The outcome of the buccinator myomucosal flap in cleft palate repair

Original Article

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ABSTRACT

Background: Researchers have reported a variety of surgical methods for cleft palate revision. Herein, we evaluated our experience and outcomes obtained after the addition of the buccinator myomucosal flap (BUMF) to a modified Furlow technique for cleft palate repair.

Patients and Methods: The current study included 20 patients who underwent palatal surgery using modified Furlow's technique with a BUMF, and another 20 patients underwent palatal surgery with Furlow Z-plasty only. Inclusion criteria were children in the age group of 8 months up to 8 years who complained of a cleft soft or hard palate, unilateral or bilateral, either primary repair or a recurrent case with a fistula.

Results: The father's age influences the risk of having a child with a cleft palate. Sixty-five percent of fathers in this study were more than 35 years old at the time of conception. The most common early postoperative complication was mild facial edema, which disappeared spontaneously after 2 days with the help of anti-edematous medicaments. Recurrent fistula occurred only in three (15%) patients of the Furlow Z-plasty without BUMF group.

Conclusion: Treating a cleft palate with a BUMF and modifying Furlow's methods may be an effective surgical technique with a good outcome.

Key Words: Cleft palate, Father's age, Furlow Z-plasty.

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INTRODUCTION

The primary goals of cleft palate surgery are to obturate the defect by separating the nasal and oral spaces and to provide optimal anatomic and physiologic mechanisms for speech, swallowing, and airway function while minimizing disturbance with maxillofacial growth[1]. In 1978, Dr Leonard T. Furlow Jr presented the Furlow Z-plasty of the palate. By avoiding longitudinal scar contracture, the Z-plasty lengthens the soft palate. By medializing the tonsillar pillars, this technique constricts the nasopharyngeal space. Another distinctive feature of this treatment is that it realigns the palatal musculature to produce a levator muscle sling in the proper anatomical location[2,3].

The addition of buccal flaps to a modified Furlow surgery has expanded the effectiveness of the Z-plasty to correct wider and more complicated clefts[4]. It serves as a support layer for the palate closure, expanding the nasal layer and preventing raw areas, tension, and poor muscle reconstruction[4]. It was used for the first time by Bozola *et al*.[5] for the closure of palatal fistulae after cleft palate repair. This flap tolerates moderate stretching, pressure, and 180° rotation and twisting due to its inherent suppleness and elasticity[6]. This flap is either an axial pattern flap, which can be based either on the buccal or facial arteries or a random pattern flap. It is flexible and versatile. Generally, closing the donor site primarily does not result in deformities[7].

Despite the advancements in surgical techniques for cleft palate repair, challenges such as achieving optimal functional outcomes and minimizing complications remain. The rationale for this study is to investigate whether the addition of the buccinator myomucosal flap (BUMF) to the modified Furlow technique can improve the outcomes of cleft palate repair, especially in complex and wide clefts. Our objective is to assess the effectiveness of this combined surgical approach in terms of functional improvements and complication rates.

Herein, the Furlow Z-plasty with the addition of the BUMF has been performed on all cleft palate patients, regardless of cleft type or cleft width. With the BUMF, the tension on closure is decreased. The study's objective is to assess the outcomes obtained after the reconstruction of primary and secondary palatal clefts using a bilateral or unilateral BUMF with modified Furlow's technique.

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PATIENTS AND METHODS:

The current study was a case–control study. It included 20 patients with primary and secondary cleft palates who presented to Cairo University Specialized Paediatric Hospital (CUSPH) and underwent a unilateral or bilateral BUMF during the period from November 2021 to November 2023. The other group of the study was 20 patients who underwent palate repair with Furlow's technique without adding BUMF. The age groups ranged from 8 months up to 8 years. A single surgeon performed the two operations.

Ethical approval and consent to participant: approved by Cairo University Medical ethical committee. An informed consent to participate was obtained from the parents or the legal guardians of the patients.

Inclusion criteria were children in the age group of 8 months up to 8 years who complained of a cleft soft or hard palate, either unilateral or bilateral, and who underwent operative correction by BUMF with modified Furlow's technique or Furlow's technique without BUMF either for primary repair or a recurrent case with a fistula. Exclusion criteria included patients with scarred buccal mucosa, patients with mental cognitive impairment, and syndromic cleft palate infants.

Preoperative assessment

History-taking and general examinations were done on all the patients to detect any comorbidities or other associated anomalies. A local examination was done, and patients were evaluated regarding the type of cleft palate, site, and cleft width, either wide clefts (>10 mm) or medium clefts (5–10 mm) and narrow clefts (<5 mm). Also, the size of the fistula in cases of post-palatoplasty fistula. Patients with associated cleft lip underwent cleft lip repair during the first 3–5 months of age. A cleft palate repair was performed 6–8 months later. A preoperative routine investigation was done. Prior to the procedure, an informed consent form was signed by each patient's relative.

Operative technique

At the operating theater, the patient lies in a supine position. The neck was slightly extended. A pillow or sandbag was put under the shoulder, and the foot end was slightly down. At the induction of anesthesia, all patients received i.v. third-generation cephalosporin intraoperatively. All patients received Tranexamic Acid (Cyklokapron) 10 mg/kg intravenously.

The endotracheal tube was applied orally, centrally, and downward. It should be fixed tightly to avoid removal during manipulation; it was preferred to use the Ring Adair Elwin or armored endotracheal tube to avoid its kink.

After sterilization with povidone–iodine, traction was applied using a Dingman mouth gag. The patient was photographed at this stage. The anatomy of the cleft was evaluated; the cleft's width, the palate shelves' arch, and the velar musculature's length and breadth were all noted (Fig. 1).

First, the cleft palate was repaired by modified Furlow's technique (double-opposing Z-plasty palatoplasty) (Figs 2 and 3). The details of the operation were described in the following intraoperative pictures.

Four triangular flaps were used, two from each side of the palate, with one mucosal and one combined muscle and mucosal flap on each side (Figs 4–6).

The two flaps containing muscle were rotated posteriorly, and the two mucosa-only flaps were transposed anteriorly (Figs 7 and 8).

Rather than closing under tension or leaving behind raw surfaces, buccal flaps were used to fill in the gaps caused by the posterior displacement of the reconstructed soft palate. Both Z-plasty and the placement of buccal flaps between the hard and soft palates are two methods used to lengthen the palate.

