Comparative study between two different surgical techniques in veloplasty

Original Article

Elsaadany Wesam[1],Sadakah Abdelfattah A.[2], MKhalifa Mahmoud E[1],

Bedir Rafic R.[2]

[1]Department of Oral and Maxillofacial, and [2]Department of Maxillofacial Surgery, Faculty of Dentistry,Tanta University, Egypt.

ABSTRACT

Purpose: This study was planned to compare intravelar veloplasty versus Furlow double opposing z-plasty technique both clinically and by magnetic resonance imaging regarding effectiveness in palatal reconstruction and future imoprovement of soft palate function.

Materials & Methods: This is an interventional, comparative study that was carried out on 16 patients with cleft palate and were divided randomly into two equal groups, Group I: included eight patients in whom soft palate cleft was repaired with intravelar veloplasty,Group II: included eight patients in whom soft palate cleft was repaired with Furlow double opposing z-plasty. All patients underwent regular follow up for six months for functional evaluation of the soft palate.

Results: Clinically, there was primary wound healing uneventfully was achieved in all patients in the two groups with no signs of infection. No oronasal fistula was recorded in any case in the two groups. By magnetic resonance imaging, there was effectiveness in palatal reconstruction and future imoprovement of soft palate function which reported from a significant increase in soft palate length postoperatively in both groups with no significant differences between them, a significant decrease in retropalatal ditance postoperatively in both groups with no significant differences between them and the cohesive sling created by the two levator muscle bundles postoperatively in both groups.

Conclusion: There was no statistically significant differences clinically and by magnetic resonance imaging between intravelar veloplasty and Furlow double opposing z-plasty technique.

Key Words: Cleft palate, Veloplasty, Intravelar veloplasty, Furlow double opposing z-plasty technique.

Received: 7 September 2021, **Accepted:** 6 March 2022

Corresponding Author: Wesam Hamed Abd El Ghani El Saadany, Assistant lecturer at Department of Oral and Maxilofacial Surgery, Faculty of Dentistry, Tanta University, Tanta, Egypt, **Tell** 0403345949, **Mobile:** +201003366597,
E-mail: wesam.elsaadany@dent.tanta.edu.

ISSN: 2090-097X, April 2021, Vol. 12, No. 2

INTRODUCTION

Cleft lip and palate is the most common congenital craniofacial defect and existing in approximately 1 in 700 live births. Cleft palate alone is perceived in about 1 in 2,000 live births and this frequency is similar in all racial groups [1].

Cleft palate is generally an isolated congenital defect but can be associated with many syndromes. Careful evaluation of a newborn with cleft palate by a multidisciplinary team is mandatory to rule out other potential abnormalities. The goals for cleft palate repair comprising separating the nasal and oral cavities, creating normal velopharyngeal function and conserving maxillofacial growth[2].

Two important factors can affect the outcome of cleft palate repair; the time and the technique of palatoplasty. It has long been known that the best speech results are gained when the palate is repaired before developing of meaningful and connected speech[3]. However, dissection on the hard palate is known to cause subperiosteal scarring that may lead to hurt of midfacial growth[4].

"To assess the success of a palatal repair, listen, not look, as speech says it all" (Dr. H S Adenwalla). In the begining, the aim of a palate repair was no breakdown and no fistula. Now, the criterion of success is pure audible speech. If this goal has not been reached, the cleft team must evaluate the surgical technique. The principal aim of palate repair is good speech, the most imperative part of surgery is establishing maximal muscle function. This is achieved by careful dissection of the muscles, most importantly levator veli palatini (LVP) from its abnormal insertion and reconstructing the normal muscle sling[5].

Nevertheless, the goal of palatal lengthening in cleft palate repair is still considered essential to decrease the space in the posterior pharyngeal wall. Presently, widely accepted methods to decrease velopharyngeal insufficiency include retropositioning and reorientation of the soft palate muscles by performing either an intravelar velopasty or Furlow double opposing Z palatoplasty[6].

Intravelar veloplasty or the levator muscle repositioning technique during palatoplasty is the most commonly

 DOI: 10.21608/omx.2022.82559.1122

practiced method to achieve velopharyngeal competence. Cutting et al., reported that in the early 20 th century, Victor Veau first defined the 'cleft muscles' and advocated the idea of midline levator palatini muscle reapproximation. He emphasized the significance of an encircling suture to pull the levator muscle bundles together, side to side[7]. A new generation of cleft surgeons concentrated on the anatomy and physiology of the velopharyngeal sphincter[8].

Furlow palatoplasty was first described in 1986, the main principles for the Furlow's z-plasties were transposition instead of transection of the palatal muscles. The palatal muscle was raised as part of the posterior based flap of each z-plasty. The posterior based oral myomucosal flap was on the left side for a right handed operator. The nasal z-plasty was completed as the mirror image of the oral layer[9]. Moreover, Furlow palatoplasty is a reliable method for the management of velopharyngeal insufficiency since it seems to be a physiological procedure as it returns the palatal anatomy in patients with sagittal levator veli palatini musculature to a relatively normal one. The procedure lengthens the palate and reduces wound contraction by using the z-plasty[10].

