TECHNIQUE OF CLOSING CLEFT PALATES WITHOUT THE RELAXING INCISIONS

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INTRODUCTION

A technique for closure of complete or incomplete palatal clefts without relaxing incisions is described. The procedure closes the entire palatal cleft, constructs the levator muscle sling to allow for efficient velopharyngeal sphincter closure during speech, lengthens the velum, and forms a normal appearing uvula. Closure of the entire palate without relaxing incisions precludes scar contraction and causes less interference with growth of the maxillary and alveolar structures. Advantages, disadvantages and complications of the technique are analyzed.

Over the years, multiple protocols for the management of congenital cleft palate have been proposed by many authors. In 1764, Le Monnier, a French dentist, performed the first surgical closure of a congenital soft palate cleft by introducing several sutures, cauterizing the cleft edges and then closing the cleft by bringing the edges together and fixing them with the sutures. Fifty years later, Carl Ferdinand von Graefe (1816) and then Philibert Roux (1819) reported successful repairs of soft palate clefts. In 1820, John Collins Warren performed the first soft palate cleft closure in America. In 1826, Johann Friedrich Dieffenbach significantly improved the surgical treatment of cleft palate by introducing hard palatal mucoperiosteal flap elevation to allow closure of hard palatal clefts. Later, in 1845, he added lateral osteotomies (osteal uranoplasty) to aid hard palate closure. In 1952, the American surgeon Sydney Wynn, described a similar procedure for palatoplasty. Bernhard von Langenbeck in 1861, Victor Veau in 1931, Thomas Kilner in 1937, and William EM Wardill in 1937, made important contributions to cleft palate surgery. (1)

Virtually all techniques for cleft palate closure use relaxing incisions to facilitate oral flap approximation and midline closure without tension. The von Langenbeck procedure is the oldest cleft palate operation still widely used today, mostly for closure of incomplete clefts of the secondary palate. Two bipedicled mucoperiosteal flaps are elevated by incisions on each side of the cleft. One of the incisions is made along the cleft edge and the other is a lateral relaxing incision, which starts transversely behind the maxillary tuberosity and then curves anteriorly along the junction of the gingival mucous membrane with the palatal oral mucous membrane, extending forward to the anterior part of the palate to about one cm behind the alveolar ridge. The mucoperiosteal flaps are elevated from the hard palate bones, and then moved medially to close the cleft with minimal tension, without lengthening the palate. Some authors have combined this procedure with an intravelar veloplasty to form a functional muscle sling for better speech results, or with Furlow’s double opposing Z-palatoplasty to increase palatal length. Palatal lengthening in palatoplasty to reduce the space in the posterior pharyngeal wall is essential for better speech outcomes.

The Veau-Wardill-Kilner V-Y (Pushback) procedure was until recently the most common technique for cleft palate closure. It is a modification of the von Langenbeck procedure to increase palatal length. Incisions along the cleft margin together with anterior and lateral relaxing incisions create two triangular mucoperiosteal flaps based on the posterior greater palatine vessels, on each side of the cleft, to facilitate cleft closure without tension. The flaps are advanced posteriorly in a V-Y fashion to lengthen the hard and the soft palate. Pushing back the oral flaps results in extensive areas of exposed denuded maxillary bone anteriorly and laterally along the alveolar margin, which retract because they heal by second intention. This causes shortening of the palate, deformities of the maxillary arch and interference with midfacial growth. Retraction is directly proportional to the amount of scaring at the site of the raw areas. (2) In complete palate clefts there is a higher rate of oronasal fistula formation with this procedure than with other techniques, because anteriorly it provides only a single layer closure of the nasal mucosa. (3)