The buccinator musculomucosal flap

Flap design

The outline of the BUMF was marked on the buccal mucosa; an inferiorly based pedicle flap was raised from the cheek mucosa. The flap was pear-shaped and narrow at the base. It broadens anteriorly and tapers at the distal end. In a 1–1.5-year-old child, the flap size is 1.5–2 cm in width x4–5 cm in length. The size was bigger in grown-up children and adults. The maximum size can be 4 cmx7 cm.

Flap dissection

After applying moderate counterpressure on the cheek from the outside, the flap was marked and incised in a composite thickness comprising mucosa and buccinator muscle, sparing the buccopharyngeal fascia (Figs 9–11). Preservation of the buccopharyngeal fascia prevents herniation of the buccal fat pad and inadvertent injury to the branches of the facial nerve.

The flap's anterior edge was placed not less than 10–15 mm posterior to the oral commissure to avoid lip distortion due to scarring; the flap's posterior edge was always placed anterior to the parotid duct so as not to damage it. The musculomucosal flap was elevated from the buccopharyngeal fascia in a superior-to-inferior direction by way of a sharp dissection.

Flap transfer and insertion

The flap was then turned transversally 90° to cover the raw hard palate bone surfaces or palatal fistula in cases of secondary repair (Fig. 12). It was used simultaneously for the reconstruction of the nasal lining and the oral surface defect. It was sutured to the adjacent mucoperiosteal flap with the feces's mucosa facing the oral lumen (Fig. 13). The Dingmann retractor used for exposure was removed before closure of the buccal flap donor sites. The donor site was closed by a direct suture. 5-0 Vicryl suture was used throughout the repair (Fig. 14).

In the case of the second palatal fistula, the nasal layer should close first, then transverse the buccinator flap (Fig. 15).

Postoperative care

(1) Postoperatively, the child was put in a prone position for 2–3 h, then lay in a semisitting position for 3–5 days.

(2) The flap was monitored 6 h postoperatively, then every 12 h for the first 48 h, then once every day.

(3) The child starts clear fluid feeding 4–5 h postoperatively for 3 days, then semisolids for another 3 days.

(4) The patients receive amoxicillin/clavulinic for 7 days postoperative, local antifungal treatment, Metronidazole (Flagyl) syrup, antifungal cream, and mouthwash.

(5) Analgesia is obtained by Diclofenac sodium oral syrup or rectal suppository; the dose adjusts depending on the age of the child.

(6) Early postoperative complications: we observed palatal and donor-site complications, early complications like postoperative bleeding, hematomas, episodes of airway obstruction, wound dehiscence, infections, parotid duct injury or obstruction, and facial nerve injury.

Follow-up

(1) The follow-up period was 6 months. The flaps were evaluated as regards achieving the preoperative goal of coverage of the palatal fistula and symptom improvement (such as regurgitation) (Fig. 16).

(2) Because the patient's short recovery period following this type of surgery means that we would not be able to assess the impact on maxillary development and velopharyngeal incompetence, we will also not conclude that maxillary growth retardation can be avoided with this therapy.

(3) Late postoperative complications: we observed late complications like fistulas, total buccal flap loss, partial necrosis at the tips of the buccal flaps, trismus, or other dysfunction related to mouth movement. Herein, an intraoperative image of another patient repaired a disrupted posterior palate by double-opposing Z-plasty palate repair with BUMF for teaching purposes and more demonstration (Figs 17–20).

Fig. 1: Cleft soft palate with traction applied by Dingman mouth gag.

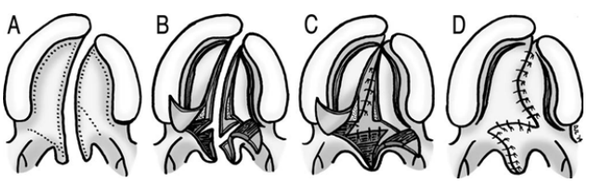

Fig. 2: Furlow double-opposing Z-palatoplasty[8]. (a) Markings for incisions. (b) Four triangular flaps are used, two from each side of the palate, with one mucosal and one combined muscle and mucosal flap on each side. (c) The two flaps containing muscle are rotated posteriorly, and the two mucosa-only flaps are transposed anteriorly. (d) Final appearance after complete closure[8].

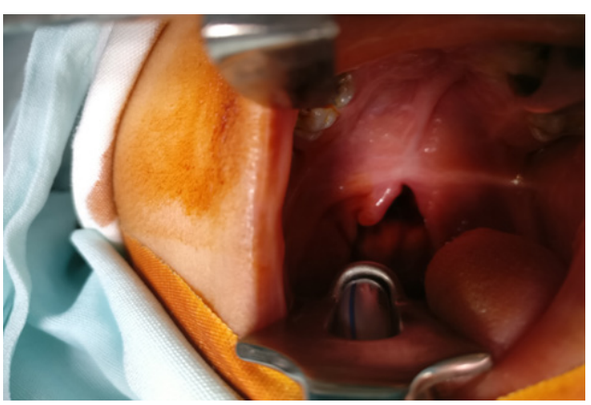

Fig. 3: Patient with a previous complete cleft palate developed a disrupted posterior palate (uvula and part of the posterior wall) and had a short palate with velopharyngeal insufficiency.

Fig. 4: Initial oral layer incision with myomucosal and mucosal flap.

Fig. 5: Reflection of oral myomucosal and mucosal flap (reversing Z-plasty flaps) and initiation of nasal myomucosal and mucosal flaps.

Fig. 6: Four triangular flaps, two from each side of the palate, with one mucosal and one combined muscle and mucosal flap on each side.

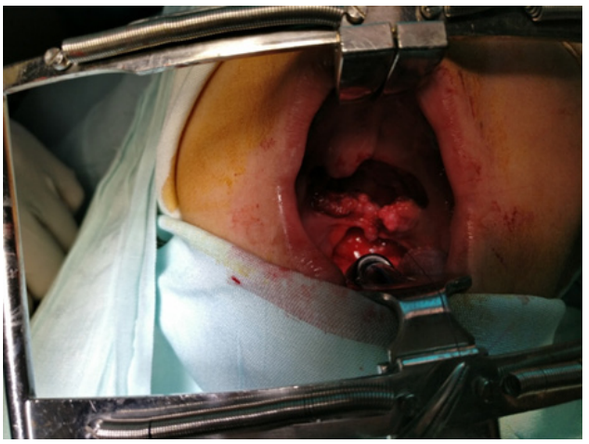

Fig. 7: The two flaps containing muscle are rotated posteriorly to reconstruct the levator veli palatine muscle and allow re-establishment of the levator sling, thus reconstructing the soft palate.

