35. Long-Term Evaluation of the Palatal Island Flap

TEN-YEAR EVALUATION IN MIAMI

A F T E R our 10 years' experience, a report in *Plastic and Reconstructive Surgery* on the palatal island flap noted in 1970 that, although 200 island flaps had been used for palate lengthening in all types of cleft problems—primary and secondary—only 73 cases could be reexamined for evaluation. This low percentage was due to the often transient population of South Florida and to the inaccessibility of many of the children in the Bahamas and the West Indies. The results, although not mathematically exact, did serve to give a general impression. With Jack Bensen as the constant speech analyst, J. H. F. Batstone of Oxford (1966) and M. H. Heycock of Great Ormond Street Hospital for Sick Children (1969) carried out the clinical assessments. Both Batstone and Heycock were from British units which did not employ the island flap; neither had been involved previously in the cases studied. They were interested in but had no loyalty to this method. Many patients tested by Batstone were retested by Heycock, without knowledge of the outcome of the previous examination—but the results showed no significant difference. During the assessment, attention was directed to the palatal mobility, length, speech results and fistulae.

Mobility

A control survey of speakers without clefts revealed that normal mobility ranged from moderate to excellent with a fairly even scatter. Out of 24 patients with complete clefts, 20 had mobility

within normal range and three had fair movement. In those with incomplete clefts, 25 out of 30 were within normal limits. Thus about 85 percent had satisfactory mobility, a result suggesting that, *unlike the synechia of a pharyngeal flap which reduces palatal mobility, the island flap allows normal movement.*

Length

Palate length in normal patients varied from moderate to very long. In 46 out of 59, palate length was within normal limits. Thus 78 percent had satisfactory length. Short results in complete clefts were found to be associated with a general lack of tissue, as seen in some bilateral and severe unilateral clefts. Short results in incomplete clefts again seemed to be associated with gross lack of tissue, as in the horseshoe-shaped palate with a wide cleft and short palatal elements. Two failures in submucous clefts occurred in short palates operated on at 9 and 11 years of age.

The occasional failure in lengthening that occurred with no apparent cause has to be blamed on *too small* an island flap or subsequent necrosis and contracture.

Of course, length and mobility are interrelated; often good activity will make up for some palatal shortness and vice versa.

Speech Results

Speech was assessed strictly and dispassionately. Nasal escape was determined primarily by its audibility but confirmed by the misting of a mirror held under the nose while a prolonged s and e were pronounced. The mirror was marked in accordance with the judgment of the speech pathologist.

Speech was graded "normal," "slight nasal escape," "moderate nasal escape," and "gross nasal escape." "Normal" meant *absolutely* normal. "Slight nasal escape" was very slight and probably would be passed as normal by most surgeons (and certainly by the lay public). "Moderate" and "gross" nasal escape indicated degrees of abnormality (Table 1).

Patients with normal speech or slight nasal escape were considered to have satisfactory results (approximately 80 percent). Those with moderate or gross nasal escape were considered to be failures.

Table 1. Type of Cleft and Speech Result (from Primary Operations)

Cleft Type	Normal Speech	Slight Nasal Escape	Moderate Nasal Escape	Gross Nasal Escape	Mentally Retarded	Satisfactory Results
Complete	10	8	4	1	1	18 out of 24
Incomplete	18	7	4	—	1	25 out of 30
Submucous	2	2	—	1	—	4 out of 5

FAILURES IN COMPLETE CLEFTS.

1. A bilateral cleft in which we closed the soft palate only, and left the anterior palate open for premaxillary repositioning.
2. A mentally retarded patient.
3. A *small* island flap early in the series, with a particularly wide cleft.
4. Repaired at 10 years of age.
5. Repaired at 12 years of age.
6. Anterior palate closed elsewhere previously.

FAILURES IN INCOMPLETE CLEFTS.

1. A mentally retarded patient.
2. A horseshoe-shaped cleft.
3. An extremely short palate initially.
4. A cleft of the soft palate in a $2\frac{1}{2}$-year-old child.