In the past, sensitive parameters like videoendoscopy and videofluoroscopy for comparing between double opposing z plasty and intravelar veloplaty were questionable due to their relative inaccessibility of the details of muscle structures. However, recently technological advancements of MRI have led to superior investigation of the LVP muscle in normal and abnormal anatomy which give the opportunity for prediction of future function of the repaired palate is more precise[11].

MATERIALS AND METHODS

This is an interventional comparative study. It was conducted on sixteen patients aged between 6 months and 4 years with palatal cleft. The patients were examined both clinically and by magnetic resonance imaging and managed at the Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Tanta University.

Patient Selection:

Inclusion criteria included patient with Cleft palate, their age ranged from 6 months to 4 years.

Exclusion criteria included Syndromic cleft palate and patients with relevant systemic disease**.**

I) Preoperative management:

The following procedures were performed for all patients in both groups:

****Patient interview:***

All the patients and relatives had preoperative initial consultation interview with the surgeons mainly for collecting demographic data, taking medical, surgical and dental history, listening to the patient's functional complaints and postoperative expectations from their relatives.

Approval for this research was obtained from Research Ethics Committee of Faculty of Dentistry, Tanta University. The purpose of the present study was explained to the patient's parents and informed consents were obtained according to the guidelines of human research adopted by the Research Ethics Committee at Faculty of Dentistry, Tanta University.

1- Clinical evaluation:

A- Extra-oral to evaluate associated cleft lip, its type, unilateral or bilateral, repaired or not, asymmetry of the alar base and presence of secondary nasal deformity or not.

B- Intra-oral to evaluate premaxilla: normal, protruded or retruded, type and width of cleft, color and quality of soft tissues around cleft, vomer unilateral or bilateral in case of hard palate cleft and soft palate length.

2-Magnetic Resonance Imaging:

Magnetic Resonance Imaging was done for all patients using proton density weighted images. Chloral hydrate was administrated orally to the patients for sedation immediately before imaging to prevent motion artifact. The primary dose is 50 to 75 mg/kg up to a maximum of 2000 mg [12].

Head images were achieved using a General Electric Echo Speed 1.5 Tesla system (Milwaukee WI). All patients were imaged using an oblique coronal sectioning plane. This was achieved in reference to a sagittal ''scout'' image and by estimating the possible course of the levator veli palatini muscle in a superior-posterior direction from the soft palate. The soft palate was clearly visible on the sagittal scout image[12].

The sagittal plane was used to measure[13]:

1.The length of the soft palate; from the posterior limits of the hard palate to its tip.

2.The retropalatal distance; the perpendicular distance between the tip of the uvula and the posterior wall of the oropharynx.

The oblique coronal plane was used to evaluate the levator palatine muscle[14]:

II) cleft repair surgery:

After standard preparation of cleft palate patients for surgery. The surgical procedures were performed under general anesthesia using midline oral endotracheal intubation for all patients.

Disinfection of the oral cavity with Betadine and appropriate surgical draping then the oral cavity was opened widely with Dingman mouth gag for sufficient exposure, its inbuilt cheek retractors used for intraoral exposure and

the tongue blade of the mouth gag, has a space for housing the endotracheal tube without producing compression, used to retract both tongue and the endotracheal tube.

Epinephrine (Adrenaline) in dilution of 1:200,000 was used for infiltration in palate 57- min before the surgery for vasoconstriction and hemostasis using smaller syringe for easier hydrodissection in the hard palate region.

According to the surgical technique, the patients were divided randomly into two equal groups:

***Group I** Include 8 patients in whom the palatal cleft was repaired by Intravelar Veloplasty in soft palate.

***Group II** Include 8 patients in whom the palatal cleft was repaired by Furlow Double Opposing Z-Plasty in soft palate.

In cases of soft and hard palate cleft, we performed one stage closure of hard and soft palate by closure of soft palate firstly by one of the two techniques of our study then secondly, closure of hard palate by two flap palatoplasty or unilateral rotational flap for the oral mucosal layer closure and unilateral or bilateral vomerine flap for the nasal layer closure according to the type of cleft (unilateral or bilateral) and width of cleft.

1)Intravelar veloplasty according to Marsh et al.,[15]:

The IVV procedure consisted of sharp separation of muscle fibers from the posterior edge of the hard palate shelves as well as from the tensor aponeurosis and the posterior constrictor muscle, take care to avoid injuring the thinner nasal mucosa, thus a complete anatomic retrodisplacement is achieved (Figure 1).

The muscle was then freed from the oral mucosa and nasal mucosa. The dissection was best carried back to the hamulus and retroposition and plication of these muscle bundles across the midline between the oral and nasal velar mucosal repairs. The palate was then closed in three layers11.