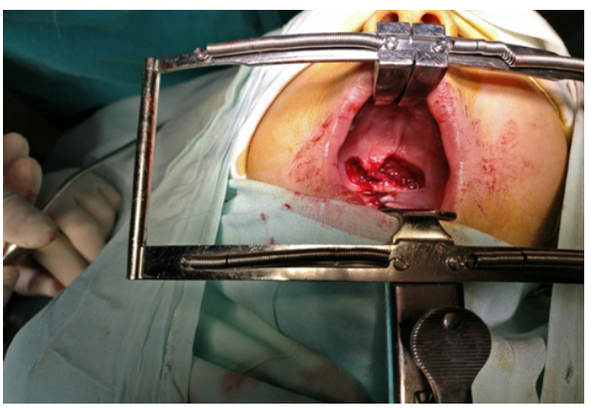

Fig. 8: Reconstruction of the soft palate by two posterior-based flaps.

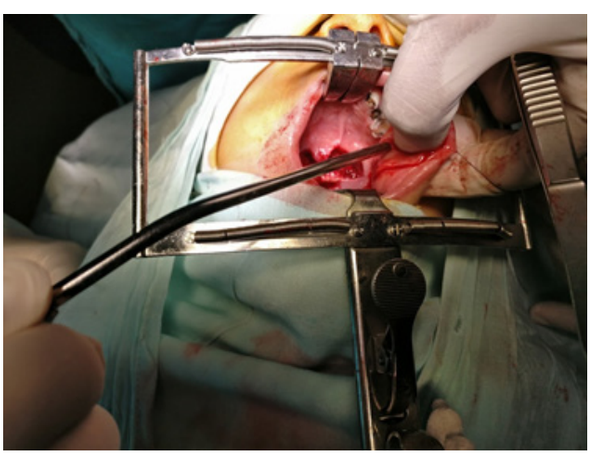

Fig. 9: Intraoperative views illustrating the flap incision. The flap was planned in the midpart of the cheek, below the opening of the Stenson's ducts. The flap was designed with a "V" shape 10–15 mm behind the oral commissures to avoid lip distortion due to scarring.

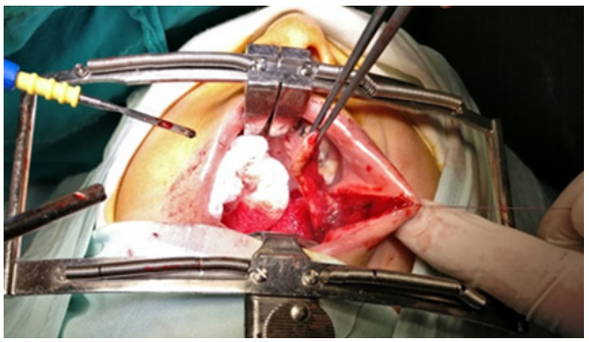

Fig. 10: Flap dissection (the nontoothed forceps are catching the flap).

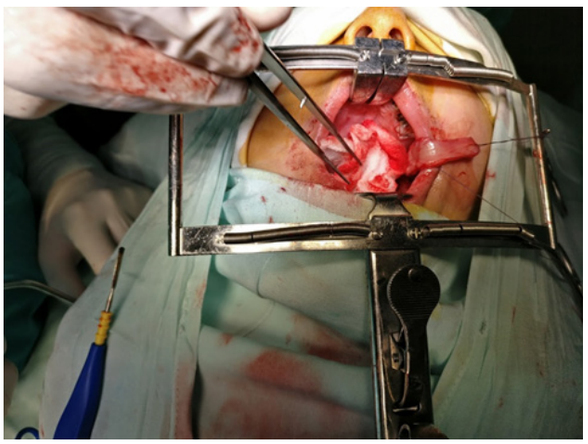

Fig. 11: The buccinator musculomucosal flap.

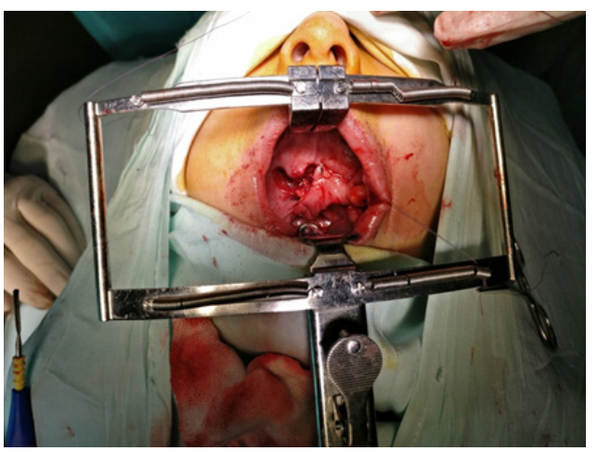

Fig. 12: The flap was then turned transversally 90º to cover the hard palate defect. It was sutured to the adjacent mucoperiosteal flap, with the flap's mucosa facing the oral lumen.

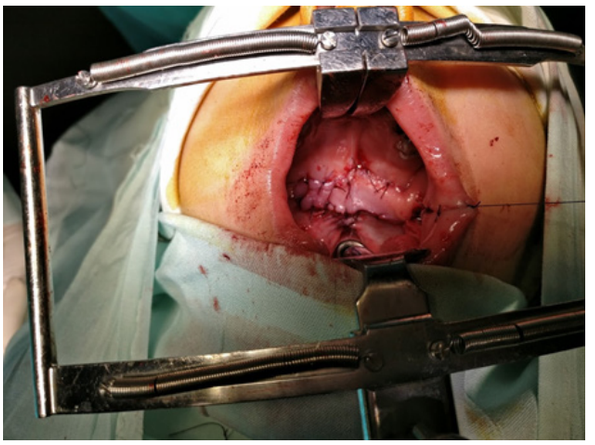

Fig. 13: Intraoperative view revealing the left-sided flap inserted into the defect and sutured into the oral layer with the flap' mucosa facing the oral lumen.