FAILURE IN A SUBMUCOUS CLEFT. This was a girl of 9. She had had normal speech until her tonsils were removed at the age of 4. She then developed a severe speech problem, which was not helped by the island flap operation.

In summary, *the more mobile palates seem to produce better speech*—but there was one child with an immobile palate which, although short, allowed only slight nasal escape (Table 2).

In this study it was obvious that the longer the palate, the better the speech results. As in normal people, there were some patients who sometimes made up for deficiencies in palatal length by extreme mobility of the pharynx (Table 3).

Table 2. Mobility of Palate and Speech Results

Mobility	Normal Speech	Slight Nasal Escape	Moderate Nasal Escape	Gross Nasal Escape	Mentally Retarded
COMPLETE CLEFTS, CLOSED PRIMARILY					
Fair	—	2	1	1	—
Moderate	—	1	1	—	—
Good	8	5	1	—	1
Excellent	1	—	1	—	—
INCOMPLETE CLEFTS, CLOSED PRIMARILY					
Nil	—	1	—	—	—
Slight	1	1	—	—	—
Fair	—	—	2	—	—
Moderate	5	2	1	—	—
Good	8	3	1	—	—
Excellent	4	—	—	—	1

Table 3. Length of Palate and Speech Results

Length	Normal Speech	Slight Nasal Escape	Moderate Nasal Escape	Gross Nasal Escape	Mentally Retarded	Satisfactory Results
COMPLETE CLEFTS, CLOSED PRIMARILY						
Very short	—	—	—	—	—	—
Short	1	2	1	1	—	3 out of 5
Moderate	3	2	3	1	1	5 out of 10
Long	5	4	—	—	—	9 out of 9
Very long	1	—	—	—	—	1 out of 1
INCOMPLETE CLEFTS, CLOSED PRIMARILY						
Very short	—	1	—	—	—	1 out of 1
Short	1	3	2	—	—	4 out of 6
Moderate	5	2	2	—	—	7 out of 9
Long	11	1	—	—	1	12 out of 13
Very long	1	—	—	—	—	1 out of 1

DUKE EVALUATION

In 1969, in the *Cleft Palate Journal,* Georgiade, Mladick, Thorne and Massengill evaluated their 54 island flap cases. They noted that the majority of the patients were too young to permit standard cleft palate speech studies. Cinefluorographic tracings of the distance from velum to pharyngeal wall during phonation of

i were obtained in 16 of the older patients. Three to six months after surgery, six patients (38 percent) had complete velopharyngeal closure, and 10 had a gap during phonation. Both fine braided wire markers placed in the midline on the anterior and posterior edges of the island during surgery were retained in 14 patients. Measurements by x-ray, between markers or the widest part of the island, showed that the amount of nasal lengthening shortly after surgery averaged 16 mm. Measurements taken three months later showed a mean decrease of 4 mm. or 25 percent shrinkage. There was a 4 percent incidence of postoperative fistulae. The mobility of the velum was reported to be impressive even in the very early postoperative examinations, and the asymmetry was not significant. In an observation that proved to be a prophecy, the authors noted:

The operation denudes more bone than the usual pushback, which may be detrimental to palatal growth. It does not appear to have the added disadvantage of the Cronin procedure in which both the nasal and palatal mucosa [are] elevated, thus denuding portions of the palatal bones on both sides.

They concluded:

In our opinion, the procedure is good technically. However, it must be used with discretion for older patients and patients with wide cleft palates.

a good prediction

In 1977 Nick Georgiade sent this follow-up:

Ray Massengill, our Speech Pathologist, feels the results are about what we stated in the 1969 article. Also, there is no appreciable difference in the speech in these patients who have had the Island Flap and those who have not, in our series of approximately 80 patients.

MONTEFIORE EVALUATION

In 1975, in the *Cleft Palate Journal,* Lewin, Heller and Kojak, of Montefiore Hospital, the Bronx, New York, studied their results with the island flap pushback procedure. They summarized:

Twenty-four patients were evaluated for voice quality after primary palatal repair by the Millard island flap procedure. In patients with overt cleft palate, acceptable speech was obtained in 71 percent. In patients with velopharyngeal insufficiency without an overt cleft, the success rate was 60

percent. Although we consider this method reliable and useful, we have no reason to believe that it offers substantial advantages over other established procedures. We suggest that the main reason for our failures to achieve velopharyngeal competence and acceptable voice quality after a repair is the inherent hypoplasia of palatal musculature.