Double Opposing Z-plasty according to Furlow [16]:

The Left Side Flaps

Left Side Posterior Based Oral Flap:

The posterior based flap runs along the junction between hard and soft palate and it ends over the hamulus which must be felt by the finger.

The cleft margin was incised along a line between oral and nasal mucosa in the soft palate above leaving 2mm margin of oral mucosa as an edge for easy suturing. The tip of the flap was elevated and the palatal muscle is detached carefully from the nasal mucosa. The dissection was completed to a point just medial to the hamulus and then the LVP muscle is dissected from the superior constrictor muscle.

Left Side Anterior Based Nasal Flap:

Incision was made anterior to the uvula to the lip of the Eustachian orifice which can be seen and located by placing the tip of periosteal elevator at the opening of its orifice.

The Right Side Flaps

Right Side Anterior Based Oral Flap:

The incision was made just anterior to the uvula to the level of the hamulus. The cleft margin incision was made just anterior to uvula and along the cleft margins separating the nasal mucosa from the oral leaving about 2mm over the nasal mucosa to facilitate suturing the incision.

The right side anterior based flap was then elevated, this flap contains only mucosa and so oral mucosa is thin and may lacerate, and to thicken it the minor salivary glands layer was included in the flap.

The flap base was elevated and mobilized by dissection of the base of the anterior based flap to reach the mucoperiostieum of the posterior part of the hard palate.

Right Side Posterior Based Nasal Flap:

It was incised along the posterior margin of the hard palate detaching the palatal muscle from the bone, to the orifice of the Eustachian tube. The nasal incision was made leaving an edge of nasal mucosa along the posterior margin of the hard palate for suture placement.

The incision divided the palatal aponeurosis exposing the palatal muscle to separate it from the superior constrictor muscle to complete mobilization of the flap (Figure 2).

Postoperative follow up

All patients were followed up clinically and by using magnetic resonance imaging.

1.Clinically:

All patients were followed up clinically postoperatively weekly for three weeks then monthly for six months. Patients were evaluated for the following:

1. Wound healing.
2. Fistula formation.
3. Nasal regurgitation on feeding.

2.Magnetic resonance imaging:

All patients were followed up postoperatively by magnetic resonance imaging performed six months following the surgery to evaluate the followings:

The midsagittal scout image used for the following measurements [13]:

1.The length of the soft palate; from the posterior limits of the hard palate to its tip.

2.The retropalatal distance; the perpendicular distance between the tip of the uvula and the posterior wall of the oropharynx.
The oblique coronal plane was used to evaluate the cohesive sling created by the two levator muscle bundles[14] .

RESULTS

The results of this study were:

1) Clinical:

1. Primary wound healing uneventfully was achieved without any signs of wound dehiscence in all patients of both groups.

2. No oronasal fistula was recorded in any case in the two groups. Bifid uvula was observed in 3 cases (no 1,2,6) in group I and 2 cases (no 1,2) in Group II which did not need any surgical intervention.

3. Primary wound healing uneventfully was achieved in all patients in the two groups with no signs of infection.

4. No nasal regurgitation on feeding in all cases of both groups except case no 3 in group I which may be due to the alveolar cleft (Figure 3 and 4).

2) Magnetic resonance imaging:

1. There was a significant increase in soft palate length postoperatively in both groups with no significant differences between them.

2. There was a significant decrease in retropalatal ditance postoperatively in both groups with no significant differences between them.

3.There was a cohesive sling created by the two levator muscle bundles postoperatively in both groups (Figure 5 and 6).

1. The length of the soft palate, , from the posterior limits of the hard palate to its tip.

The preoperative value in group I, mean of 13.18 ± 1.65, while after six months, the postoperative value a mean of 21.50 ± 1.19 The difference between preoperatively and postopertvely in group I was statistically highly significant (*P*-value = 0.000**) (Figure7).

The preoperative value in group II, mean of 12.50 ± 1.31, while after six months, the postoperative value a mean of 23.50 ± 2.78 The difference between preoperatively and postopertvely in group II was statistically highly significant (*P*-value = 0.000**) (Figure 8).

The postoperative value in group I, mean of 21.50 ± 1.19, while in group II, the postoperative value a mean of 23.50 ± 2.78 The difference between both groups postoperatively was statistically non significant (*P*-value = 0.082) (Figure 9).

2.The retropalatal distance; the perpendicular distance between the tip of the uvula and the posterior wall of the oropharynx.

The preoperative value in group I, mean of 5.55 ± 1.04, while after six months, the postoperative value a mean of 4.85 ± 0.96 The difference between preoperatively and postopertvely in group I was statistically highly significant (*P*-value = 0.000**) (Figure 10).

