



Comparative Study Between Furlow Palatoplasty with Buccal Fat Flaps And Two Flaps Palatoplasty (Bardach's Technique) In Cleft Palate Repair.

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Abstract

Introduction: Cleft palates are among the frequent craniofacial defects. The most frequent postoperative complication is the formation of an oronasal fistula.. Other complications include VPI , airway obstruction, bleeding and aspiration . **Aim of work:** This study aiming to evaluate two techniques in the management of cleft palate furrow's technique and bardach's technique , regarding to which technique has less complications , operative time , hospital stay. **Methods:** This study was conducted from August 2021 to July 2023, and all patients with primary cleft palate, there were 40 patients (20 in each group). Group A received Furlow palatoplasty with buccal fat flaps, while Group B received two flaps palatoplasty. **Results:** There are no deaths or major life threatening complications.

Group A: complications were in (45%) in our study, oronasal fistulae in four (20%) cases. One case had complete wound dehiscence, two cases (10%) had wound infection, one cases (5%) had Upper airway obstruction and while other case (5%)

manifested as reactionary hemorrhage. In group A : - there is no donor site complications .

Group B: complications were in (30%) cases in our study. Two (10%) cases had oronasal fistulae; two (10%) cases had wound infection at surgical site, one (5%) case had Upper airway obstruction and one (5%) cases had complication of reactionary hemorrhage .

Conclusion: Combination of two or more types of repairs can be used in the same case. Furlow's technique has the advantage of lengthening the velum and prevents VPI. Two flap palatoplasty is a practical technique that can be combined with Furlow in case of complete clefts especially in those with high palatal index

1. Introduction:

Cleft palate, a congenital malformation affecting roughly 1 in 2,000 to 2,500 births, arises from incomplete fusion of the palatal processes during fetal development. Its severity varies, and it can occur as an isolated anomaly or alongside a genetic syndrome. The cleft may involve just the soft palate or prolong into the hard palate., or be complete, with unilateral or bilateral presentations.¹

Cleft palate repair, while necessary for optimal speech and facial growth, necessitates careful patient selection and meticulous surgical execution to mitigate potential complications. Fistula formation stands as the most frequent challenge, followed by wound dehiscence, infections,

airway obstruction, and bleeding. Rarer concerns include feeding difficulties and, in exceptional cases, mortality.²

Cleft palate repair has undergone a fascinating historical transformation. Once reliant on obturators as the primary intervention until the 18th century, the field gradually adopted specialized surgical approaches for both the soft and hard palate. Early soft palate techniques prioritized ensuring proper velopharyngeal function and speech production, while later hard palate repair methods shifted their focus toward tension-free closure, optimizing facial aesthetics and dental health.³

the Furlow palatoplasty technique enjoys popularity for addressing both primary and

secondary cleft palates, concerns exist regarding its potential drawbacks. Its effectiveness in lengthening the palate but come at the expense of increased midline tension, especially in broader clefts. This tension increase may heighten the risk of wound dehiscence and fistula formation, warranting careful consideration during surgical planning .⁴

While the Furlow palatoplasty technique has gained traction, this study aims to shed light on its merits and potential shortcomings by drawing comparisons to other reliable methods like the two-flap palatoplasty. As elucidated by Bardach and Salyer (1987), the two-flap palatoplasty achieves complete cleft closure through a layered suturing approach, minimizing exposed bone and potentially offering advantages in certain scenarios.⁵

By critically evaluating these procedures, we hope to optimize surgical outcomes and improve long-term functional and aesthetic results for patients with cleft palate.

2. Patients and methods:

This study was conducted from August 2021 to July 2023, and all patients with primary cleft palate who were referred from

the outpatient pediatric surgery and plastic surgery clinic at Beni-Suef university hospital were included , as there were 40 patients (20 in each group). Group A received Furlow palatoplasty with buccal fat flaps, while Group B received two flaps palatoplasty (bardache technique). The following criteria were met by all of the patients.

Inclusion Criteria

Age: 6 months to 18 years old, Gender: males & females, Informed consent from parent(s) or guardian(s).

Exclusion Criteria

Patients who are not fit for surgery, Failure to obtain informed consent, Patients with major co-morbidities e.g. cardiac anomalies.

Methods

All cases in the study were subjected to the following: A full history is taken, a thorough physical examination, including a palatal examination, and investigations, including routine labs(C.B.C Inr, pt, pc , serum creatinine, serum Na and serum K) , are performed.