A fascinating observation was made by this group:

Examining our lateral cephalograms we noted an interesting finding regarding the configuration of the palate after the Millard island flap operation. In a few patients, in addition to the "knee" (levator prominence), we noted on phonation another elevation anterior to the "knee." This double hump, which we refer to as a "camelback" appearance, probably corresponds to the observation of Pigott et al. and Millard of buckling and puckering of the flap on the nasal side. However, some patients with the "camelback" palate had adequate voice quality, and we could show no correlation between this radiologic finding and voice quality.

It is interesting that the hump has been transferred from the oral to the more needy nasal side.

Here is a "camelback" palate with a voice quality rating of 2.3 shown at rest and phonating "Eeeee. . ."
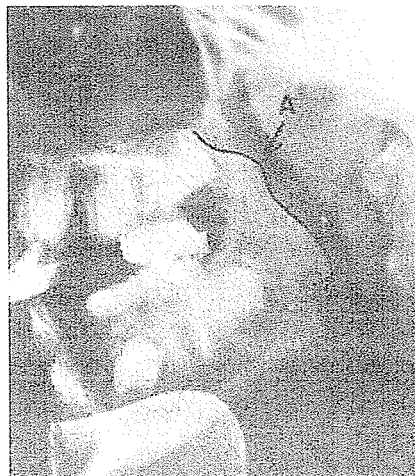
Another "camel" with a voice quality rating of 1.0 at rest and phonating "Eeeee. . ."

Little did it ever occur to me that I have been propagating two-humped "horses" as referred to in the Preface of Volume I.

HOPKINS EVALUATION

In 1976 Luce, McClinton and Hoopes reviewed patients of the Facial Rehabilitation Clinic of the Johns Hopkins Hospital who had had a primary repair of a cleft palate by the unilateral small elliptical island flap technique performed between January 1, 1965, and December 31, 1971. They summarized this seven-year follow-up.

We analyzed all 104 island flap pushback palatal repairs done through our Facial Rehabilitation Clinic in the period from 1965 to 1971. The results were compared to those in a group of 109 standard pushback repairs.

The island flap group had a higher incidence of operative complications, of velopharyngeal insufficiency, and of secondary procedures to correct the latter. (The differences between the two groups were not statistically significant, however.)

In this group of patients the island flap repair offered no particular advantage over the V-Y or the Dorrance push-back; in fact, it may have been deleterious.

A hypothetical explanation for these results is offered, based on possible continuing osteogenesis by the transplanted mucoperiosteum, to produce an inflexible and poorly functioning velum.

It should be back of the velum.

They did admit:

Thus, the final result of excellent or good speech was obtained in almost 85 percent of the island flap group. Unfortunately, the retrieval of that final result necessitated frequent reoperation, rather than less frequent reoperation as had been anticipated by the early devotees of this procedure.

I cannot imagine why so many operations were required. An occasional pharyngeal flap should solve most residual problems. It was a bit more encouraging to hear personally from John Hoopes in 1977:

It has been my feeling that the island flap pushback palatoplasty is the only procedure which results in significant retro-displacement of the levator sling. I have, therefore, in my personal series utilized (almost exclusively) the island flap pushback for repair of cleft palate. Needless to say, I was distressed by the data in the recent paper by Drs. Luce, McClinton and

myself. It is imperative, now, that I extract from that data those island flap pushback procedures performed only by myself—in that I, personally, have had no postoperative fistulae, and my patients have not (inordinately) required secondary pharyngeal flaps. In spite of the data, I continue to utilize the island flap pushback—simply because I have no procedure available which significantly retro-displaces the levator sling.