The preoperative value in group II, mean of 5.33 ± 0.72, ,while after six months, the postoperative value a mean of 4.44 ± 0.69 The difference between preoperatively and postopertvely in group II was statistically highly significant (*P*-value = 0.000**) (Figure. 11).

The postoperative value in group I, mean of 4.85 ± 0.96 , while in group II, the postoperative value a mean of 4.44 ± 0.69 The difference between both groups postoperatively was statistically non significant (*P*-value = 0.343) Table (12) and (Figure 12).

Figure 1: a: An intraoperative photogragh of patient no (4) in group I showing a midline incision in the oral mucosa; b: An intraoperative photograph of patient no (4) in group I showing muscle layer closure using non-absorbable 4-0 nylon sutures; c: An intraoperative photograp of patient no (4) in group I showing oral layer closure using 3-0 vicryl absorbable sutures.

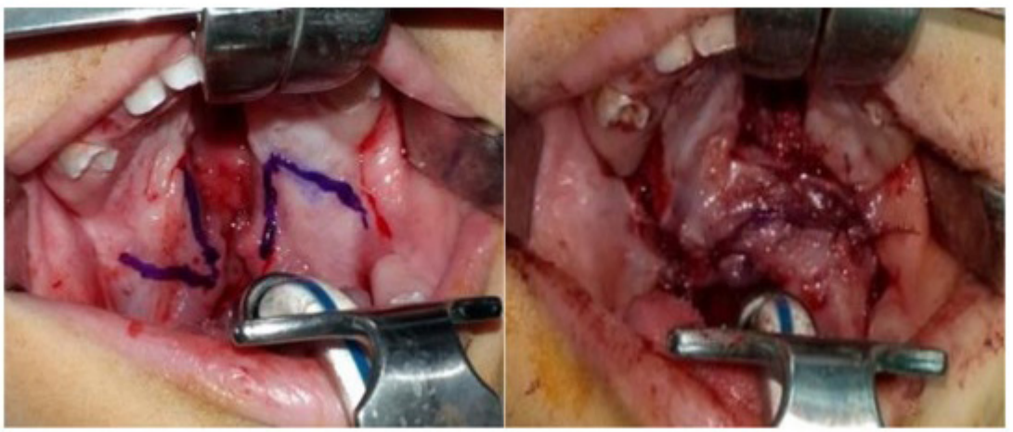

Figure 2 : a. An intraoperative photograph of patient no (3) in group II showing incision marking; b:An intraoperative photograph of patient no (3) in group II showing oral layer closure using 3-0 Vicryl suture.

Figure 3 : a. A preoperative photograph of patient no (4) in group I showing soft palate cleft; b. Six months postoperative photograph of patient no (4) in group I showing complete wound healing.

Figure 4 : a. A preoperative photograph of patient no (3) in group II showing unilateral complete cleft lip and palate with repaired lip; b. Six months postoperative photograph of patient no (3) in group II showing complete healing without oraonasal fistula.

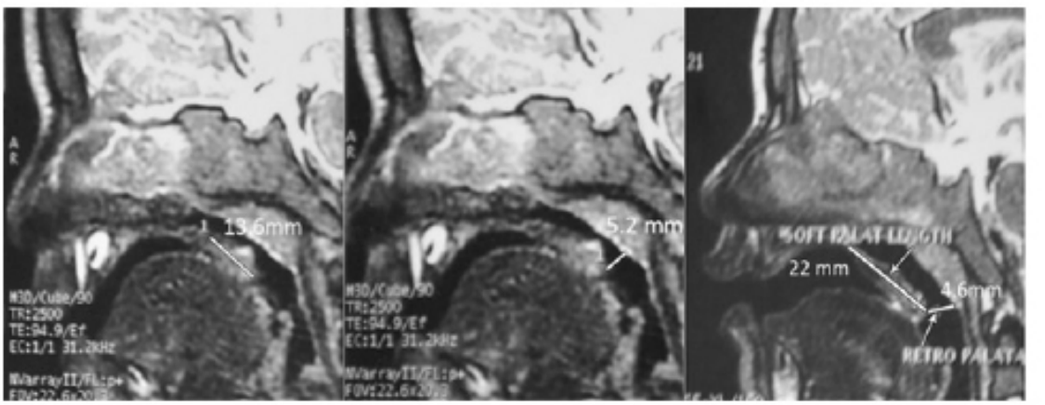

Figure 5 : a. A preoperative scout image of soft palate of patient no (4) in group I showing length of the soft palate; b. A preoperative scout image of soft palate of patient no (4) in group I showing retropalatal distance; c: A postoperative scout image of soft palate of patient no (4) in group I showing the length of the soft palate and the retropalatal distance.

