Preliminary Evaluation of the Island Flap in Cleft Palate Repair

NICHOLAS G. GEORGIADE, D.D.S., M.D.
RICHARD A. MLADICK, M.D.
FRANK L. THORNE, M.D.
RAYMOND MASSENGILL, ED.D.
Durham, North Carolina

One of the prime requisites for good speech after cleft palate repair is the attainment of adequate palate length and mobility, thus resulting in velopharyngeal closure. The standard pushback palate procedures necessarily leave a large raw area on the nasal side which must heal by secondary intention and probable scar contraction. This may contribute to eventual shortening with decreased mobility of the repaired palate and poor speech. Efforts to cover this raw area have included the skin graft technique of Baxter (*1*) and Dorrance and Bransfield (*3*), the nasal mucosal flaps devised by Cronin (*2*), and more recently, the island pedicle flap originally described by Millard (*7–9*).

The island flap procedure utilizes an island of anterior mucoperiosteal tissue based on the greater palatine neurovascular bundle. By turning this island over to cover the raw nasal side (resulting from the push-back), a one-stage repair is accomplished (Figure 1). As with any type of palate closure, the final evaluation must await the analysis of speech in the long term follow-ups.

Because speech development is a changing dynamic process maturing with the growing child, many years and a significant number of well-studied cases are necessary for meaningful conclusions. With this in mind, longitudinal studies are carried out on all of our island flap repairs, utilizing a number of methods to evaluate postoperative results. Direct inspection of the palate is used to give information on the integrity, mobility, and symmetry of the closure. Lateral X rays and cinefluorography provide information on the range of palatal motion and the size of the velopharyngeal gap. Articulation tests, airflow manometry, and electromyography are used on the older and more cooperative patient. We have also included the operative and post-operative serial measurements of the distance between wire markers placed to measure the width of the island flap. These markers are

The authors are affiliated with the Department of Surgery, Division of Plastic and Maxillofacial Surgery and Speech Pathology, Duke University School of Medicine, Durham, North Carolina.

This paper was presented at the 1968 annual meeting of the American Cleft Palate Association, Miami Beach.

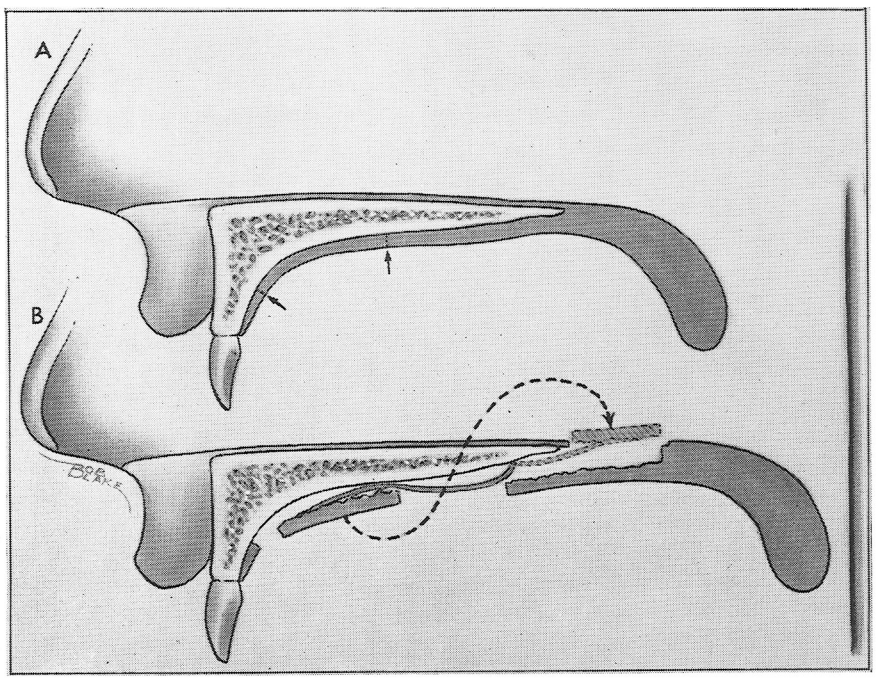

FIGURE 1. Diagrammatic cross-section of the palate. A, preoperative side view of the short cleft palate. The arrows point to the borders of the "island". B, the muco-periosteal flaps have been elevated and the palate pushed back exposing the raw nasal side. The island flap will be turned over 180° to supply mucosal coverage for the raw nasal side.

sutured into opposite sides of the island flap at its widest antero-posterior diameter (midline), and are followed by X ray to give information as to whether there is contracture of the flap in the postoperative period.

