Furlow's Palatoplasty is a Safe Competent Procedure for Isolated Cleft Palate Repair

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ABSTRACT

This prospective comparative study was designed to evaluate and compare the surgical outcome of Von Langenbeck and Furlow's techniques for repair of primary cleft palate. The study included 30 patients: 17 males and 13 females with mean age of 14.8±2.3 months. Patients were allocated into 2 equal groups according to the procedure; Group V underwent Von Langenbeck procedure and Group F underwent Furlow's procedure. Intraoperative data as regards width of the cleft at the junction between soft and hard palates, length increase in the soft palate, length of Z-plasty, the frequency of the need for hamulus fracture, duration of surgery and intraoperative blood loss were recorded. The postoperative distance between last molar tooth and the uvula was determined and compared versus preoperative one. There was a non-significant (p>0.05) difference between studied patients as regards the width of the cleft and the preoperative length of the distance between the last molar and uvula. Postoperative length of the distance between the last molar and uvula was significantly (p<0.05) longer in group F (3.81±0.42; range: 2.9-4.3 mm) and group V (3.29±0.42; 2.4-4 mm) compared to their preoperative length with a significantly (p<0.05) longer length in group F compared to group V. The mean increase of velar length was significantly (p<0.05) higher in group F (31.5±16.8%) compared to mean length in group V (10.1±16.8%).

INTRODUCTION

Orofacial clefts are defined as congenital defects in which the fusion between two or more of the following structures has failed: the palatal shelves, the maxillary prominences, and the medial nasal prominences which occur between the eighth and twelfth weeks of embryonic development. Clefting is the most common craniofacial anomaly; varies in severity and often involves the lip. In extreme cases, facial clefts are seen. Cleft lip and palate is one of the most frequent congenital anomalies with an overall incidence of roughly 1 in 1,000 births; while the incidence of cleft palate alone is roughly 1 in 2,000 births.\(^{1}\)

The clefts are surgically closed to restore the integrity of the oral and nasal cavity, and to allow for normal feeding and speech development. Improvement of speech problems seemed to be related to surgical intervention, and persistent problems seemed to be related to the presence of additional multiple malformations or syndromes.\(^{20}\)

The management of patients with cleft palate has improved significantly over the past 20 years.
Important surgical advances have accompanied a multidisciplinary approach to patient care. Technical innovations have become focused on improving functional results. Despite this, however, palatal fistulas remain a challenge. Reports of the incidence of postoperative fistula following palate repair range from 11% to 23%. The site most likely to fistulize at the junction of the hard and soft palates. A defect at this location is frequently associated with hypernasality of speech, depending on its size. Nasal exposure to oral contents and food trapping may be seen as well.

A modified Von Langenbeck method is often used for palatoplasty, the initial surgical repair of the palate. Incisions are made on both sides of the cleft and adjacent to the alveolar bone, and the mucoperiosteal flaps are mobilized and sutured together in the midline. As a consequence, this technique results in lateral open wounds with denuded bone. Healing of these wounds is associated with the disadvantageous effects on maxillary growth and dento-alveolar development often seen in cleft palate patients.

Difficulty in attempts at repair, fibrosis and poor vascularity of adjacent tissues, tension on suture line predispose to fistula formation and/or recurrence. Moreover, closure of wider clefts is particularly tenuous at the hard palate–soft palate junction. Despite wide undermining of palatal flaps and skeletonization of the greater palatine pedicle, this site represents the area of least mobility and greatest tension. These factors, compounded by the atrophic nature of the mucosa, the inadequate muscular layer centrally at the hard palate–soft palate junction, and the constant motion of the soft palate against the hard palate, further challenge successful closure.

Various techniques have been advocated to gain tissue for closure of cleft area, including hamulus fracture and distal dissection of the vascular pedicle. These techniques, however, may only provide 1 to 2 mm of additional length. For larger defects, local flaps may be used; buccinator musculomucosal flap, tongue flaps, and buccal fat pad flap have been advocated. These flaps, however, can be bulky and usually require a second-stage procedure. They are generally reserved for use once a fistula has occurred.