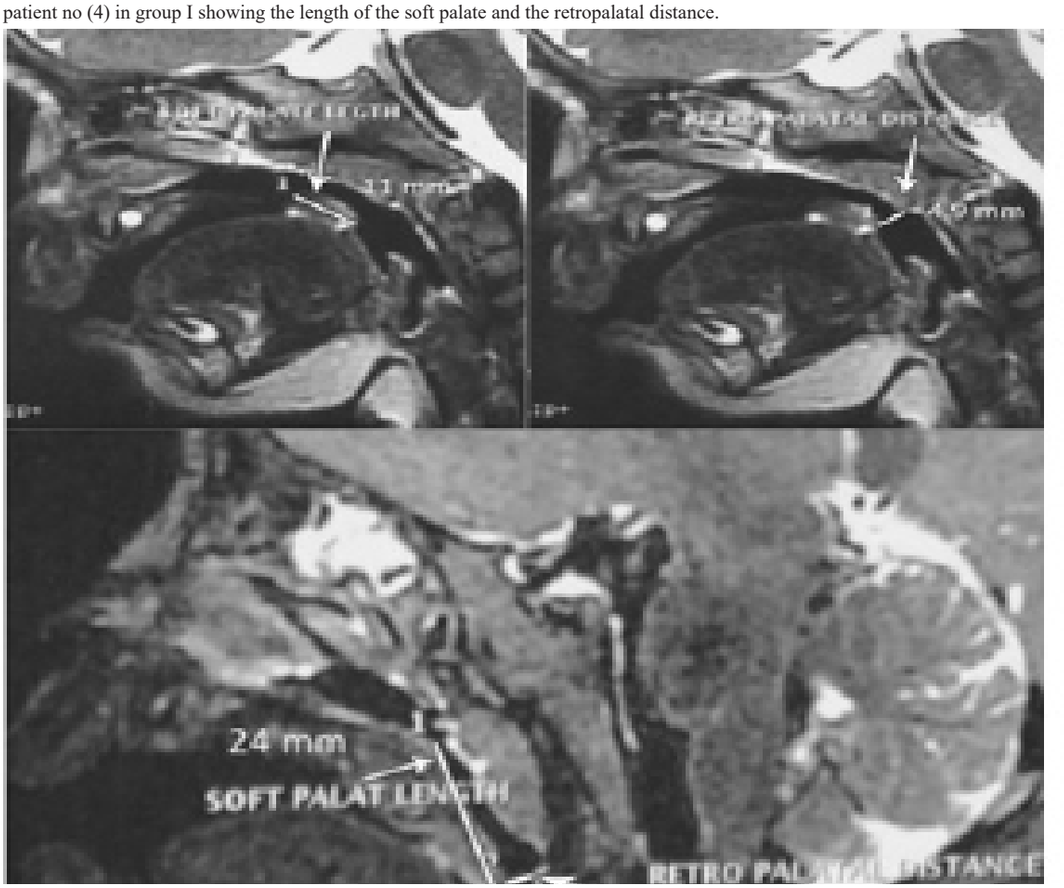

Figure 6 :a. A preoperative sagittal scout image of soft palate of patient no (3) in group II showing length of the soft palate; b. A preoperative sagittal scout image of soft palate of patient no (3) in group II showing retropalatal distance; c. A postoperative scout image of soft palate of patient no (3) in group II showing the length of the soft palate and the retropalatal distance.

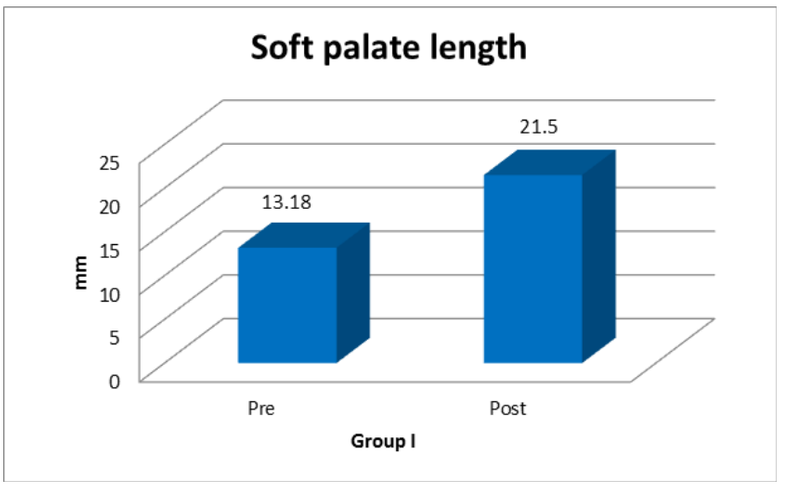

Figure 7 : Bar graph showing the soft palate length of group I preoperatively and postoperatively.