Before presenting the results of these examinations in 54 island flap repairs, we will discuss some of the advantages and disadvantages found in our series.

The island flap procedure can be carried out quite satisfactorily by modifying the basic Wardill-Kilner palatal repair (*6, 10*). The neuro-vascular bundle is easily dissected from the mucoperiosteal flaps by sharp dissection, as advocated by Edgerton (*4*). In our experience, the intact untraumatized bundle provides excellent vascularization for even the largest of the island flaps. The firmness of the island helps support the repair and gives a two-layer overlapping closure in the area of maximum tensions. Edgerton states that the flap has sensation which theoretically helps handle the nasal mucus (*5*).

We have found some definite limitations with this procedure. In clefts with narrow arches and/or wide complete clefts, it is difficult to get a sufficiently wide island flap. Without a large island flap the pushback effect is limited. The width of the island flap determines the extent of

the pushback and, unfortunately, no matter how *long* the island is made, its *width* is predetermined by the distance from the alveolar ridge to the cleft. The operation takes approximately thirty minutes longer than a simple pushback. In a few adult cases we have found extensive arborization of the neurovascular bundle which hinders mobilization of the vessels. In one adult case, there was a portion of a flap that was definitely compromised, possibly because of the division of the many branches during mobilization. Whether this presents a problem is questionable but it should be considered when performing the operation on adults. In some cases the island flap repair produces an asymmetrical closure which may or may not be ultimately harmful. The asymmetrical closure is caused by the necessity of bringing the mucoperiosteal flaps over the island flap-hard palate junction to prevent a fistula from developing at this suture line. 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 is elevated, thus denuding portions of the palatal bones on both sides.

Technique

Our technique is essentially the same as that previously described by Millard (*7–9*). After outlining an island flap of maximum width (Figure 2), the mucoperiosteal flaps are raised as in the Wardill-Kilner

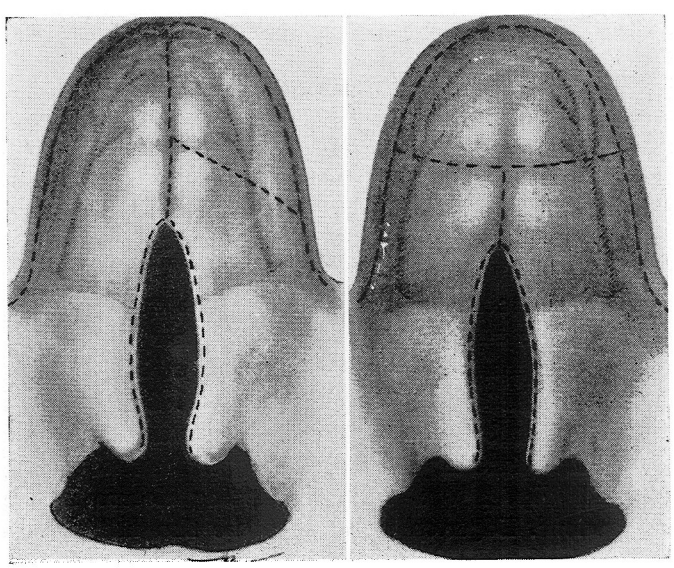

FIGURE 2. Left, a unilateral island flap is marked with dotted lines. In incomplete clefts, as shown here, the island may cross the midline but to gain any significant increase in width, it is necessary to use a bilateral flap. Right, the bilateral island flap is marked with dotted lines.