In 1967, Polish surgeon Janusz Bardach first described a two-flap palatoplasty technique for cleft closure. The original procedure could only be used to close narrow clefts, by releasing mucoperiosteal flaps from the cleft margins. Later, Berdach modified the procedure by performing more extensive dissection of the mucoperiosteal flaps and extending the relaxing incisions. The two-flap technique is a modification of the von Langenbeck procedure. In each flap the incision made along the cleft margin joins the lateral relaxing incision at the alveolar margin anteriorly. The peninsular mucoperiosteal flaps are based on the posterior greater palatine neurovascular bundles, and they can be easily approximated to meet each other in the midline, after detaching the muscles of the soft palate from the posterior edge of the bony palate. Once the cleft is closed, the two flaps are sutured back to the alveolar margin to eliminate or at least minimize bone exposure. Therefore, minimal or no exposed bone remains after the operation, thus reducing palatal scarring and also deleterious effects on growth. No attempt is made to lengthen the palate. The levator muscles are reconstructed as in the intravelar veloplasty to form a functional muscle sling, and the soft palate, including the two hemiuvulae of the cleft, are closed in a straight line. (4)

Furlow in 1986 described double opposing Z-plasty flaps for closure of velar clefts. The Z-plasties, one of the oral side and one of the nasal side, are mirror images of each other, with their central limbs along the cleft. The anteriorly based flap of each Z-plasty is composed of mucosa, and the posteriorly based flap contains muscle and mucosa. Transposition of the nasal flaps across the cleft rotates one palatal muscle, and transposition of the oral flaps, rotates the other palatal muscle across the cleft, producing an overlapping muscle sling. According to Furlow, in narrow to medium sized palate clefts, it is possible to close the hard palate cleft without relaxing incisions because of the arch (vault) of the hard palate. When the mucoperiosteal flaps are detached from the hard palate bones and brought from their vaulted position into a horizontal plane, they are nearly always long enough to make contact
with each other in the midline, before they are sutured. The nasal layer is closed by means of a superiorly based vomer turnover flap that is sutured to the nasal mucoperiosteum flap on the opposite side. Therefore, the hard palate is closed in two layers, usually without relaxing incisions, except when the cleft is very wide, and the soft palate in three layers. When the cleft is very wide (2 cm or more), Furlow uses lateral relaxing incision along the alveolus on the right side to accomplish cleft closure. (5) (6)

The conventional way for uvular repair is to incise each of the two hemiuvulae of the velar cleft, and then suturing them together in the midline. However, after uvular closure wound retraction or dehiscence often occur, resulting in a bifid or deformed uvula. An alternative method to create a natural appearing uvula, designed by the author, is presented. (7)

PATIENTS AND METHODS

Over the past 5 years, 360 non-syndromic patients where operated by the author for one-stage primary closure of unilateral or bilateral clefts of the palate, without relaxing incisions. The uvula is formed by centralizing one of the two hemiuvulae of the cleft velum. Fifty-four percent of the patients were males and the rest were females. Patient's age at the time of cleft closure ranged from 6 months to 2 years, with a mean age 9.3 months. Follow-up ranged from 10 days to 3 years. Cleft palate was associated with unilateral cleft lip in 65.4% of the cases, with bilateral cleft lip in 20.7% and with cleft palate in 13.9%. Nasoalveolar molding (NAM) before surgery, was not used. All the patients were operated under general endotracheal anesthesia coupled by local anesthesia containing a vasoconstrictor, to reduce bleeding and facilitate tissue dissection. No blood transfusions were used. All sutures used were absorbable. Arm restraints were not used. Ninety-six percent of the patients were discharged within 24 hrs after surgery. Velopharyngeal competency after surgery could not be tested, because the patients were not old enough for speech evaluation.