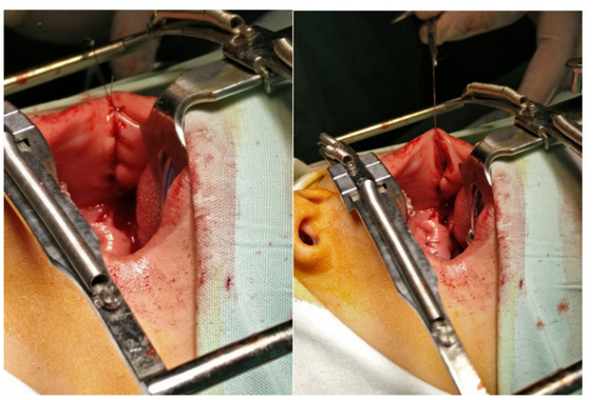

Fig. 14: The donor site was closed by a direct suture.

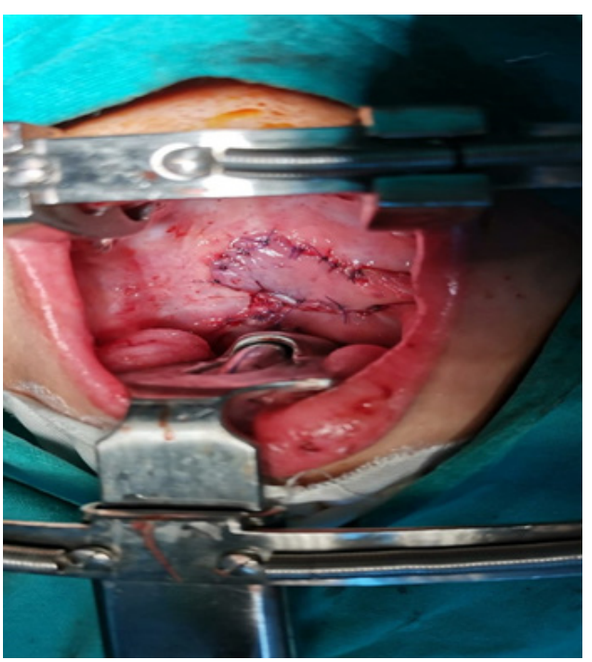

Fig. 15: Immediate postoperative view.

Fig. 16: One-month postoperative.

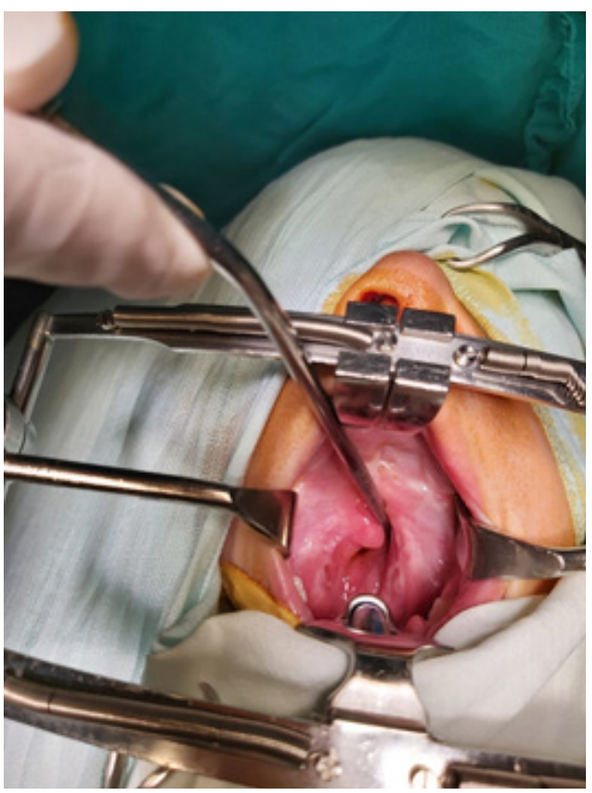

Fig. 17: Patient complained of the disrupted posterior palate (uvula and part of the posterior wall).

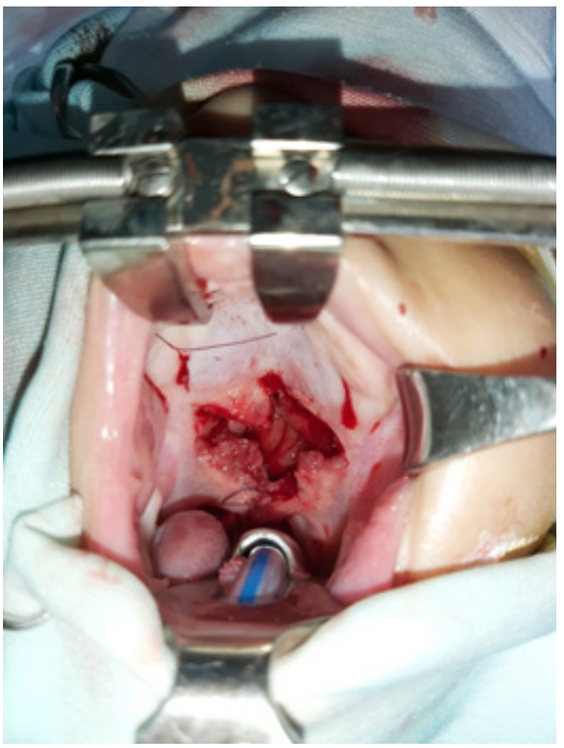

Fig. 18: Four triangular flaps, two from each side of the palate, with one mucosal and one combined muscle and mucosal flap on each side (Furlow's technique of double-opposing Z-plasty palate).

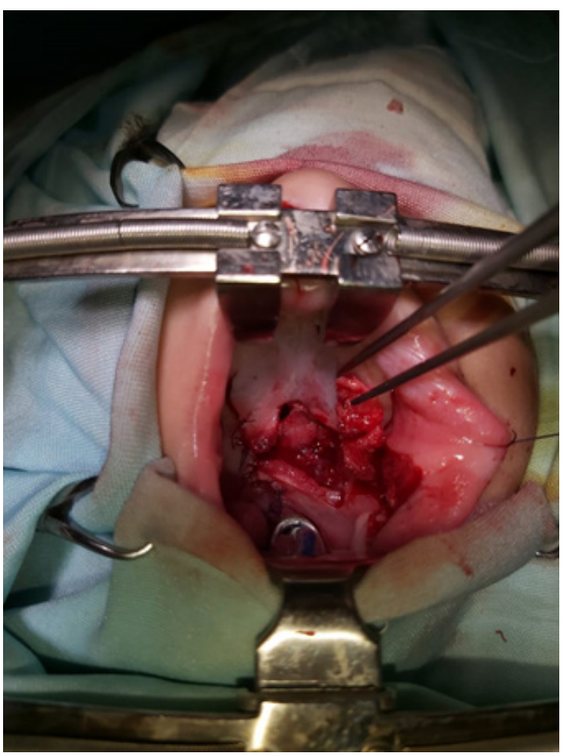

Fig. 19: The soft palate reconstructed by two posterior-based flaps. The buccinator musculomucosal flap (nontooth forceps) was dissected.