Operative Technique

Anaesthesia: through general anesthesia

Position: The patient was positioned in a supine decubitus position with a 20-degree head tilt to optimize surgical visualization. Endotracheal tube placement was confirmed to be central. The patient's shoulders were elevated utilizing a shoulder roll to facilitate surgical access.

Medication: thirty minutes before the surgical procedure, the patient received a systemic antibiotic following the sensitivity test.

Following anesthetic induction, the first step in the operating room was to place Dengman, Be sure not to kink the ET tube,

Preoperative photographic documentation is recommended at this time, measurement of palatal index, delineate palatal flaps and buccal flap

IV injection of dicynone. To lift the flaps, an appropriate amount of a mixture containing 1 mg of adrenaline and 200 cc of isotonic saline with xylocaine was created and injected underneath the flaps.

GroupA: Two flaps were constructed for furrow palatoplasty: a right nasomuscular flap and a left oromuscular flap. After the flaps were extracted, the nasal side of the repair was joined, with the left nasal mucosal flap placed anteriorly and the right nasomuscular flap placed posteriorly.

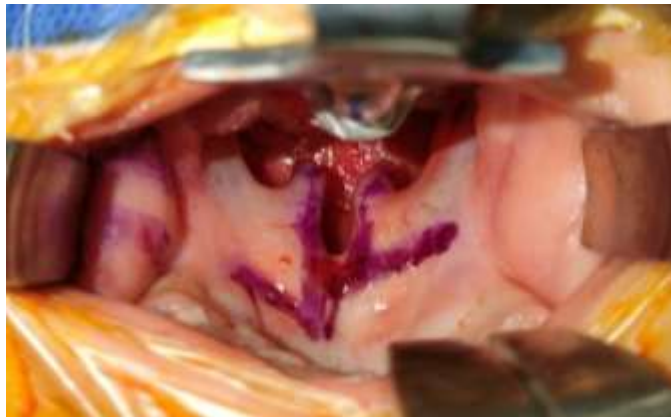


Fig (1): show Furlow incision

The necessity for buccal fat pad flap augmentation was determined by evaluating the intraoperative tension on the oral mucosal Z-plasty flap and the presence of any closure defects.

The selection of unilateral or bilateral buccal fat flaps hinged upon the anticipated tension zones in the final closure. A buccal mucosal incision was meticulously crafted just lateral to the posterior-most aspect of the alveolar

ridge. This strategic placement facilitated direct visualization and atraumatic liberation of the flap's delicate vascular supply, which could be susceptible to avulsion under excessive tension. The buccal fat was then meticulously dissected, either employing a suction tip or gentle traction with smooth forceps, until the desired length was achieved. Subsequently, the buccal fat flap was positioned at the repair site with minimal tension, situated just posterior to the hard palate and anterior to the transposed levator

veli palatini muscle. The placement ensured its location between the deep nasal mucosal Z-plasty limb and the superficial oral mucosal Z-plasty limb. Following this, the oral phase of the procedure commenced. This entailed the transposition of the right oral mucosal flap anteriorly to drape over the buccal fat pad, while the left oromuscular flap was transposed posteriorly to lie behind the buccal fat flap.



Fig(2): during taking of buccal fat flap

In some cases buccinator myomucosal flap was taken above the BFF for supporting the fat and for coverage of defect in palatal mucosa. As the following:-

The duct of parotid gland carefully identified. Marking of the duct by lacrimal duct probe can be helpful.

Following exposure of the oral mucosa overlying the cheek, a buccinator myomucosal flap measuring approximately 1.5–2 cm in width by 2.5 cm in length is harvested. Notably, this flap is often harvested from the left side.

The limits of the flap are the parotid duct superiorly, the oral commissure anteriorly

and the pterygomandibular raphe posteriorly. Inferiorly, the limit is dependent on the size of tissue required, but a flap as big as 7×5 cm can be raised

Thickness:- To enhance vascularity, the flap is harvested along with a thin layer of the underlying buccinator muscle.

Injection of saline with adrenalin (1 mg/mL adrenaline solution diluted in 200 mL of isotonic saline) and handling the flap with stay vicryl suture facilitate elevation of the flap.