This prospective comparative study was designed to evaluate and compare the surgical outcome of Von Langenbeck and Furlow's techniques for repair of primary cleft palate.

PATIENTS & METHODS

This study was conducted at General Surgery and ENT Surgery Departments, Benha & Azhar Universities since Jan 2007 till Jan 2010 and included 30 patients; 17 males and 13 females with mean age of 14.8±2.3; range: 10 to 19 months. Patients were allocated into 2 equal groups according to the procedure undertaken; Group V underwent Von Langenbeck procedure and Group F underwent Furlow's procedure. All patients underwent full clinical examination to identify type of cleft palate and audiological evaluation included tympanometry and acoustic reflex. There were 11 patients (36.7%) with cleft soft palate with exposed adenoid mass, (Fig. 1), 10 patients (33.3%) with cleft soft and hard palates up to the incisive foramen, (Fig. 2), 7 patients (23.3%) had complete unilateral cleft and 2 patients (6.7%) had complete bilateral palate. There was a non-significant (p>0.05) difference between both groups as regards demographic data or distribution of types of clefts, (Table 1).

All surgeries were performed under general inhalational anesthesia using un-cuffed endotracheal tube with pharyngeal backing to prevent aspiration. Patients were placed supine with a sand-bag beneath shoulders to hyperextend the neck. Mouth was kept open throughout the procedure using a Devis-Boyle mouth gag.

Von Langenbeck palatoplasty involves elevation of large mucoperiosteal flaps from the hard palate and side-to-side approximation of the cleft margins of both soft and hard palates with detachment of the levator muscles from their bony insertions and the use of long relaxing incisions without lengthening maneuver. Wound closure involved 3-layers closure in soft palate and 2-layers closure in hard palate using vicryl 4/0 or 5/0 suture material, (Fig. 3).

Furlow's procedure involves oral side Z-plasty incision was made with the cleft is the central limb, lateral limbs end over the hamuli, cleft margins were incised, mucoperiosteal flaps elevated with Blair elevator and palatal muscles
were separated from the superior constrictor fibers laterally and from the nasal mucosa beneath. On the right, the anteriorly based mucosal flap was elevated from the underlying soft plate muscle and the mucoperiosteal flap was elevated. The nasal lateral limb incisions end at the tip of the Eustachian orifice on each side, then the flaps of the nasal Z-plasty were incised and a vomer flap was retracted. Then, transposition of the posteriorly based nasal Z-plasty flap brings the palatal muscle posteriorly and across the cleft. Insetting of the anteriorly based Z-plasty flap and former flap closes the front of the soft and hard palates. A mattress suture through the base of the left mucoperiosteal flap can assist in pulling the vomer flap across the cleft. Then, oral Z-plasty flaps were transposed to overlap the palatal muscles creating a palatal muscle sling. The hard palate was closed with horizontal mattress sutures to evert the stiff mucoperiosteum. (Fig. 4). (14)

Patients were observed in postanesthetic recovery room for 2 hours to assure patency of airway and well oxygenation. Patients were kept intravenous fluids for 24 hours and oral fluid intake was allowed on the 2nd postoperative day and provided by rubber tipped dropper. Patients were discharged on the 3rd postoperative day and mothers were instructed to avoid suckling and only watery-to-soft diet was allowed for 3 weeks and thereafter normal diet was allowed. Patients were followed-up weekly for one month and monthly for 3 months.

Intraoperative data as regards width of the cleft at the junction between soft and hard palates, length increase in the soft palate, length of Z-plasty, the frequency of the need for hamulus fracture, duration of surgery and intraoperative blood loss were recorded. The postoperative distance between last molar tooth and the uvula was determined and compared versus preoperative one.