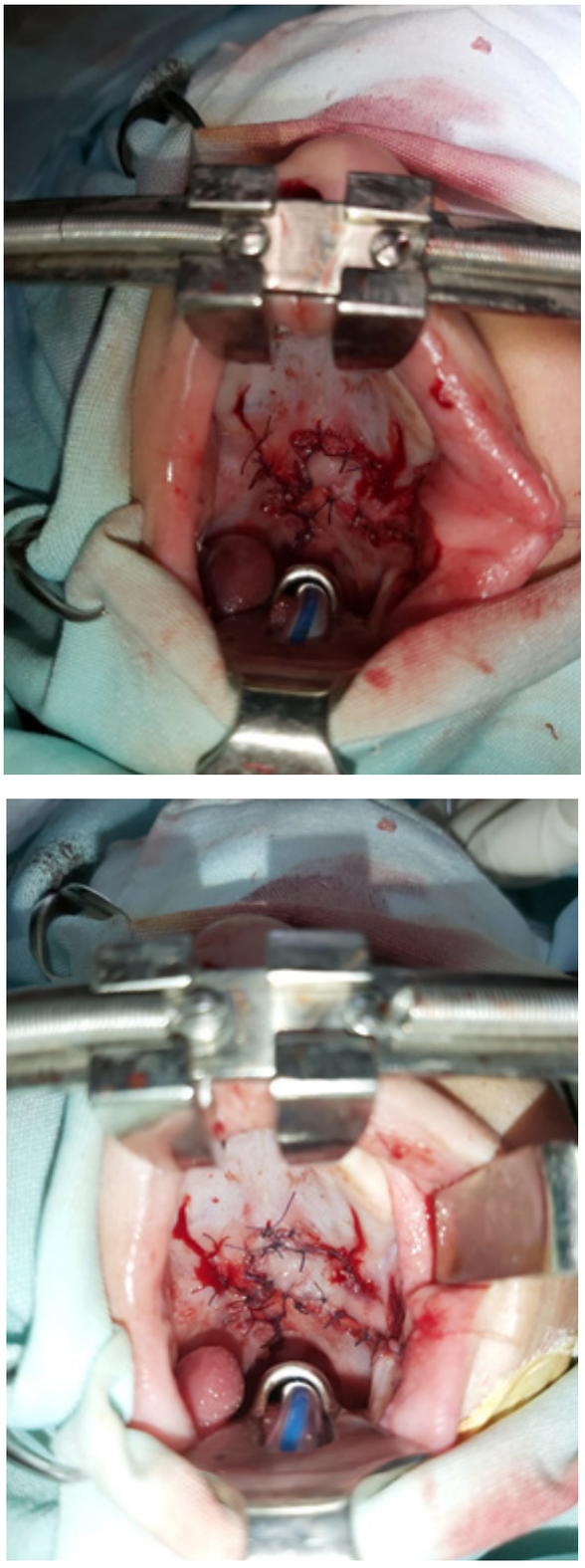

Fig. 20: Intraoperative view revealing the left-sided flap inserted into the defect and sutured into the oral layer with the flap' mucosa facing the oral lumen.

RESULTS:

The current study included 40 patients who fit the inclusion and exclusion criteria. All patients were nonsyndromic.

Patients' demographics

Age and sex

In this study, the age group ranges from 8 months up to 8 years old. The mean age was 25 months. There were 13 (65%) males and seven (35%) females in Furlow's technique with BUMF. In Furlow's technique without BUMF, there were 15 (75%) males and five (25%) females. The ratio of cleft palates in males compared to females was 3 : 1 (Fig. 21).

Family history

In Furlow's technique with BUMF, nine mothers were more than 35 years old at the time of pregnancy. The other 11 mothers' ages were less than 35 years old (Table 1). Fourteen (70%) fathers were more than 35 years old. While in Furlow's technique without BUMF, seven (35%) of mothers were more than 35 years old, and 12 (60%) of fathers were more than 35 years old. Table 1 showed that the old mother's age was not responsible for the cleft palate, while the old father's age was associated with the cleft palate.

Twenty-four (60%) parents in our study were relatives and cousins (Fig. 22). The ratio of cleft palates in relatives' parents compared to nonrelative parents was 1.5 : 1. The incidence of cleft palate was more common in relatives' parents. Endogamy refers to parents who are first or second cousins.

Indication for surgery

In Furlow's technique without BUMF, all 20 (100%) patients complained of an incompletely primary cleft soft and hard palate (it was the first operative intervention for the patients). The clefts' widths were medium clefts (5–10 mm) in 16 patients or narrow clefts (<5 mm) in four patients.

In Furlow's technique with BUMF, 14 (70%) patients undergo surgery for a wide palatal fistula of the second cleft palate (second cleft palate means patients with previous operations who developed a recurrent palate fistula and needed redo surgery). The size of the fistula ranged from 1 to 2.5 cm. The most common site of the recurrent fistula was in the secondary hard palate (hard palate posterior and middle) in seven (50%) cases (Figs 23 and 24). All fistulas were grade 1: score 4–6 according to Richardson and Agni[9] classification and difficulty index.

The other six (30%) patients had an incompletely primary cleft soft and hard palate (it was the first operative intervention for the patients). The clefts' widths were medium clefts (5–10 mm) in two patients and wide clefts (> 10 mm) in four patients.

Type of used buccinator flap

All buccinator flaps were inferiorly based, random, regional, rotational, pedicle, and myomucosal flaps.