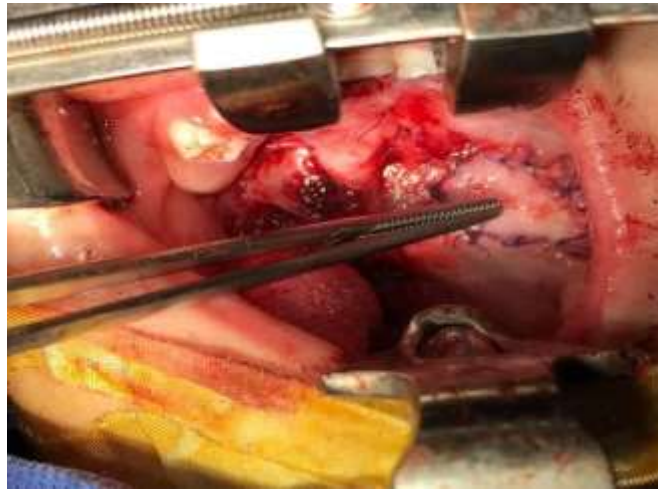


Fig (3) : application of buccal buccinator myomucosal flap

Donor site closure: - The mucosal defect is closed with 4-0 vicryl.

surgical conduit was fashioned behind the greater palatine vessels to facilitate passage of the local tissue flap for reconstruction of the nasal layer deficiency. The flap was then rotated in a counter-clockwise direction and meticulously sutured to the surrounding upper palatal mucosa using 4.0 vicryl sutures. Ensuring proper orientation, the flap was positioned with its mucosal surface facing the oral cavity. Meticulous technique was employed to avoid pedicle torsion. This

maneuver effectively augmented the length of the nasal layer by 1.5 to 2 centimeters.

Group B : This group underwent two flap palatoplasty repairs. The surgery began by trimming the soft palate cleft margins and incising the hard palate cleft at the junction of the oral and nasal mucoperiosteums. The lateral incision was made within the alveolar ridge, which extend from opposite the canine anteriorly to a little above the hamulus posteriorly. The oblique incision joins the lateral incision's anterior end to the cleft margin. The mucoperiosteal flap has been

raised above the hard palate. The oral mucoperiosteal flap has been rolled back to expose the larger palatine veins that connect the greater palatine foramen to the flap. Dissection of the mucosal layer has been completed on the septal surface (vomer), with preservation of its attachment to the adjacent palatal border.

Two-flap palatoplasty, this palatoplasty technique involves extending relaxing incisions alongside the alveolar margins until they reach the cleft border. This approach yields well-vascularized flaps due to their proximity to the major palatine vessels.

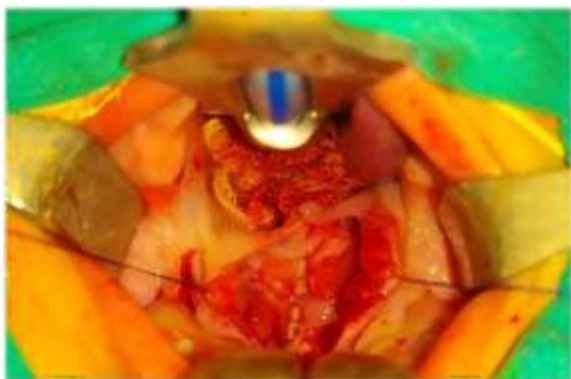


Fig.(4) Closure of nasal layer

Furthermore, these flaps offer exceptional versatility in terms of their final placement. The flaps are then advanced anteriorly and laterally based as the gingival/palatal junction incisions are not made.

Closure of the cleft in this scenario relies upon: Excellent mobility of the lateral side of the palatal flap. Medial dissection of the medial side of the palatal flap to gain width by losing height of the palatal arch. We use enough tissues to close the nasal layer of the palate by interrupted manner using absorbable Coated Vicryl suture

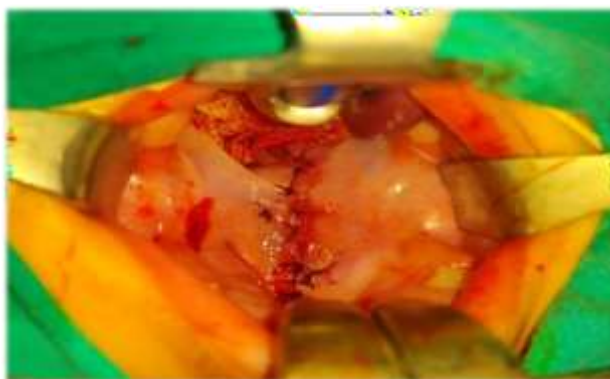


Fig.(5): Closure of oral layer.