**RESULTS**

There was a non-significant (p>0.05) difference between patients enrolled in both groups as regards the width of the cleft and the preoperative length of the distance between the last molar and uvula. Postoperative length of the distance between the last molar and uvula was significantly (p<0.05) longer in group F (3.8±0.42; range: 2.9-4.3 mm) and group V (3.29±0.42; 2.4-4 mm) compared to their preoperative length with a significantly (p<0.05) longer length in group F compared to group V, (Fig. 5). The mean increase of velar length was significantly (p<0.05) higher in group F (31.5±16.8%) compared to mean length in group V (10.1±16.8%).

Mean postoperative increase in length of soft palate was significantly (p<0.05) longer in group F (1.31±0.18; range: 1-1.6 mm) compared to group V (0.6±0.18; range: 1-1.6 mm), (Table 2, Fig. 5). All patients in group V required relaxing incision to tension-free competent wound closure irrespective of the preoperative cleft width; while only 2 of patients in group F required relaxing incision with a significant difference in favor of group F, (X2=5.39, p<0.05). These 2 patients required relaxing incision in group F had a preoperative cleft width of 1.5 mm. Mean length of Z-plasty incision required in group F was 1.52±0.18; range: 1.2-1.8 mm.

Mean operative time was significantly (p<0.05) shorter in group V (75±13; range: 55-95 min) compared to group F (84.3±8.2; range: 70-100 min), (Fig. 7). Furthermore, Furlow's procedure was associated with significantly more blood loss (67±15.4; range: 20-90 min) compared to Von Langenbeck procedure (49±12.7; range: 15-65 ml), (Fig. 8). Only one patient in group F had small fistula, but no patient had wound dehiscence; while in group V, one patient had wound dehiscence and another had oronasal fistula.

**Table (1): Patients distribution according to demographic data and preoperative findings**

<table>
<thead>
<tr>
<th>Data</th>
<th>Group V</th>
<th>Group F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (months)</td>
<td>15.2±2.6</td>
<td>14.5±2</td>
<td>14.8±2.3</td>
</tr>
<tr>
<td>Sex; M:F</td>
<td>9:6</td>
<td>8:7</td>
<td>17:13</td>
</tr>
<tr>
<td>Type of cleft</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleft soft palate</td>
<td>5 (33.3%)</td>
<td>6 (40%)</td>
<td>11 (36.7%)</td>
</tr>
<tr>
<td>Cleft soft &amp; hard palate till incisive foramen</td>
<td>5 (20%)</td>
<td>5 (20%)</td>
<td>10 (33.3%)</td>
</tr>
<tr>
<td>Complete unilateral cleft</td>
<td>4 (26.7%)</td>
<td>3 (20%)</td>
<td>7 (23.3%)</td>
</tr>
<tr>
<td>Complete bilateral cleft</td>
<td>1 (20%)</td>
<td>1 (20%)</td>
<td>2 (6.7%)</td>
</tr>
</tbody>
</table>
Table (2): Mean procedural data

<table>
<thead>
<tr>
<th>Data</th>
<th>Group V</th>
<th>Group F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of the cleft (mm)</td>
<td>1.15±0.14</td>
<td>1.25±0.2</td>
</tr>
<tr>
<td>Length of distance between last molar and uvula (mm) Preoperative</td>
<td>3±0.48</td>
<td>2.94±0.46</td>
</tr>
<tr>
<td></td>
<td>Postoperative</td>
<td>3.29±0.42*</td>
</tr>
<tr>
<td>Postoperative increase in length of soft palate (mm)</td>
<td>0.6±0.18</td>
<td>1.31±0.18†</td>
</tr>
<tr>
<td>Length of Z-plasty incision (mm)</td>
<td>No Z-incision</td>
<td>1.52±0.18</td>
</tr>
<tr>
<td>Need for relaxing incision</td>
<td>Yes</td>
<td>15 (100%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>0</td>
</tr>
</tbody>
</table>

Data are presented as mean±SD    *: significant versus preoperative †: significant versus group V
DISCUSSION

