly less aesthetic, as is graphically demonstrated in the two cases Pitanguy presented in his clinic bulletin. Although the color photos are vague in focus and angle, it seems that in the more pleasing of the two he has actually preserved the central prolabium for a philtrum, as in the standard primary forked flap. In the second case he used the total prolabium for columella, and consequently the lip and philtrum have suffered for it. The following case of mine is pertinent to this argument.

Although it was encouraging that surgeons were willing to

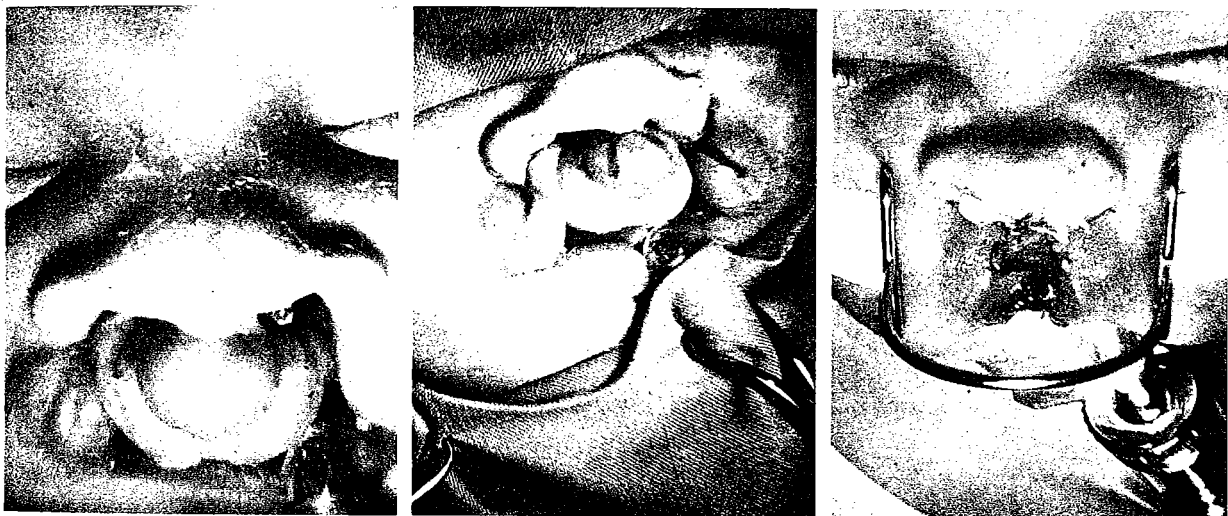
make valiant efforts to correct the lip and the nose in one stage, the results were not perfect and the hazards and problems were real. Even with the originator's edge I had one case that proved to be such a problem it deserves description in detail.

A DIFFICULT COMPLICATION

On December 12, 1966, at nine days of age, a primary forked flap was cut from the prolabium and advanced along the septum with elevation of the depressed nasal tip. The lateral lip elements were freed widely and sutured to the residual prolabium. The lateral vermilion flaps overlapped prolabium vermilion. The infant had a severely protruding premaxilla and a small prolabium, but closure was still obtained.

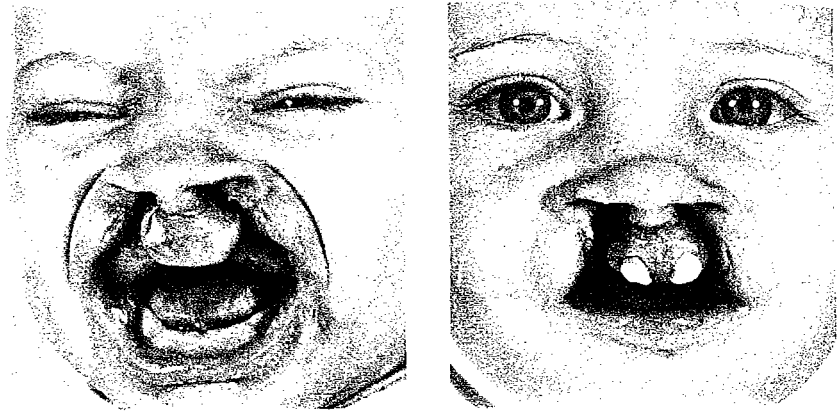


B.D. 12-3-66
F.H. No clefts
F.T. Uneventful
O.C.A. None



Then a mistake was made! A maxillary plate, fitted previously, was inadvertently left out during surgery, and on the first post-operative day an attempt to reinsert the plate caused the lip closure to pull away on one side and eventually to separate on both sides. Emergency resuture was of no avail. The forks on the columella were left in good condition, but the diminutive prolabium was further reduced by its forfeit of the forks. Now, with three raw sides and only the premaxillary blood supply, it gradually shrank and was scarred to oblivion.