BUTTERWORTH EVALUATION

In 1975 Blocksma, Leuz and Mellerstig of Grand Rapids, Michigan, reechoed the plea against early mucoperiosteal flap dissections:

We analyzed all the cleft palate surgery performed from 1963 to 1973 in Butterworth Hospital. . . . Evidences of long-term complications in our own patients, and those of others, who had been repaired by the traditional mucoperiosteal flap techniques led us early to the conclusion that such operations as the Dorrance pushback, the Wardill V-Y pushback, the Millard island flap and the typical Von Langenbeck operation were all to some extent implicated in the gradual development of facial deformity. Many patients who had had an early mucoperiosteal flap closure looked excellent at the age of 5 years, but exhibited evidence of serious maxillary growth arrest at the age of 15 years.

Blocksma leveled a direct attack on the island flap, but from his description it is obvious that he was still using the original elliptical island instead of the larger modern ones.

Secondary pharyngeal flaps were required in as many patients after radical palate lengthening procedures as after our conservative closures.

In all likelihood our study included a disproportionately large number of older patients who had had complications after repeated radical closures. It is significant that 22 of our 43 patients who had been treated by the Millard island-flap procedure subsequently required a pharyngeal flap (51 percent); 90 percent of the 43 showed a significant contracture of the alveolar arch. We concluded that this procedure provides considerable additional tissue on the oral side, and a dubious increase in length on the nasal side, at a very high price in subsequent deformity.

right

Functional Analysis of 309 Cleft Palate Patients over 11-Year Period*

NEEDING PHARYNGEAL FLAP (OR IMPLANT)

Procedure	No. Patients	No. Needing	Percent
MVL (no pushback	107	53	49
V-Y pushback	81	64	79
Island flap	43	22	51
Dorrance	8	5	63
Von Langenbeck	5	2	40
Unknown	18	13	73
TOTAL = 262			

* 47 patients needed no further study.

*Something's wrong here with their use of the method.*

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At the time of its conception, it was hoped that the island flap for lengthening nasal lining would be a universal panacea for all palate problems. Nineteen years and about 300 island flaps later, it has been found that such is not the case. With the aid of Walter R. Mullin, our most recent study of 141 available island flap pushback cases revealed that 12 had required later addition of a pharyngeal flap (8.5 percent). Among these 12, two were mentally retarded, one had multiple congenital anomalies including lack of half of the soft palate (A), one had a wide cleft of the soft palate (B), and one was a CPI with a deep pharynx who developed severe nasal escape after a T & A. A pushback with an island flap was followed in two years with a pharyngeal flap, and three years later with lateral pharyngeal flaps to reduce lateral escape and to produce normal speech. Another had a short, scarred secondary palate with a posterior gap of 2 to 3 cm. (C).
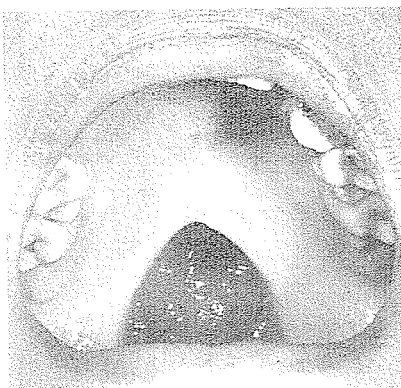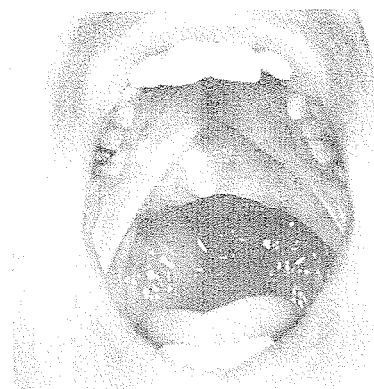
A   B   C

Most of these cases received the pushback, with an island flap as a secondary procedure, later than the ideal age, varying from 6 to 26 years. Two were primary island flap pushback cases at 16 months of age (1962) and 20 months (1961), and each of these had a horseshoe-shaped deformity with severe deficiency of tissue of the soft palate musculature. Continued nasal emission or development of emission after T & A precipitated the addition of a pharyngeal flap one to eight years after the pushback, with an average interval of 3.2 years.