The ideal surgical approach for management of the cleft palate deformity continues to be a source of controversy. The goal of cleft palate surgery is to repair the defect and allow normal facial growth and speech development. Different treatment approaches have evolved over the years in an attempt to balance facial growth with speech development, esthetic considerations and the child’s social needs.\(^{15}\)

Timing of repair of craniofacial clefs is still a matter of debate; McHeik et al.,\(^{16}\) encouraged early cleft lip and nose repair during the first 4 weeks of life in the full-term baby as the good method of management of newborns with cleft. However, Liao et al.,\(^{17}\) reported that timing of hard palate repair significantly affects the growth of the maxilla in patients with unilateral cleft lip and palate and late hard palate repair has a smaller adverse effect than does early hard palate repair on the growth of the maxilla. This timing effect primarily affects the anteroposterior development of the maxillary dentoalveolus and is attributed to the development being undisturbed before closure of the hard palate. On contrary; Salyer et al.,\(^{18}\) reported that age at palatoplasty did not affect the development of velopharyngeal insufficiency in studied patients and all underwent palate repair before 12 months of age. The current study included 30 patients with variant forms of isolated cleft palate in children with mean age of 14.8±2; range: 10-19 months at time of repair.

Postoperative length of the distance between the last molar and uvula was significantly (p<0.05) longer in group F and group V compared to their preoperative length with a significantly longer length in group F compared to group V and a significantly higher percentage of increase of length in group F (31.5±16.8%) compared to group V (10.1±16.8%). Also, the mean postoperative increase in length of soft palate was significantly (p<0.05) longer in group F compared to group V.

These data go in hand with that previously reported in literature; Huang et al.,\(^{19}\) reported that Furlow double opposing Z-plasty repositions the velar muscles in transverse orientation and increases both velar length and thickness. D’Antonio et al.,\(^{20}\) reported a significant increase in velar length after Z-plasty. Guneren & Uysal,\(^{21}\) performed quantitative evaluation of palatal elongation after Furlow palatoplasty and reported an increase of 55.47% of preoperative length. Deren et al.,\(^{22}\) performed Furlow palatoplasty in patients who had undergone primary palatoplasty with the Veau-Wardill-Kilner technique and reported 44% of mean velar length compared to preoperative length.

All patients in group V required relaxing incision irrespective of the preoperative cleft width. In group F, only 2 patients (13.3%) required relaxing incision, while the other 13 patients did not require with a significant difference in favor of group F, (X²=5.39, p<0.05). These 2 patients required relaxing incision in group F had a preoperative cleft width of 1.5 mm. These data illustrates the applicability of Furlow palatoplasty irrespective of the preoperative cleft width these data agreed with Oyama et al.,\(^{23}\) who reported that 11 of 13 patients underwent Furlow’s palatoplasty without relaxing incisions, and in 2 (15.4%) patients relaxing incisions were required along the inside of the alveolus and relaxing incisions around the maxillary tuberosities were not required in any of the 13 cases. Also, Weinzweig et al.,\(^{24}\) experimentally performed in utero palatoplasty using a modified von Langenbeck technique with elevation of bilateral mucoperiosteal flaps and lateral relaxing incision in 6 fetuses.

Only one patient in group F had small fistula, but no patient had wound dehiscence; while in group V, one patient had wound dehiscence and another had oronasal fistula. These findings
showed the better wound healing of using Z-plasty instead of direct closure despite the relaxing incision performed in all cases included in group V and agreed with Yu et al., (25) and Sie et al., (26) who reported similar figures of complications with both procedures and concluded that the number of complications after a Furlow palatoplasty was low and it should be a recommended treatment. Also, Mommaerts et al., (27) reported that Furlow's technique could be used for closure of complete cleft palates (with or without cleft lip or alveolus) with an acceptable rate of complications.

It could concluded that Furlow's palatoplasty is appropriate surgical procedure for closure of isolated cleft palate irrespective of cleft width and provides significant lengthening of the uvula with few postoperative complications.

REFERENCES