Subsequently, the oral layer is meticulously closed, ensuring a tension-free repair facilitated by the previously performed lateral release incisions.

Ethical consideration

The procedures of the research did not have any negative effects on the participants or the service that was provided, informed consent was obtained from all participants once they were informed about the seeks and procedures of the research in addition to applicable goals, and the principal investigators successfully protected the confidentiality of individual data. The scientists paid for everything related to this aspect of the study, so the participants did not have to worry about paying any additional fees. Approval No:

FMBSUREC/06072021/Abdeltawab

Data management and Statistical Analysis

The data were statistically characterized utilizing phrases such as mean standard deviation (SD), median and range, or frequencies (number of cases) and percentages, depending on the context. P values with a delta of less than 0.05 were regarded as statistically significant. All of the statistical computations were performed on a computer utilizing the application SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA).

3. Results:

Total number of patients included in the study was 40 patients: patients in group A: 10

males (50%), and 10 females (50 %), 20 patients in group B: 13 males (65%) , 7 females (35%)

According to presence of cleft palate and cleft lip, group A: 3 patients (15%) had cleft palate and cleft lip and 17 patients (85%) had cleft palate only. Group B: 4 patients (20%) had cleft palate and cleft lip and 16 patients (80%) had cleft palate only. In the patients who had cleft lip, the lip was repaired before and presented in our study with primary cleft palate for repair.

According age, the mean age of patients in our study in Group A was 11 ± 7 months .a minimum of 6months and a maximum of 36 months. Group B was 11 ± 4 months .a minimum of 6 months and a maximum of 18 months.

Based on the palatal index used in this study, there were no cases in the mild group, 16 cases (80%) in the moderate group (palatal index 0.2-0.4), and 4 cases (20%) in the severe group (palatal index greater than 0.4) in group A. In group B, there were 6 cases (30%) in the severe group of palatal index (palatal index greater than 0.4) and 14 cases (70%) in the moderate group (palatal index 0.2-0.4).

All cases had median clefts, in group A 16 cases(80%) of them with complete cleft palate and 4 cases(20%) with incomplete

cleft palate. in group B 17 cases(85%) of them with complete cleft palate and 3cases(15%) with incomplete cleft palate.

According to duration of surgery (from the incision and delineation of the flaps), In

group A: - the mean time 117.75 ± 16 minutes. a minimum of 100 minutes and a maximum of 130 minutes, In group B: - the mean time 107.75 ± 9 minutes. A minimum of 95 minutes and a maximum of 120 minutes.

Table (1) postoperative hospital stay

Postoperative hospital stay	Group A		Group B	
	Number	Percent	Number	Percent
One day	0	0%	18	90%
Two days	10	50%	0	0%
Three days	10	50%	2	10%

There are no deaths or major life threatening complications in this study.

Group A : complications were in 9 cases (45%) in our study , inform of oronasal fistulae in four (20%) cases , One case had (5%) complication of complete wound dehiscence , Two cases (10%) had complication of wound infection at surgical site , one case (5%) had complication of Upper airway obstruction, One case (5%) had complication of reactionary hemorrhage at recovery from anesthesia,

In group A : - there is no donor site (of the flaps) complications (no parotid duct injury , no dehiscence , no infection and no fascial nerve injury)

Group B: complications were in 6 (30%) cases in our study. Two (10%) cases had complications of oronasal fistulae , one (5%) case had complication of Upper airway obstruction which discovered during recovery from anesthesia at operative theater , One (5%) case had complication of reactionary hemorrhage at recovery from anesthesia.

Table (2) Type of complication.

	Group A		Group B	
	Number	Percent	Number	Percent
Fistula	4	20%	2	10%
Upper airway obstruction	1	5%	1	5%
Hemorrhage	1	5%	1	5%
Wound infection	2	10%	2	10%
Wound dehiscence	1	5%	0	0%
Total	9	45%	6	30%

There is significant difference between the two groups as regards the correlation between increased palatal index and occurrence of fistula where in group(A) p.value = 0.002 , group(B) p.value > 0.05 in group (B).

There is no significant difference between group A and group B as regards correlations

between presence of fistula and type of cleft groups , where P-value = 0.780 in group A , P-value = 0.531 group B .

There is no significant difference between presence of fistula and age of performance of operation in both groups , p.value = 0.281 in group A p.value = 0.305in group B.