Four more cases face the possibility of having a pharyngeal flap, which would make a total of 11.3 percent. These cases either had the pushback–island flap as a secondary procedure, resulting in more nearly normal speech which speech therapy is attempting to improve, or were early primary pushback–island flaps in clefts with severe deficiency of soft tissue musculature.

As in all plastic surgery, the choice of the case is important. The mucoperiosteal elliptical island based on one or, preferably, both posterior palatine neurovascular bundles can be turned over to supply as much as a 20 × 30 mm. (usually 12 × 30 mm.) stiff mucosal patch—to fill the nasal gap produced by the release and backward migration of the levator muscles and soft palate. There are limitations as to how much palate length this flap can achieve and how much flap some palates can spare.

When the island flap can be spared and the required lengthening does not exceed 12 mm., this procedure is ideal. It is physiological and it does not impede palate mobility while achieving permanent length. It is not effective in a paralyzed palate, but when scarring has produced some immobility the release can be dramatic.

Preservation of a triangle of mucoperiosteum anteriorly, as well as the adjunct of retropositioning and suturing the *levator veli palatini* muscles, is now included in the standard pushback–island flap procedure.

Berkowitz

Of course, the question of maxillary distortion always arises in any palate operation, but according to Berkowitz in 1970, the island flap was not causing more distortion than other methods when orthodontic correction had been carried out by the usual techniques, if indicated. Since then, however, there has been *enough evidence of distortion* following *primary* pushback with an island flap to cause Berkowitz to request postponement of this more radical surgery until age 3 to 5 years. As he noted at the end of his Chapter 4 in this volume:

An *island flap* will not cause palatal deformation if performed on a well-developed palate with adequate tissue and if the lateral incisions *are made at least 5 mm. medial to the dentition.*

Berkowitz has been following my cases with lateral cephalometric studies for many years. Here are some of his observations on the pushback with an island flap:

Palate lengthening using the "island flap"

1. *Congenital palatal incompetence (CPI)*
   The failure of the velum to make contact with the retropharyngeal wall in CPI is usually due to an excessively deep pharyngeal space. Presurgical evaluation of the palatal tissue is crucial in determining the adequacy of the tissue for palatal lengthening. A ten-year monitoring of palatal development following the island flap led us to conclude that the least deleterious effect resulted when surgery was postponed until 5 years of age, when 80% of palatal growth was completed. The worst effect resulted when the island flap was used as a primary cleft closure procedure, and the lateral incisions were made close to the teeth.

2. *Isolated cleft palate*

   4 years Preoperative evaluation: Short velum associated with a relatively deep pharyngeal space and a sparse adenoid mass.

   6½ years At rest. Velum lengthened by island flap.

   6½ years Vocalizing *"Youuu. . . ."*
   Good elevation with a velopharyngeal gap of 5 mm.
   Vocalizing *"Ssss."*

   7½ years The velum increased in A-P length and was able to make contact with the pharyngeal wall at the adenoid.

Island flap at 11 years

4 years postoperative. At rest. Vocalizing *"Youuu. . ."*

4 years, preoperative. At rest. 6½ years, postoperative. At rest.

6½ years. Vocalizing *"Youuu. . ."* Vocalizing *"Ssss"*

7½ years. At rest.   Vocalizing "*Youuu. . .*"   Vocalizing "*Ssss*"

7½ years The stretch reflex was still evident a year later. The functional velum appears to become thinner than when at rest. The lengthened velum remained the same length one year after surgery.

3. *Submucous cleft palate*

Cephalometric and model analysis associated with an island flap performed at 4½ years of age. Successful reduction of hypernasality.

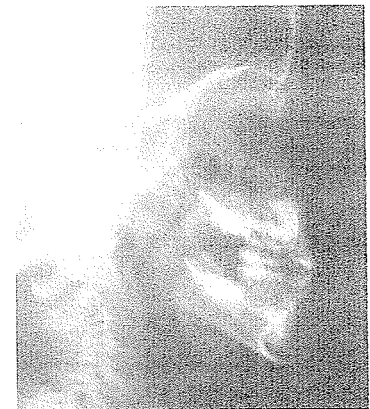3 years   The velum is too short to function adequately within this pharyngeal architecture.