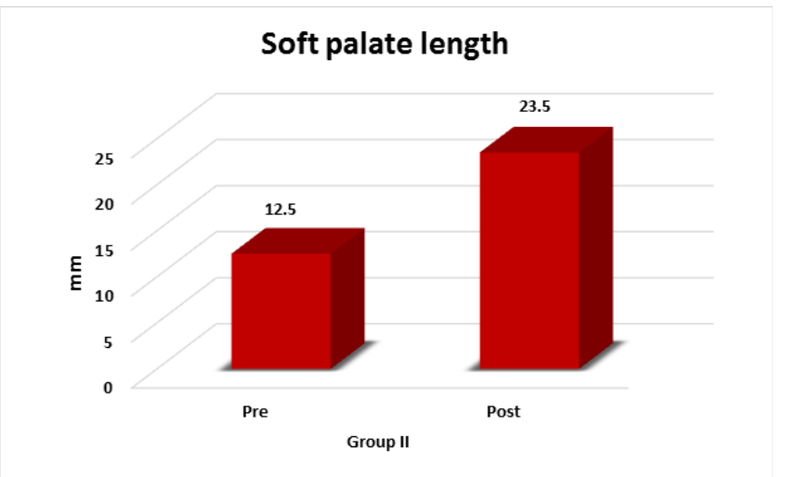

Figure 8 : Bar graph showing the soft palate length of group II preoperatively and postoperatively.

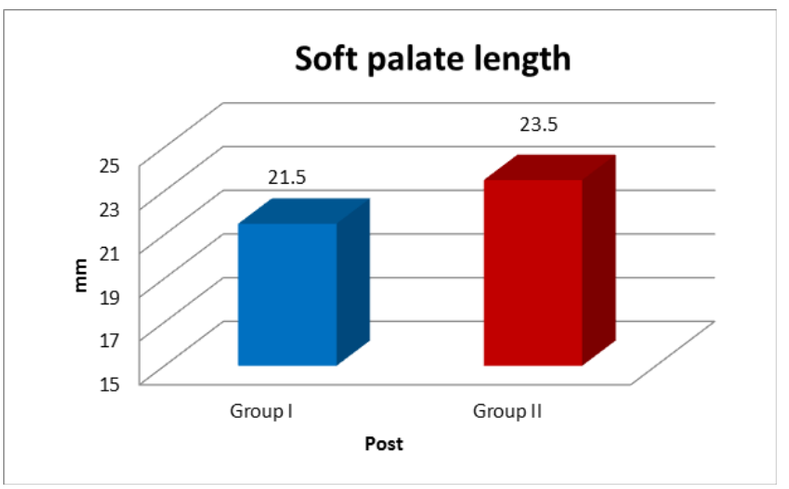

Figure 9 : Bar graph showing the soft palate length of both groups postoperatively.

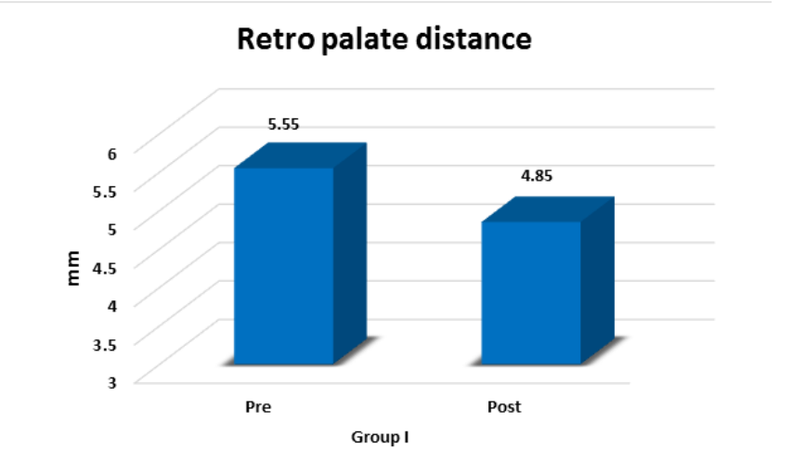

Figure 10 : Bar graph showing retropalatal distance of group I preoperatively and postoperatively.

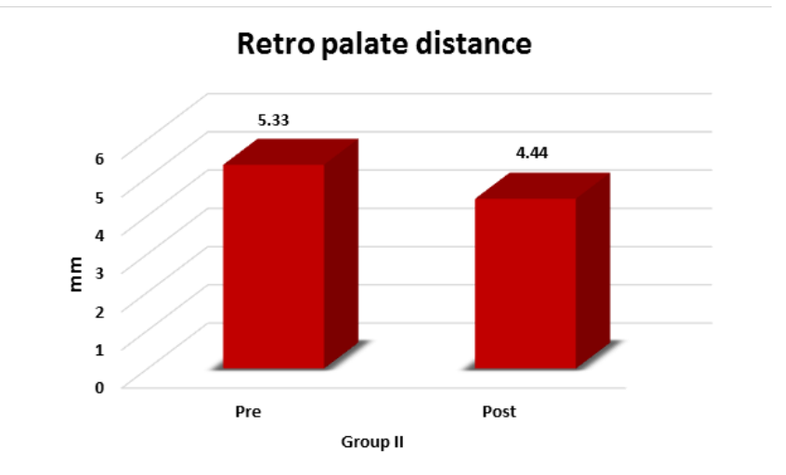

Figure 11 : Bar graph showing retropalatal distance of group II preoperatively and postoperatively.