4. Discussion:

Palatal surgery aims to achieve two main goals: sealing off the opening between the nasal and oral passages and creating a functional velum that enables effective speech. Numerous methods have been developed to attain those aims in one procedure and primary healing.⁶

There are risks involved with correcting cleft palates surgically. The most common consequence of a palatoplasty is the occurrence of a fistula. Various complications have been documented involving surgical wound dehiscence, infections, obstruction of the airway, respiratory tract infections, pneumonia, hemorrhage, difficulties with feeding, aspiration, fever, otitis media, speech dysfunction (articulation errors, nasal escape, and hypernasality) and mortality. The surgical technique of cleft palate repair has evolved over the years. An ideal method of repair would provide velopharyngeal adequacy with minimal operative morbidity and mortality and without interfering with maxillary growth.⁷

The purpose of this study is to make a comparison between two commonly used techniques in cleft palate repair, Furlow palato-plasty supported with buccal fat flap and buccinator myomucosal flap (used in

group A) and two flap palatoplasty (used in group B) aiming to extract a good conclusion to reduce post palatoplasty morbidity.

In group A, we used BFF with primary palatoplasty in the Furlow technique, and we observed its role in filling the dead space under the mucoperiosteal flap and reducing tension on Z flaps. Furthermore, BFF has no effect on facial contour. Because of the simple nature of operation, healing ability, and low complication risk, we also advise against using a suction device when applying BFF because we experienced suction of a portion of the flaps during their application. Overall, the use of BFF in palatoplasty is a helpful and reliable method that may be utilised in palatal repair, and we recommend conducting more separate research on a large number of patients. During the study it was found that taking buccinator myomucosal flap (BMMF) will add a benefit of substituting part of the mucosal defect in the palate besides will support the buccal fat taken and will give easy access for harvesting the buccal fat, so after the first two cases in group (A), BMMF was added routinely in the Lt side to substitute for the defect.

Analysis of our data show :-

According to postoperative hospital stay, in group A; cases stayed for two days for

follow up except cases with early post operative complications (like upper airway obstruction, haemorrhage and cheek edema) had stayed three days for follow up , One (5%) case had reactionary hemorrhage at recovery from anesthesia, one case (5%) had upper airway obstruction, five cases (40%) had cheek edema, they received IV hydrocortisone (4-8mg /kg /24h they improved and discharged to home with antiedematous drug.

In group B: cases stayed for one day for follow up except cases with post operative complications(like upper airway complication and haemorrhage) had stayed three days for follow up, 5% of the patients had reactionary hemorrhage during recovery from anesthesia . one case (5%) had upper airway obstruction which discovered during recovery from anesthesia at operative theater.

Regarding to complication in this study, no deaths or life threatening complications. Complications are grouped into two groups. Group one includes early problems, which occur within two weeks of surgery. The second group includes long-term problems, which occur more than two weeks following surgery.

According to this classification, group A had six (30%) complications within two weeks of surgery and three (15%) late complications.

In group B, three (15%) complications occurred within two weeks of surgery, and three (15%) were late complications.

In Group A, four cases (20%) developed oronasal fistulae, two at the hard palate (type IV according to the Pittsburgh classification) and two at the junction between soft and hard palate (type III according to the Pittsburgh classification). After almost three months of follow-up, 2 mm and 3 mm fistula spontaneously healed.

While in group B, we had two (10%) oronasal fistulae were at hard palate (type IV according to the pittsburgh classification) and continued for further surgical repair.

In group A, one (5%) complication was complete wound dehiscence (this case was with complete cleft palate with severe palatal index. underwent surgical correction in follow up). On the other side, we didn't have wound dehiscence in group B.

Both groups experienced an equal proportion of wound infection, upper airway obstruction, and reactionary hemorrhage, described as follows:

Each group had two (10%) complications in the form of wound infection at surgical site and was same cases complicated with oronasal fistula at hard palate later and extended beyond our follow-up period for additional surgical intervention.

In addition, each group experienced one complication (5%) in the form of upper airway obstruction. which discovered during recovery from anesthesia at operative theater by snoring and difficulty of breathing, first we searched for foreign body (no foreign body) ,suspected laryngeal edema so the patient receive nasal O2 , hydrocortisone iv (8 mg / kg /dose), nebulization with adrenaline , patient improved and admitted in PICU one day for monitoring then to the ward for another two days till discharge to home .