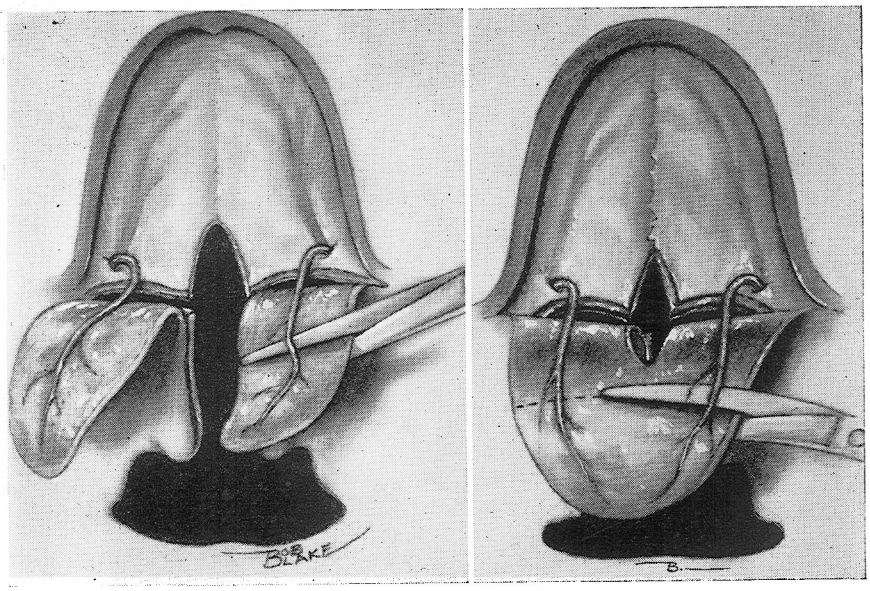

FIGURE 3. Left, with the mucoperiosteal flaps elevated and turned back, the scissors may be inserted to cut the island under direct vision. It is necessary to free the neurovascular bundle from the flap by sharp dissection. Right, the entire mucoperiosteum has been reflected off the hard palate and the scissors are placed to cut a bipedicle island flap.

operation. The neurovascular bundle (or bundles if a double pedicle flap is used as in incomplete cleft) is freed by sharp dissection (Figure 1B). The nasal mucosa is cut, leaving a cuff on the hard palate. The mucoperiosteal flap is transected at a predetermined level leaving the neurovascular bundle intact and attached to the "island" (Figure 3). Fine braided wire markers are sutured in the island flap at its widest points. The island is turned over and sutured to the proximal and distal edges of the nasal mucosa (Figure 4). The freshened edges of the soft palate are closed in two or three layers and the mucoperiosteal flaps are placed to just overlap the island flap-hard palate suture line. They are then sutured to the posterior edge of the hard palate to decrease the possibility of fistula formation. In the unilateral island flap the nondonor half of the palate will need to be brought across the midline, hence the asymmetrical closure (Figure 5).

Results

The majority of the fifty-four patients in this study were too young to permit studies often employed in cleft palate speech research. However, cinefluorographic tracings of the distance between the velum and the pharyngeal wall during the phonation of the vowel *i* were obtained on sixteen of the older patients. The distance between the pre-