SURGICAL TECHNIQUE

After induction of general endotracheal anesthesia, the head of the patient is extended and supported by a padded ring to allow intraoral placement of a Dingman mouth gag for cleft exposure. The tissues in the hard and soft palate are infiltrated with 2 to 4 mL of 2% lidocaine with epinephrine diluted to 1:40,000. A 3 cc Luer lock tip syringe with a 27 gauge needle is used for injection. The infiltration expands the soft palate tissues, facilitates tissue dissection, minimizes blood loss, and diminishes the amount of the agent administered for general anesthesia. A ten minute wait after infiltration is advisable for adequate vasoconstriction. (Figure 1) On each side of the cleft, incisions on the cleft edges extend from the anterior alveolar ridge to the base of each of the two hemiuvulae of the cleft. (Figure 2) On the normal side (greater maxillary segment) the incision is placed along the cleft margin at the junction of the oral mucosa with the vomer. On the cleft side (minor maxillary segment) the incision is placed about 2 mm above the junction of the oral with the nasal mucosa. No relaxing incisions are made. Through these incisions, oral and nasal mucoperiosteal flaps are elevated. The oral mucoperiosteal flaps are widely detached from the bones over the entire hard palate, up to the alveolar border. (Figure 3) When the arches of the palatal shelves are deep, the borders of the elevated oral mucoperiosteal flaps will approximate as the flaps are moved from their vaulted position in the hard palate bones to the horizontal plane, before they are sutured to close the hard palate cleft on the oral side. (Figure
4) On each side of the cleft, the greater palatine neurovascular bundle is identified and preserved, as it emerges from the greater palatine canal (pterygopalatine canal) in the horizontal part of the palatine bone. (Figure 5) A superiorly based vomer flap (described by Pilcher in 1926) is elevated from the edge of the cleft; the mucosa is reflected away from the septum and moved across the cleft to close the nasal layer of the hard palate, by suturing the flap to the nasal layer on the opposite side. (Figure 6) Unless the cleft is very wide, the vomer flap reaches the border of the nasal mucosa of the opposite side without tension, eliminating the need for wide detachment of the nasal layer from the bone on that side. In bilateral clefts, an incision is made on the free edge of the vomer, and two superiorly based flaps are raised, which are sutured to the nasal layers of the palatal shelves to close the cleft on the nasal side. In the soft palate, the oral and the nasal mucosa are carefully dissected to expose the palate muscles which run along the edges of the velar cleft. The nasal layer of the soft palate is closed with 4-0 absorbable sutures. The nasal flaps in the velum are usually very elastic and can be sutured together in the midline with little tension. Closure of this layer is very important, because if a watertight closure is accomplished, the possibility of oronasal fistula formation is greatly reduced. The palatal muscles are freed completely from their abnormal attachment into the posterior edge of the hard palate and then retropositioned, so they come to lie transversely at right angles to the long axis of the velum near the base of the uvula, and sutured together with 4-0 absorbable sutures to form a functional muscle sling. (Figure 7) When possible, the muscles are sutured transversely so they overlap. As the muscles move back, the velum elongates to some extent. On each side of the velar cleft, the oral mucosa is undermined as much as needed to allow a tension-free closure with 4-0
absorbable sutures. One of the two hemiuvulæ of the soft palate cleft is selected, usually the largest and/or the one that is most posteriorly located, to become the definitive uvula of the soft palate after moving it to the midline. A transverse incision with a small posterior back cut at the base of the chosen hemiuvula facilitates its centralization. The other hemiuvula is split horizontally into two flaps: oral and nasal. Each flap is inserted into the transverse triangular space that remains after centralizing the selected hemiuvula, and sutured into the nasal and oral mucosa of the borders respectively, of that space. This maneuver further lengthens the soft palate, and precludes wound retraction in the midline, because it breaks the straight line. The centralized uvula always looks normal, and it can not become bifid, (Figure 8) although it can be lateralized to some extent if it is not placed correctly at the midline.