Each group had one complication (5%): reactionary hemorrhage at recovery from anesthesia. We closely examined the patient in the operation theater and administered him Tranexamic acid (kapron) at a dose of 5mg per kg body weight. The bleeding stopped without the need for surgical intervention or blood transfusion.

In comparative studies, there seems to be no difference between less and older than 12 months with respect to the occurrence of fistula (**Williams WN et al., 2011; Pradel W et al, 2009**).^{8,9} regarding to both groups: We classed as early (less than 12 months) and late (greater than 12 months). and group A show 3 fistulas(15 %) early , and one fistula (5%) late with p.value = 0.281 . and group B show one fistula (5%) early and one fistula (5%) late with p.value = 0.305 . so there is no

significant difference between presence of fistula and timing of operation in both groups , p.value = 0.281 in group A p.value = 0.305 in group B. so Our data supports this view.

In **2014 Deshpande et al¹⁰** in retrospective analysis included 709 consecutive nonsyndromic patients with cleft palate there was a 2.4% rate (17/709) of take-back to the operating room in the immediate postoperative period for control of bleeding. There were no blood transfusions. Twenty of 512 patients had complications resulting in fistula formation, for a total complication rate of 3.9%. Also authors report a 3.9% rate of early complications after primary cleft palate repair.

In **1992 Lees et al¹¹** a study of 160 patients with primary cleft palate repair showed that nine cases (5.6%) presented with a dehiscence of the suture. One case(0.6) was a complete reopening of the suture line from infection three days after the operation and eight cases(5%) were small fistulas at the junction of the hard and soft palate observed between three and seven days postoperatively. Also in this study Five cases (3,1%) of postoperative hemorrhage were observed when the children were in the recovery room. None needed reoperation as a local compression on the operated area sufficed to control the bleeding. However, two cases

needed a transfusion (with its related hazards) for low hemoglobin in the postoperative period.

In **2019 Tache et al¹²**, Fistula percentage was calculated as the percentage of cases with fistula among all study participants and was 9.94% (95% confidence level). Follow up periods ranged from 6 months to 16 years with a mean of 53.8 months (95% confidence level).

In **2019 Tache et al¹²**, The mean fistula percentages were 9.1% in one stage palatoplasty. A Student t test for group means did not reach statistical significance ($P = 0.184$). There was also no statistical difference in the frequencies of fistula between syndromic and nonsyndromic cases or between male and female patients.

A little breakdown at the junction of hard and soft palate, which heals spontaneously, is not uncommon. In the 5-year period from 1993 to 1997, the rate of fistula after primary cleft palate repair has been 15 % .¹³

Parwaz et al 2009 said that cleft width and extent influence the frequency of oronasal fistula and found that width 15 mm was associated with a statistically significant risk of fistula development.

In comparing our results, we found Correlation between presence of fistula and severity of palatal index that was significant

in both group, group A had shown p.value = 0.002 and group B had shown p.value >0.05.

In Correlation between presence of palatal fistula and type of cleft. Both groups had shown non significant p-value as group A had shown p- value = 0.780, while group B had shown p-value =0.531.

We recognize the limitations, including the low number of patients and lack of direct control group. The difference in complication rate across centers may be attributed to a patient and surgeon factors. So Selection of types of the anomaly whether complete or incomplete cleft needs to be specified in further studies Specification of certain range of age needs selection, whether to work, on early or delayed cases. Palatal index is an important contributing factor that has to be considered in selection of certain group of patients. Monitoring of patients for longer period for proper dealing with complications especialy of nasality and VPI that need to be assessed properly by phoniatics and video nasoendoscopy and to deal with accordingly for maximizing the improvement in speech and better social life for those kids .

5. Conclusion:

Cleft surgery needs orientation for various techniques used by many surgeons. Every technique has its merits but cannot be applied to all cases. Combination of two or more

types of repairs can be used in the same case according to severity of the cleft to achieve maximal palatal lengthening with avoidance of oronasal fistula (ONF).

Combination of techniques like Furlow with its modifications buccal part of fat flap with buccinator myomucosal flap is lengthier procedure and needs learning curve to avoid loss of flaps and minimize complications and hospital stay. This technique has the advantage of lengthening the velum and prevents VPI.

Two flap palatoplasty is simple well known practical technique that can be combined with Furlow in case of complete clefts especially in those with high palatal index but it does not add to the length of the velum.

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