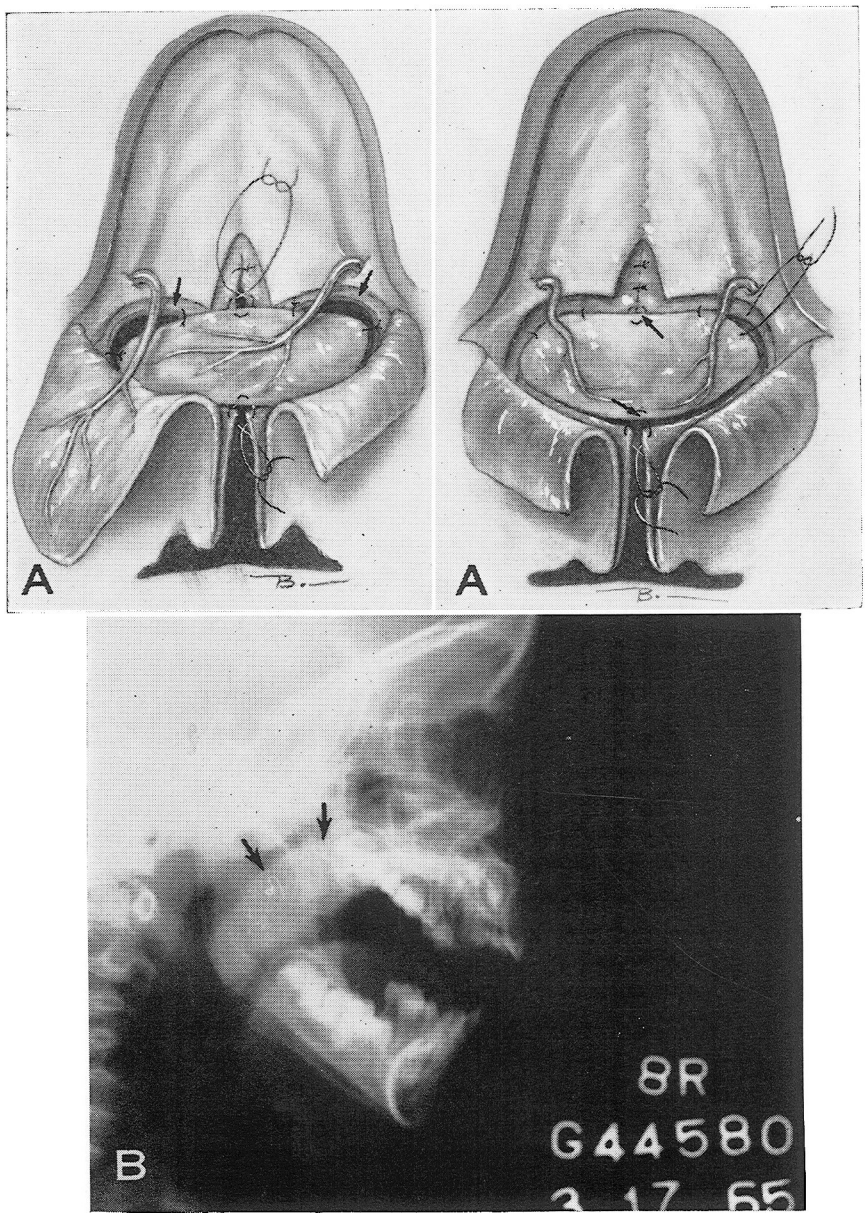

FIGURE 4A. Left, the single pedicle island flap has been turned over to be sutured to the proximal and distal edges of the nasal mucosa. Arrows point to the cuff of nasal mucosa that is important for a secure closure. Right, the double pedicle island flap being sutured in place. Arrows point to the positions of the wire markers. The wires are placed to mark the width of the flaps on follow-up X rays, but most are lost within three or four months.

FIGURE 4B. Lateral X ray with the wire markers designated by the arrows.