Modified Furlow's technique with buccinator musculomucosal flap

The mean time of the surgical procedure was about 100±20 min. One case was operated on by a bilateral buccinator flap; the time of this operation was 130 min. The mean amount of intraoperative blood loss was 60±10 ml. The mean hospital stay was 1 day preoperative and 1 week postoperative ±1 day. In two cases, the need for a second operative intervention was due to disruption of the donor suture site in one patient and partial necrosis at the tip of the flap in another.

Furlow's technique without buccinator musculomucosal flap

The mean time of the surgical procedure was about 75±25 min. The mean amount of intraoperative blood loss was 50±5 ml. The mean hospital stay was 1 day preoperative and 6 days postoperative ±1 day. In three patients, the need for a second operative intervention was due to recurrent fistula.

Complications

Early

The early complication in Furlow Z-plasty with BUMF is facial edema, which occurs postoperatively in 10 (50%) patients, but disappears spontaneously after 1 or 2 days. It is defined as increasing the dimension of the face. There's only one case of postoperative oozing. It was stopped by compression with ephedrine-soaked gauze for 5 min. Donor-site morbidities had occurred in three (15%) patients (Table 2).

The early complication in Furlow Z-plasty without BUMF is facial edema, which occurs postoperatively in six (30%) patients. (Table 3) showed that there were no significant differences between the two types of operation with or without BUMF regarding postoperative facial edema or blood oozing.

Late

Partial necrosis at the tip of the buccal flap was observed in one (5%) patient in Furlow Z-plasty with BUMF. Closure under general anesthesia occurs after 6 months. The late complication in Furlow Z-plasty without BUMF was the occurrence of recurrent fistula in three (15%) patients (Table 3). Table 3 showed that there were no significant differences between the two types of operations regarding recurrent fistulas (*P=0.072*).

Total complications rate

In two cases with BUMF, the need for a second operative intervention was due to disruption of the donor suture site in one patient and partial necrosis at the tip of the flap in another. The total complication rate was 10%. In Furlow Z-plasty without BUMF, the three patients who had recurrent fistulas underwent another operative intervention. The repair in the second operation occurred with the help of the BUMF without any recurrence. The total complication rate of Furlow Z-plasty was 15%.

Quality of life

Regarding clinical improvements such as regurgitation and nasal tone, out of 20 patients with BUMF complaining of regurgitation, 19 were satisfied with the flap result. Out of 20 patients with BUMF complaining of nasal tone, 10 cases showed tone improvement. So, most patients' parents were satisfied either with fistula closure or symptomatic improvement, even in patients with partial necrosis at the tip of the flap. The same results occurred with Furlow Z-plasty without the BUMF group after redoing operations for the three patients with recurrent fistulas by adding the BUMF.

Table 1: Association between the parent's conception age and the incidence of the cleft palate

	Mothers' conception age		Father's age	
Incidence of cleft palate	Mothers age >35 years	Mothers age <35 years	Father's age >35 years	Father's age <35 years
		Furlow Z-plasty with BUMF		
	9 (45)	11 (55)	14 (70)	6 (30)
n (%)		Furlow Z-plasty without BUMF		
	7 (35)	13 (65)	12 (60)	8 (40)
Total	16 (40)	24 (60)	26 (65)	14 (35)

Sixty-five percent of fathers were more than 35 years old at the time of the conception.
BUMF, buccinator myomucosal flap.

Table 2 Donor site morbidities

Donor site morbidities	*n* (%)
Postoperative infection resolved with antibiotics	1 (5)
Postoperative infection led to disruption of the suture site	1 (5)
Postoperative infection led to healing by fibrous tissue	1 (5)

Table 3: Early and late complications of Furlow Z-plasty and Furlow Z-plasty with buccinator myomucosal flap

Type of operation	Furlow Z-plasty [*n* (%)]	Furlow Z-plasty with BUMF [*n* (%)]	*P* value
Facial edema	6 (30)	10 (50)	0.197
Blood oozing	0	1 (5)	0.311
Recurrent fistula	3 (15)	0	0.072

BUMF, buccinator myomucosal flap.
χ^2 test.

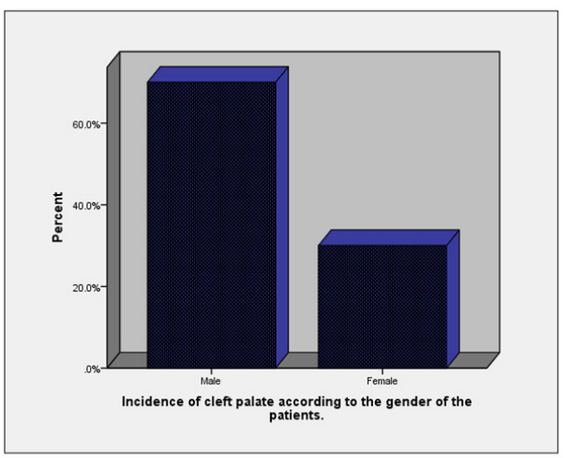

Fig. 21: Incidence of cleft palate according to the sex of the patients. It is more common in males (70%) than females (30%).

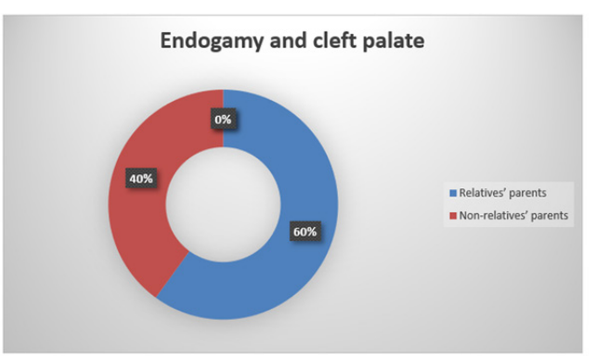

Fig. 22: Association between endogamy and cleft palate. Sixteen (40%) patients were nonconsanguineous marriages while 24 (60%) parents were a result of endogamy marriage. The incidence of cleft palate is more common in consanguineous than nonconsanguineous marriages.

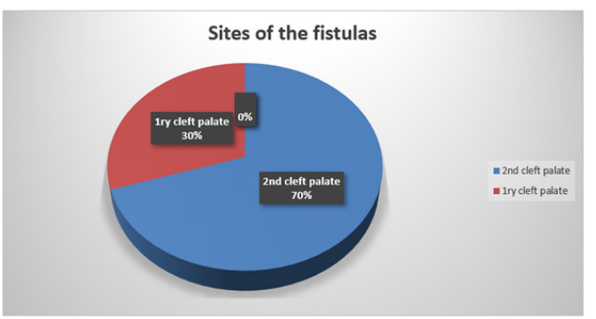

Fig. 23: Site of palatal fistulae.

