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COMPARISON OF SPEECH OUTCOME FOLLOWING PALATAL REPAIR WITH AND WITHOUT RADICAL INTRAVELAR VELOPLASTY IN PATIENTS WITH INCOMPLETE AND COMPLETE CLEFT PALATE.

Plastic Surgery

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ABSTRACT

Introduction- Cleft lip and palate are variations of a type of congenital deformity caused by abnormal facial development during gestation. Treatment of the condition is aimed to provide optimum function of all these organs. Apart from correction of oral competence and ear pathology, speech correction is always a challenging aspect of the management in patients of cleft palate. Various methods of palatoplasty have been described which can be categorized broadly as two layered and three layered palatoplasty or palatoplasty with and without intravelar veloplasty. Both methods have their own advantage, disadvantages and outcomes.

Objective- To compare speech outcome, middle ear function, and post operative complications in palatoplasty with or without radical intravelar veloplasty (IVV).

Methodology- this is a prospective observational study done on 64 patiens of complete or incomplete cleft palate. Group A (n=32) patients were operated by palatoplasty without radical IVV. Group B (n=32) patients were operated by palatoplasty with radical IVV.

Results- speech outcome was improved in group B, while no significant deference was noticed in middle ear function or post operative complications.

Conclusion- Palatoplasty with radical intravelar veloplasty may be considered as an effective procedure for speech outcome as compared with palatoplasty without radical intravelar veloplasty.

KEYWORDS

Cleft palate, palatoplasty, speech outcome, radical intravelar veloplasty.

INTRODUCTION

Cleft palate is a condition in which two palatal shelves, that forms roof of the mouth fail to fuse partially (usually soft palate) or completely (both soft and hard palate). Cleft palate also known as palatoschisis can occur with or without cleft lip and are variations of a type of congenital deformity caused by abnormal facial development during gestation.

Among the children suffering from cleft lip and palate, most common presentation is cleft lip and palate together (46%), followed by isolated cleft palate (33%), and isolated cleft lip (21%). Majority of bilateral cleft lips (86%) and unilateral cleft lips (68%) are associated with cleft palate. Unilateral clefts are more common than bilateral clefts and occur more frequently on left side than on right. The etiology of cleft palate is Multifactorial. Genetic, environmental teratogens, folic acid deficiency during pregnancy, smoking, alcohol, maternal obesity, poor nutrition, intrauterine exposure to anticonvulsant phenytoin are some of the etiological factors known for causing cleft palate.[1]

Various classifications have been described for cleft lip and palate. Davis and Ritchie presented first classification for cleft lip and palate, followed by Veau's classification, Kernahan and Stark classification, Modified Kernahan's classification, Kriens classification etc. Balakrishnan presented Indian classification in 1975.This still remains a popular system for classification of cleft lip and palate.[2,3]

The Levator veli palatini muscles forms a transverse sling across the posterior half of soft palate, which on contraction causes the soft palate to move superiorly and posteriorly, contracting the posterior pharyngeal wall for velar closure. In a patient with cleft palate this sling becomes discontinuous due to its insertion across the cleft margin. This results in inability to close the palate against the posterior pharyngeal wall and air escapes through the nose during speech producing hypernasal quality. In addition to levator positioning, abnormal fusion of tensor veli palatini muscle impairs function of Eustachian tube and contributes to cleft otopathology.[4]

Various goals of palatoplasty are to separate oral and nasal cavities to provide better speech outcome, better Eustachian tube function, and to minimized any detrimental effect on dento-maxillofacial growth.[5]

MATERIALS AND METHODS

This is a prospective observational study done in 64 consecutive patients of cleft palate with or without cleft lip who were treated in the department of Plastic Surgery at our institute. The study duration was 24 months (from July 2014 to July 2016). Approval for the study was obtained from scientific board and Ethics committee of the Institute. Informed consent was taken for the study, to obtain photograph and for publication. All patients with cleft lip and palate group 2 and 3 (Nagpur classification), Full term born and between 9 month to 7 years of age were included in the study. Preterm born children, children with history of developmental delay were excluded from the study.

Various Parameters used in the study are shown in the table 1.