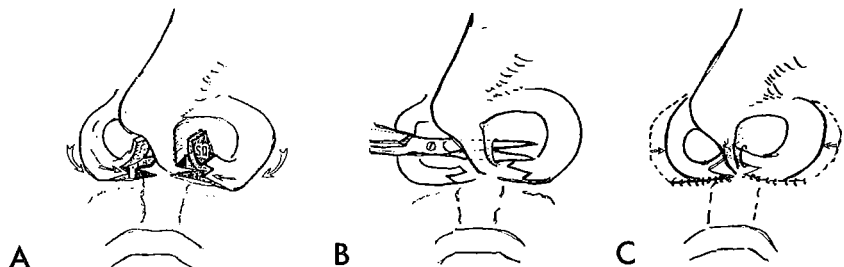
*The gradual
climb back*



Six months later, on June 30, 1967, a Hagerty-Mylin maxillary spreader type of screw plate was pinned in Miami by William Mylin of Charleston, South Carolina. About a year later, on July 7, 1968, resection of 1 cm. of vomer allowed setback of the premaxilla so that the lateral lip elements could be approximated to each other. On October 8, 1969, the soft palate was approximated, and on July 14, 1971, the anterior hard palate cleft was closed with a vomerine flap. Iliac cancellous bone chips packed between the alveolar bone gaps and struts were overlaid across the clefts.

Four years after lip closure, on July 5, 1972, the midline lip scar was excised. A long, 2.25 cm. Abbe flap was transposed into the lip defect and trimmed at its distal end to blend into the columella base. Seven months later a pharyngeal flap was attached to the velum. As the alar bases were still too wide, they were corrected with a general technique being used primarily in unilateral and bilateral clefts routinely now.

The alar bases were freed and divided into two flaps each: one anterior to advance to the columella base and narrow the nostrils; one posterior in nostril sill, denuded of epidermis, to join its mate from the opposite side with a Mersilene suture through a tunnel behind the columella to add bulk and to secure the alar advance.



Maytag Fellow Arnold Arem from Peacock's Tucson unit sketched the above records of the procedure.



9 years

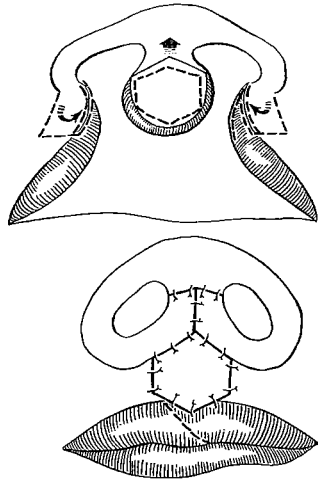
After several years of experience with the primary forked flap, it finally occurred to me that this "all-in-one" method, although available for "one-shot" cases, was probably too hazardous for general use. There had been rumors of prolabial loss elsewhere, whatever the cause, but then I myself watched one shrivel and scar. Yet the *cardinal disadvantage* of the primary forked flap procedure was the impossibility of including the Meyer-Schultz-Browne-Glover principle of *joining* the *lateral mucosa* and *muscle behind the prolabium* to form a functioning lip with an upper labial sulcus.

I no longer use it

OBSOLETE

ANOTHER ONE-SHOT CLOSURE

Jack Mustardé, a canny Scotsman with a knack for getting the better of the other fellow, spent three years as a P.O.W. and ended up writing a best-seller on his experiences. Gillies' early influence stimulated him to venturous innovations, and one example was his 1971 one-stage rendition of the primary simultaneous lip and nose correction in bilateral clefts. He isolated the prolabium from all of its blood supply except that coming



through the premaxilla but left it its original size. He then cut quadrilateral flaps vertically from the lateral lip elements, which often cannot spare the tissue. These lateral flaps first were transposed in the manner of Trauner across between the prolabium and the released columella base and then were shoved side by side one step further as upside-down forks up into the columella to end head-on under the nasal tip. On paper this maneuver seems to be an improvement over Trauner in that it gets more columella out of the lateral flaps, but again there are some real disadvantages. It faces the hazards my primary forked flap did which finally caused it to be set aside for a better and safer approach. Moreover, the lateral lip muscles cannot be joined together behind the prolabium, no upper labial sulcus is formed and the *early complete* division of the nasal tip from the prolabium is almost certain to result in a lip too long in its vertical dimension.

HASTE MAKES WASTE

I think it is fair to conclude that any one-shot procedure that by its rapid execution forces omission of any important aspect has only speed in its favor. If speed is not required, its use is unjustified.