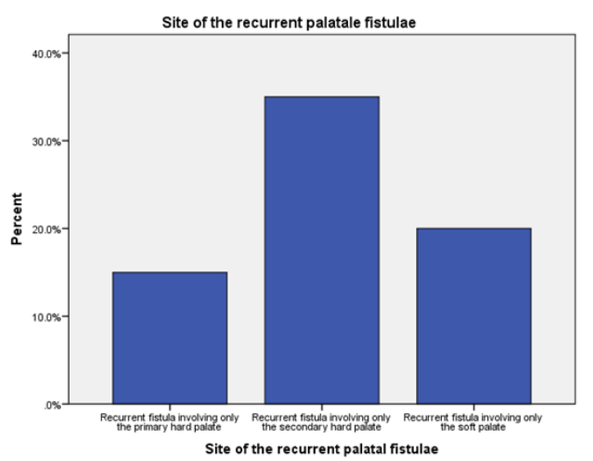

Fig. 24: Site of the wide palatal fistula of second cleft palate that underwent repair in this study. The most common site of the recurrent fistula was in the secondary hard palate, seven (50%) cases, then in the soft palate or uvula, four (28.6%) cases. The last three (21.4%) cases of recurrent fistula were in the primary hard palate.

DISCUSSION

Currently, many techniques are used as treatments for cleft palate, but the best type of treatment for patients is still unclear. Mann *et al*.[10] reported in 1997 the use of buccal flaps in conjunction with double Z-plasty to close larger clefts with less strain and the seldom requirement for lateral relaxing incisions along the alveolus. These benefits optimize blood flow to the alveolus and reduce the formation of scars[3]. Herein, we evaluated our experience and outcomes obtained after using BUMF for cleft palate repair in either primary (30%) or secondary (70%) cases.

All buccinator flaps used in the current study were inferiorly based, random, regional, rotational, pedicle, and myomucosal flaps.

(1) In posterior or anteriorly based flaps, the long axis is horizontal, but in superior or inferiorly based flaps, the long axis is vertical. This flap is inferiorly based because the long axis is vertical, and the pivot point is located inferiorly on the retromolar trigon.

(2) Random, as the mucosa did not separate from the underlying muscle. Buccinator flaps with a random pattern rely on the robust vascular supply of the buccinator muscle. A thin layer of buccinator muscle without including the axial artery can survive if sufficient pedicle width is considered.

(3) Regional because it transverses from the cheek to the palate. It is rotational because it rotates around the inferior pedicle of the flap from the cheek to the adjacent tissue defect on the palate.

(4) There was no need for pedicle base division, so it is a pedicle.

(5) Myomucosal because it consists of muscle and mucosa.

In this study, the occurrence of cleft palate is higher in males (70%) than females (30%). The male-to-female ratio is 3 : 1. The mean age at operative intervention was 25 months. The age of the father alone affects the likelihood of producing an infant with a cleft palate; the mother's age has little impact (Table 1). The ratio of cleft palate children born to parents with a history of relative marriage versus nonrelative marriage is 1.5 : 1. It raises a question: does endogamy affect cleft palate incidence and indicate the presence of a genetic predisposition? (Fig. 22). In 2021, Nasreddine *et al*.[11] reported a higher prevalence of cleft lip and palate among children whose parents were related. In addition, Putri *et al*.[12] reported that older paternal age increases the prevalence of nonsyndromic cleft palate. Most of our patients are from remote rural areas. So, a 1-week postoperative follow-up inside the hospital is important to manage postoperative complications without neglecting children.

For the majority of patients, intraoperative hemorrhage is tolerable. Blood loss is decreased when epinephrine lignocaine solution is used. Bipolar coagulation is a very helpful tool for reaching hemostasis. A small number of patients still have bleeding, mostly from the outer edges of the mucoperiosteal flaps and from the exposed membranous bony palate. Packing is necessary using either oxidized cellulose polymer fibers (surgical) or absorbable compressed gelatin sponges (gel foam)[13].

Only one case of postoperative bleeding had been reported in our study, and it was managed by compression with ephedrine-soaked gauze for 5 min. We used ephedrine-soaked gauze, not norepinephrine because ephedrine has a longer duration as a vasoconstrictor than norepinephrine. Also, through an unclear mechanism, ephedrine may be considered for short-term and/or supplemental treatment of nausea, vomiting, and dizziness in postoperative patients[14].

All patients undergoing palatoplasty must have postoperative pulse oximetry performed until that child is completely awake and able to sustain O_2 saturation on their own without assistance. We did not report any cases of any form of respiratory obstruction. Facial nerve damage can occur, but it is rare and should be avoided when remaining in the same layer during the preparation of the flap[15]. In the current study, no patients were complicated by a facial nerve injury. The parotid duct should be carefully protected, but if damaged, it is of no consequence; the parotid secretion always finds a way out[16]. None of our cases were complicated by parotid duct injuries.

The most common early postoperative complication was mild facial edema, which was defined by increased face diameters, and it appeared in 10 patients. Facial edema disappeared spontaneously after 2 days in our patients. Anti-edematous measurements are helpful in the resolution of facial edema, such as Avil ampule 0.5 mg/kg and hydrocortisone amp 0.2 mg/kg once.

In our study, three (15%) cases with donor site comorbidities were reported. The main causes of donor site morbidities in our patients were postoperative donor site infections. One case improved with medical treatment with oral antibiotics [Amoxicillin, Metronidazole (Flagyl) syrup, antifungal cream, and mouthwash]; one case developed suture disruption and had to redo sutures after 3 weeks from the primary operation; and one case had healed by fibrous tissue (Table 2). The buccal cavity is easily contaminated by pathogens in children. This explains the source of

the postoperative infection. Disruption of the suture site is a sequence for postoperative infection. The healing of the donor site by fibrous tissue occurs due to postoperative infection. It causes stiffness of the cheek, but this finding resolves spontaneously after 3 months.