When the cleft is very wide, the palatal vault is shallow or the vomer is short, it is impossible to close the hard palate without relaxing incisions, unless surgical maneuvers are performed to reduce tension and minimize postoperative palatal dehiscence, such as inward fracture of the hamulus, advocated by Billroth in 1889, to displace the attachment of the tensor veli palatine from the hamulus to facilitate tension free closure of the cleft; stretching of the greater palatine neurovascular bundles or a Limberg osteotomy, as described by Skoog, (8) to free the neurovascular bundles from the greater palatine canal to allow the
oral mucoperiosteal flaps to come together across the cleft without tension. However, an easier alternative to avoid relaxing incisions is to detach the gum from the teeth on the lingual side of the alveolus by introducing a periosteal elevator through the dentogingival space, a natural space that exists between the gum and the teeth, and then proceed with the mucoperiosteal elevation of the oral flap. (Figure 9) The separated gingiva becomes a lateral extension of the oral flap, facilitating oral flap approximation and midline cleft closure without tension. In very wide clefts this maneuver is performed bilaterally (9) (10)
RESULTS

Of the 360 cleft palate patients operated by the author during the past five years, no relaxing incisions were performed in 245 cases (68%). In 115 patients (32%) the clefts were very wide and additional surgical maneuvers were used to avoid conventional relaxing incisions (Figure 10). Complications were few and easy to manage: Immediate post-operative bleeding in 6 cases (1.66%). Small midline oro-nasal fistula (Figure 11) in 16 cases (4.44%). Most of the fistulas (87%) were at the junction of the hard and soft palate, and lateralized uvula in 8 patients (2.22). No speech evaluation was performed in these patients because they were not old enough to be tested.

Fig 9. Detaching the lingual gum by introducing a periosteal elevator through the dentogingival space in wide clefts to avoid relaxing incisions.

Fig 10. Soft palate cleft closure: Pre and post op,
DISCUSSION

Relaxing incisions are part of the most commonly used procedures for cleft palate closure: The von Langenbeck, the Veau-Wardill-Kilner V-Y Push back, and the Bardach two-flap palatoplasty. Furlow described his double opposing Z-plasty mirror flap procedure for closure of the soft palate and of the hard palate without relaxing incisions, except when the cleft is very wide.

In the procedure described by the author, all surgical maneuvers needed to close a complete or incomplete cleft of the palate, either unilateral or bilateral, can be performed through the cleft edge incisions, without relaxing incisions. After the oral mucoperiosteal flaps are elevated, they are retracted with a hook and the greater palatine neurovascular bundles on both sides of the cleft can be safely identified and preserved. The palatal muscles which run along the cleft margins and insert into the posterior edge of the hard palate, can be adequately dissected from their abnormal attachments, and moved posteriorly so they can be sutured together transversely to form a functional muscular sling; indispensable for adequate speech. Moving the muscles posteriorly elongates the soft palate to some extent. Formation of the soft palate uvula as described, produces a normal looking uvula, and at the same time, adds more length to the velum.

There are several advantages with this technique. Incisions, bleeding and the amount of general anesthesia administered are minimized. Raw areas are eliminated or greatly reduced, so healing proceeds rapidly with less pain; feeding can be started as soon as the patient recovers from anesthesia, and growth disturbances are lessened. Patients that operated by the author with conventional techniques that included relaxing incisions, before he developed the present technique without relaxing incisions, have smaller dental arches, alveolar distortion and retardation maxillary growth. The degree of distortion and growth disturbance was directly related to the extent of the relaxing incisions. In contrast, in patients managed without relaxing incisions, only minor distortions have been detected, mostly anteriorly near the area of previous lip repair, and facial growth has been better. Oronasal fistulas have been infrequent, and when they occur, they are small, located in the midline, and easy to close in two layers secondarily.

There are also some disadvantages with the technique. Initially the surgery will take longer than with the conventional procedures, and there is a learning curve. When the clefts are wide and the palatal vault is shallow, additional surgical maneuvers are needed to close the cleft without relaxing incisions.

CONCLUSIONS

This technique is a good alternative for repair of complete or incomplete, unilateral or bilateral clefts without relaxing incisions, and it is associated with few complications. The uvula repair as described produces a normal appearing uvula, and also helps to elongate the velum.
REFERENCES


10. Navarro CE. Can Reoperative Surgery be Prevented or Minimized?