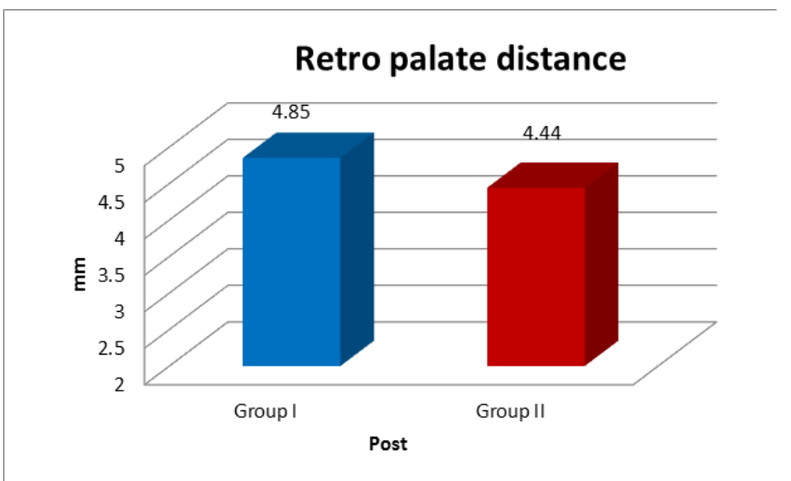

Figure 12 : Bar graph showing retropalatal distance of both groups postoperatively.

DISCUSSION

In the present study, the preoperative collected data regarding the patients age, sex, site of cleft and type of clef in both groups showed no statisticaly significant difference between both groups, so we accept the null hypothesis and we can say that group I is similar to group II in patients age, sex, site of clef and type of cleft and this demographic parameters doesn't interfere in the experiment.

Following the recommendation of many cleft surgeons in the United Sates who demonstrated that the most frequently used techniques were the Furlow Palatoplasty and the Bardach palatoplasty with an intravelar veloplasty (IVVP) (87% of all cases)[17]. This specification encouraged us to compere between these two techniques for cleft palate repair in our prospective comparative study.

In the present study, primary wound healing was achieved uneventfully in all patients without oronsal fistula in any case of both groups which disagree with Gunther E et al., (1998)[18] who found fistula frequency of 14.3% and this may be due to the small sampling size in both groups in our study.

In our study, there is no significant difference between both groups regarding the incidence of postoperative fistula which in agreement with Gunther E et al. (1998) who compared the Furlow palatoplasty with IVVP [18] and a systematic review by Timbang MR et al. (2014) who compared fistula rates between the Furlow palatoplasty and straight-line IVVP techniques did not also show any difference in fistula rates [19].

Technological advancements of MRI due to its excellent soft tissue contrast and possibility of imaging palates of babies with cleft palate and obtaining detailed anatomic information like muscle orientation and distribution [11]. Furthermore, it is easily repeatable, noninvasive and does not use ionizing radiation have led us to use it in our study. On the other hand, Videoendoscopy, is an invasive method and difficult to perform on children and videofluoroscopy uses ionizing radiation and produces superimposed images that might obscure differences between bone and soft tissue beside its limitation of soft tissue contrast[20].

The disadvantages of these two techniques support the application of MRI in our study.

In the current study, we used proton density weighted images according to Kuehn DP et al.,(2004) who concluded that proton density weighted images give the best contrast of the levator veli palatini muscle in relation to surrounding soft tissue structures comparing with either T1- weighted or T2-weighted images[12].

In the current study, we found a significant increase in soft palate length when comparing postoperative with preoperative values in each group without statistically significant difference between the two groups which predict good speech outcomes in future with agreement of Randall P et al., (2000) [21] who emphasized the importance of palatal length in palatoplasty and reported that patients with longer palates had statistically better speech results compared with patients with shorter palates.

In this study, the mean difference value of soft palate length was 8.330.69± mm in group I. On the other hand, the mean difference value of soft palate length was 112.51± mm in group II which was relative to palatal lengthening measurements of the elongation in the velar length was done by Ravishanker R (2006)[22].

In the present study, the course of the levator veli palatini muscle was changed dramatically after palatal surgery in both groups. By dissecting the levator fibers from the hard palate and releasing the anterolateral attachments in the region of the pterygoid hamulus, the course of the muscle became steeper relative to its origin at the base of the skull. This was in consistence with Kuehn DP et al., (2004) [12] and Ettema SL et al., (2002) [14]who stated that a more acute angle of origin would result in less favorable leverage for elevating the soft palate.

Finally, the analysis of the clinical and magnetic resonance results of the current study, proved that, both intravelar veloplasty and Furlow double opposing z-plasty technique were effective in soft palate lengthening besides the anatomical reconstruction of LVP which predict functional improvement of soft palate without significant difference between the two techniques.