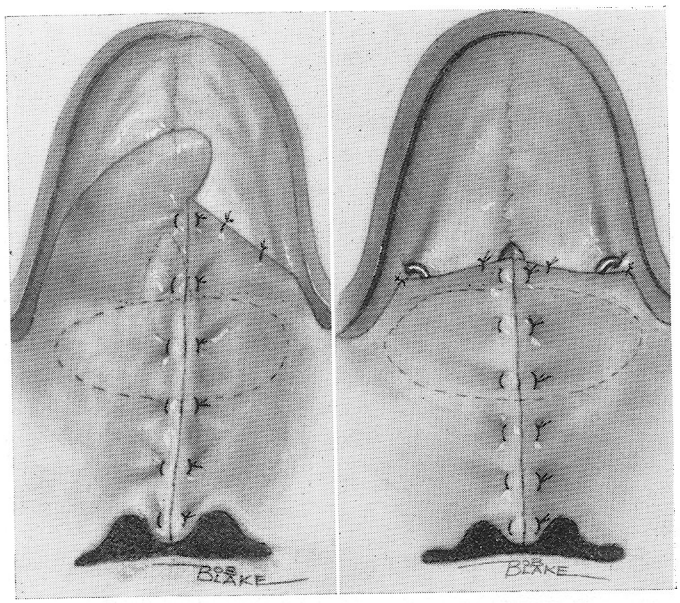

FIGURE 5. Left, the completed unilateral island flap repair. The location of the island flap is marked by the oval dotted lines. In some unilateral island flap repairs the non-donor half of the palate will need to be brought further across the midline using an asymmetrical closure. Right, the completed bilateral island flap repair with the location of the island again shown by the dotted lines.

viously described wire markers and the amount this distance decreases over a three-month period was also studied.

The results of the tracings showed that six of the patients (38%) had complete velopharyngeal closure and ten had a velopharyngeal gap during phonation. However, it is important to note that the majority of the cases were studied for velopharyngeal closure only three to six months after surgery.

Only fourteen patients retained both the wire markers as long as three months. In the early postoperative X rays, the markers showed the average width of the island flaps to be 16 mm. The three-month postoperative X rays showed the mean decrease in distance between the markers (that remained) to be approximately 4 mm. Percentage-wise, this represents a 25% decrease in the size of the island flap.

All patients had periodic postoperative examinations in the Cleft Palate Clinic. There is an approximate 4% incidence of postoperative fistulae. The good mobility of the repairs has been impressive even in the very early postoperative examinations. The asymmetry has not appeared significant.

At a later date, more data will be added to this investigation; including calculated sound pressure level readings, the velopharyngeal relationship during sustained phonation and connected speech as ob-

tained from cinefluorographic analysis, speech intelligibility ratings as produced from tape recorded sentences and articulation testing. Since the majority of our patients have been infants, it will be a few years before this study can be completed.

Summary and Conclusions

The island flap procedure is a relatively new operation which has provided a unique method for establishing mucosal lining for the raw nasal side of the pushed-back palate repair. A turned-over island of mucoperiosteal tissue based only on the neurovascular bundle is used to prevent the late scarring and contracture and shortening of the palate seen in other repairs. In our opinion, the procedure is good technically. However, it must be used with discretion for older patients and patients with wide cleft palates. Certainly, long term study of the results of the procedure is needed.

reprints: *Dr. Nicholas Georgiade*
Box 3098
Duke University Hospital
Durham, North Carolina 27706

References

1. Baxter, H., A new method of elongating short palates. *Canad. med. Assoc. J., 46,* 322–325, 1942.
2. Cronin, T. D., Method of preventing raw area on nasal surface of soft palate in pushback surgery. *Plastic reconstr. Surg., 20,* 474–483, 1957.
3. Dorrance, G. M. and J. W. Bransfield, The push-back operation for repair of cleft palate. *Plastic reconstr. Surg., 29,* 551–560, 1946.
4. Edgerton, M. T., Surgical lengthening of the cleft palate by dissection of the neurovascular bundle. *Plastic reconstr. Surg., 29,* 551–560, 1962.
5. Edgerton, M. T., The island flap pushback and the suspensory pharygneal flap in surgical treatment of the cleft palate patient. *Plastic reconstr. Surg., 36,* 591–603, 1965.
6. Kilner, T. P., Cleft lip and palate repair technique. *St. Thomas Hospital Reports (London), 2,* 127–140, 1937.
7. Millard, D. R., Wide and/or short cleft palate. *Plastic reconstr. Surg., 29,* 40–57, 1962.
8. Millard, D. R., The island flap in cleft palate surgery. *Surg. Gyn. Obst., 116,* 1–4, 1963.
9. Millard, D. R., A new use of the island flap in wide palate clefts. *Plastic reconstr. Surg., 38,* 330–335, 1966.
10. Wardill, W. E. M., The technique of operation for cleft palate. *Brit. J. Surg., 25,* 117–130, 1937.