Fistula, as a late complication of cleft palate repair, was not reported in any cases in the Furlow Z-plasty with BUMF. Recurrent fistula had occurred in three (15%) patients in Furlow Z-plasty without BUMF due to closure under tension or poor supply from the blood vessels. The fistula repair in the redo operation occurred with the help of BUMF. Partial necrosis of the tip of the flap was reported in one patient with BUMF. In Furlow Z-plasty with BUMF, two patients only needed reoperative intervention due to disruption of the donor suture site in one patient and partial necrosis at the tip of the flap in one patient. The total complication rate for Furlow Z-plasty with BUMF was 10%, and for Furlow Z-plasty without BUMF was 15%.

When used BUMF in conjunction with Furlow's double-opposing Z-plasty, the advantages of BUMF are manifold. In general, these include a rich blood supply, lower risk of necrosis, preservation of function, less donor site morbidity, and the flexibility of myomucosal tissue to adapt to different defect shapes and sizes. Specifically, the BUMF provides a robust solution for larger and more complex defects, reduces the need for secondary surgical interventions, and enhances functional and esthetic outcomes. This technique not only improves the structural integrity of the repair but also optimizes functional outcomes, particularly in speech and feeding, which are crucial for the patient's quality of life[17].

Unique strengths and contributions in the study

Use of combination technique: this study explores the innovative combination of the BUMF with the modified Furlow Z-plasty, which has not been extensively documented in the literature.

Broad applicability: the technique was applied to a wide range of cleft types and widths, demonstrating its versatility and potential as a standard approach.

Reduced tension and enhanced healing: by using the BUMF, the study shows a significant reduction in tension during closure, leading to improved healing and reduced complication rates.

Comprehensive patient demographics: the inclusion of patients with both primary and secondary cleft palates provides a comprehensive overview of the technique's effectiveness across different clinical scenarios.

Focus on genetic and environmental factors: the study highlights the influence of paternal age and endogamy on the incidence of cleft palate, contributing valuable insights into the genetic and environmental factors involved.

The study had some limitations, such as a fair sample size and insufficient evidence for the epidemiologic findings in the article. The small number of patients does not allow for conclusions about the relationship between cleft palate and parental age, and the study does not address other potential influencing factors such as parental medical history, smoking, or medication use during pregnancy. There is a lack of randomization. We did not compare our technique with other techniques randomly. We used only one type of flap. Also, we did not study the effect of intersurgeons' differences. Larger studies are needed with a larger sample size to ensure our findings in comparison to other techniques or flaps.

CONCLUSION

Treating a cleft palate with a BUMF and modified Furlow's technique may be an effective surgical technique that has a good outcome regarding regurgitation and nasal tone with a good and very accepted safety profile.

ABBREVIATION

BUMF: buccinator myomucosal flap.

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CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Naran S, Ford M, Losee JE. What's new in cleft palate and velopharyngeal dysfunction management? Plast Reconstr Surg 2017; 139:1343e–1355e.

2. Willadsen, E., Lohmander, A., Persson, C., Lundeborg, I., Alaluusua, S., Aukner, R., *et al*. Scandcleft randomised trials of primary surgery for unilateral cleft lip and palate: 5. Speech outcomes

in 5-year-olds – consonant proficiency and errors. J Plast Surg Hand Surg 2017; 51:38–51.

3. Khodir M, Soliman M, Aboulhassan M. Evaluation of Furlowz plasty technique with addition of buccinator muomucosal flap on palatal lengthening for primary cleft palate repair. Alex Dent J 2022; 47:143–148.

4. Jackson IT, Moreira-Gonzalez AA, Rogers A, Beal BJ. The buccal flap – a useful technique in cleft palate repair? Cleft Palate Craniofac J 2004; 41:144–151.

5. Bozola AR, Gasques JA, Carriquiry CE, Cardoso de Oliveira M. The buccinator musculomucosal flap: anatomic study and clinical application. Plast Reconstr Surg 1989; 84:250–257.

6. Bhaumik B. Buccinator myomucosal flap in cleft palate repair: revisited. J Cleft Lip Palate Craniofac Anomal 2014; 1:11–16.

7. Van Lierop AC, Fagan JJ. Buccinator myomucosal flap: clinical results and review of anatomy, surgical technique and applications. J Laryngol Otol 2008; 122:181–187.

8. Furlow LTJr. Cleft palate repair by double opposing Z-plasty. Plast Reconstr Surg 1986; 78:724–738.

9. Richardson S, Agni NA. Palatal fistulae: a comprehensive classification and difficulty index. J Maxillofac Oral Surg 2014; 13:305–309.

10. Mann, R. J., Martin, M. D., Eichhorn, M. G., Neaman, K. C., Sierzant, C. G., Polley, J. W., & Girotto, J. A.. The double opposing Z-plasty plus or minus buccal flap approach for repair of cleft palate: a review of 505 consecutive cases. Plast Reconstr Surg 2017; 139:735e–744e.

11. Nasreddine G, El Hajj J, Ghassibe-Sabbagh M. Orofacial clefts embryology, classification, epidemiology, and genetics. Mutat Res Rev Mutat Res 2021; 787:108373.

12. Putri FA, Pattamatta M, Anita SES, Maulina T. The global occurrences of cleft lip and palate in pediatric patients and their association with demographic factors: a narrative review. Children (Basel) 2024; 11:322.

13. Agrawal K. Cleft palate repair and variations. Indian J Plast Surg 2009; 42(Suppl):S102–S109.

14. Wuhrman E, Clark M. Use of ephedrine for the short-term treatment of postoperative nausea and vomiting: a case report. J Perianesth Nurs 2011; 26:305–309.

15. Nolte, J.W., Breugem, C.C. (2022). FAMM-Flap: The Facial Artery Myo Mucosal Flap in Palatal Fistulae Reconstruction. In: Fayyaz, G.Q. (eds) Surgical Atlas of Cleft Palate and Palatal Fistulae. Springer, Singapore. https://doi.org/10.1007/978-981-15-8124-3_126, pp 565 - 573, Part V or chapter 5.

16. Varghese D, Datta S, Varghese A. Use of buccal myomucosal flap for palatal lengthening in cleft palate patient: experience of 20 cases. Contemp Clin Dent 2015; 6(Suppl 1):S36–S40.

17. Denadai R, Sabbag A, Amaral CER, Pereira Filho JC, Nagae MH, Amaral CAR. Buccinator myomucosal flap for the treatment of velopharyngeal insufficiency in patients with cleft palate and/or lip. Braz J Otorhinolaryngol 2018; 84:697–707.