CONCLUSION

From the results of this study we can conclude that:

1- Tensor tympani dissection and medialization without complete transection of its tendon in both techniques is mandatory for retropositioning of LVP muscle.

2- Although there were no statistically significant differences in soft palate length postopertively between both techniques. Furlow double opposing z-plasty technique lengthened the soft palate more than intravelar veloplasty, it can direct surgeon to prefer Furlow double opposing z-plasty technique in short soft palate.

3- Magnetic resonance imaging is a reiable and effective in imaging palates of babies with cleft soft palate and obtaining detailed anatomic information like muscle orientation and distribution especially in submucous cleft.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Costello BJ, Ruiz RL. Comprehensive Treatment Planning and Primary Repair. In: Peterson`s principles of oral and maxillofacial surgery. 2nd ed. USA:People's medical puplishing house 2004, 839.

2. Van Alast J, Kloppa K SM. Non syndromic cleft palate. Plast Reconstr Surg. 2008;121:1.

3. Kirschner RE., LaRossa D. LaRossa. Cleft lip and palate. Otolaryngol Clin North Am. 2000;33:1191.

4. Arosarena OA. Cleft lip and palate.. Otolaryngol Clin North Am. 2007;40(1):27–60.

5. Jayarajan R, Natarajan A, Nagamuttu R. Intravelar veloplasty: A review. J Cleft Lip Palate Craniofacial Anomalies. 2018;5(2):68.

6. Salyer KE, Sng KW SE. Two flap palatoplasty: 20-year experience and evolution of surgical technique. Plast Reconstr Surg. 2006;118:193–204.

7. Cutting CB, Rosenbaum J, Rovati L. The technique of muscle repair in the cleft soft palate. Oper Tech Plast Reconstr Surg. 1995;2(4):215–22.

8. LaRossa D. The state of art in cleft palate surgery. Cleft Palate Craniofacial J. 2000;37:225-8.

9. Furlow LT. Cleft Palate Repair by Double Opposing Z-Plasty. Plast Reconstr Surg. 1986;78(6):724–36.

10. Abdel-Aziz M. Speech outcome after early repair of cleft soft palate using Furlow technique. Int J Pediatr Otorhinolaryngol. 2013;77(1):85–8.

11. Ha S. The Levator Veli Palatini Muscle in Cleft Palate Anatomy and Its Implications for Assessment Velopharyngeal Function: A Literature Review. Korean J Commun Disord, 2007;12(1):77–89.

12. Kuehn DP, Ettema SL, Goldwasser MS, Barkmeier JC. Magnetic resonance imaging of the levator veli palatini muscle before and after primary palatoplasty. Cleft Palate-Craniofacial J. 2004;41(6):584–92.

13. Brown DL, Bapuraj JR, Mukherji SK, Chervin RD, Concannon M, Helman JI, et al. MRI of the pharynx in ischemic stroke patients with and without obstructive sleep apnea. Sleep Med. 2010;11(6):540–4.

14. Ettema SL, Kuehn DP, Perlman AL, Alperin N. Magnetic resonance imaging of the levator veli palatini muscle during speech. Cleft Palate-Craniofacial J. 2002;39(2):130–44.

15. Marsh, JL, Grames LM, Holtman, B. Intravelar veloplasty: a prospective study. Cleft Palate J. 1989;26(1):46–50.

16. Furlow LT. Cleft palate repair by double opposing z-plasty. 1995;2(4):223–32.

17. Stein MJ, Zhang Z, Fell M, Mercer N, Malic C. Determining postoperative outcomes after cleft palate repair : A systematic review and. J Plast Reconstr Aesthetic Surg. 2019;72(1):85–91.

18. Gunther E, Wisser JR, Cohen MA, Brown AS. Palatoplasty: Furlow's double reversing z-plasty versus intravelar veloplasty. Cleft Palate-Craniofacial J. 1998;35(6):546–9.

19. Timbang MR , Gharb BB , Rampazzo A , Papay F , Zins J DG. A. Systematic review comparing Furlow double oppos- ing Z plasty and straight line intravelar veloplasty methods of cleft palate repair. Plast Reconstr Surg. 2014;134:1014–22.

20. Beer AJ, Hellerhoff P, Zimmermann A, Mady K, Sader R, Rummeny EJ et al. Dynamic near-real-time magnetic resonance imaging for analyzing the velopharyngeal closure in comparison with videofluoroscopy. J Magn Reson Imaging. 2004;20(5):791–7.

21. Randall P, LaRossa D, McWilliams BJ, Cohen M, Solot C JA. Palatal length in cleft palate as a predictor of speech outcome. Plast Reconstr Surg. 2000;106:1254–1260.

22. Ravishanker R. Furlow's palatoplasty for cleft palate repair. Med J Armed Forces India. 2006;62(3):239–42.