4½ years After the island flap procedure during vocalizing of "*Youuu. . . .*" The velum elevates and makes contact with the adenoid.
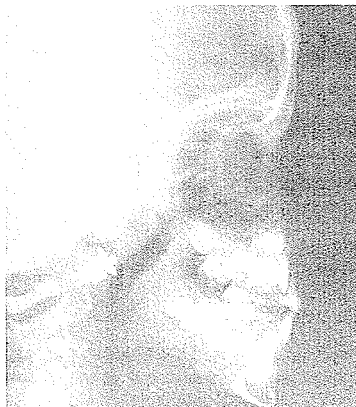

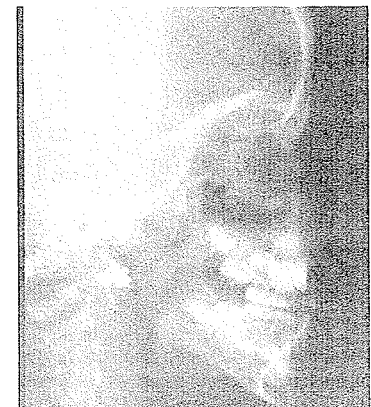3 years. Preoperative.   4½ years. Postoperative. At rest.   Vocalizing "*Youuu. . .*"

6 years. At rest.   Vocalizing "*Youuu. . .*"   Vocalizing "*Ssss*"

6 years   At 6 years, the velum lies on the dorsum of the tongue at rest. During function the velum makes good contact with the adenoid. Hypernasality was reduced postoperatively, and there was no change in velar function one and a half years postoperatively.

4. *Failure of the "island flap" procedure*

The velum did not reach the posterior pharyngeal wall during function. Postsurgical cephalometric examination revealed the failure of the velum to obturate the nasopharynx during function. One cannot presume that *all* velar pushbacks will function adequately.

In this instance a pharyngeal flap was performed to further improve air flow control. The need to perform a pharyngeal flap should not necessarily condemn this palatal lengthening procedure, for there are instances when a pharyngeal flap can also fail in its purpose. Further research is necessary to relate the condition of the palate, the depth of the pharynx and velar length to the surgical procedure of choice.

After "island flap" procedure   Vocalizing *"Youuu. . ."*—10 mm. gap   Vocalizing *"Ssss"*—5 mm. gap

MODERN PLAN

I now close the soft palate at the time of the lip adhesion or definite closure, and the hard palate when the operation can be accomplished without more than lateral relaxing incisions and moderate undermining at 18 months. Then I wait to see how speech will develop. In the 25 to 30 percent of patients with velopharyngeal incompetence, an island flap pushback at 4 to 5 years can be carried out if the velopharyngeal gap is no more than 1.5 cm. and the mobility of the palate is good. If not, a pharyn-

geal flap or an island combined with a pharyngeal flap may be indicated. In fact, in patients with a short velum, reasonable mobility and a large velopharyngeal gap, I have come to employ the combination of an island flap in a pushback to enable the lengthened palate to make good use of its muscle action. Moreover, I add a superiorly based pharyngeal flap not only for reduction of the large space and the obturator effect but to act as a high, resting, unrestricted suspensory tether to hold the velum backward and elevated, *to reduce the velar excursion* necessary for functional pharyngeal closure. The pharyngeal flap can be as large as the cleft tissue deficiency requires or as small as a Stellmach adhesion. The reduction in the amount of lift the palatal muscles must continuously and rapidly achieve not only increases *efficiency* but reduces *fatigability*. This combination wins in most cases, even in the face of large tissue deficiencies. Thus, in the first three months of 1978, the simultaneous combination of a pushback with an island flap and some type of pharyngeal flap has been used in five out of the last 10 secondary cases, with an age variation of 9, 14, 17, 19 and 25 years. For a more detailed evaluation of an evolutionary series of palatal closures including island flaps see Chapter 46.