Table1

Parameters of speech outcomes
1. Nasal emission (0= absent, 1= mild, 2= moderate, 3= Severe) 2. Nasal turbulence (0= absent, 1= mild, 2= moderate, 3= Severe) 3. Hyper nasality (0= absent, 1= mild, 2= moderate, 3= Severe) 4. Speech intelligibility (0= none, 1= poor, 2= moderate, 3= good, 4= very good) 5. Velo pharyngeal insufficiency using Borel- Maisonny scale. [7] Grade1- Normal speech, no nasal emission Grade1/ 2- Intermittent nasal emission, good intelligibility Grade 2b- Continuous nasal emission, intelligible speech Grade 2m- Continuous nasal emission, unintelligible speech Grade 3- Presence of compensatory articulation mechanism
Parameters for middle ear function
Graphical record of tympanometry
Parameters for Post operative complications
Immediate-Bleeding, airway difficulties. Early- Oro-pharyngeal infection, wound dehiscence, palatal flap necrosis. Late - Oro-nasal fistula.

All patients of cleft palate attending plastic surgery OPD who were fit for surgery and fulfilling inclusion criteria were included in the study after obtaining informed consent from parents. Necessary parameters of speech assessment and middle ear functions were assessed and

recorded preoperatively in all patients irrespective before their categorization. Speech assessment and recording were done by speech therapist of the department of plastic surgery in a blinded manner in all patients. Middle ear functions in all patients were assessed by otolaryngologist of the institute in a blinded manner. After necessary evaluations and anesthesia fitness, Patients were planned for surgery. All patients were operated by two groups of surgeons as per hospital protocol and the method of Palatoplasty was as follows. First group of surgeons (surgeon 1 and 2) performed the palatoplasty in a routine manner for hard palate by raising mucoperiosteal flaps and for the soft palate by separating nasal and palatal layers without radical dissection of palatal muscles, however the muscles were released from the posterior border of hard palate an levator sling was created. Suturing of nasal and palatal layer was done in usual manner. We termed this as palatoplasty without radical intravelar veloplasty. Hence closure of soft palate was done in two layers nasal mucosa along with the levator muscle (not dissected separately) and palatal mucosa (figure 1a, 1b, 1c). Second group of surgeons carried out a radical dissection of intravelar musculature under magnification and recreation of levator sling was performed as a separate layer, hence the palate was closed in three layers, nasal mucosa, muscular sling and palatal mucosa (figure 2a, 2b, 2c). Patients were categorized in to two groups after surgery. Those who were operated by first group of surgeons were kept in group A (n=32) and those who were operated by second group of surgeons were kept in group B (n=32). Patients were discharged after 5 to 7 days and were followed up in outpatient department two weekly for one month, monthly for 4 to 6 months, followed by 2 to 3 monthly up to two years.

Speech assessment was done after 3 months of surgery and was repeated every two monthly interval for up to 2 years.

Post-operative parameters of complications (immediate, early, and late) were assessed and recorded by different surgeon or unit resident doctors. Speech assessment was done by the same speech therapist of the department and Middle ear function was assessed by the same otolaryngologist of the institute in a blinded manner. Neither of them was aware about the procedure details. Final Comparison of parameters was performed in both the groups.

The data was computerized and the database was prepared in Microsoft Excel 2007. The distribution of categorical data on patient's socio-demographic characterstics, clinical characterstics such as, complications, speech outcome etc was expressed in frequency and percentages. The comparison of these variables between the groups was be carried out by using Chi-Square test. The distribution of data on continuous variable such as age was expressed as mean with standard deviation (S.D). The comparison of this variable between groups was carried out by using independent student's t- test. All statistical analysis was carried out at 5% level of significance and p- value <0.05 was considered as significant. The statistical analysis was carried out in IBM PASW Statistics version 19.0 (SPSS version 19.0)

Observation

The distribution of the age group showed that the age among the group was found to be comparable (P > 0.05). The mean age of patients in group A was 3.48 (standard deviation 1.79) and in group B it was 3.42 (standard deviation 1.87). Among the group A, 46% were female and 53% were males. In group B 43.8% were female and 56.2% were females (Table 2, 3).

Table 2

Age group	Group A (n=32)	Group B (n=32)	Statistical significance
< 3 years	21(65.6%)	22 (68.7%)	P > 0.05
3 – 5 years	4 (12.5%)	3(9.3%)	
5 -7 years	7(21.8%)	7(21.8%)	

Table 3

	Gender		Total
Group	F	M	
A	15 (46.9%)	17 (53.1%)	32
B	14(43.8%)	18 (56.2%)	32
Total	29	35	64

Comparison of pre operative parameters

Pre operative parameters of nasal emission, nasal turbulence, hyper nasality, speech intelligibility, VPI, and tympanometry were compared between the study groups and the distribution of these parameters were found to be comparable (p > 0.05).

Comparison of pre operative and post operative parameters between the groups

A. Nasal emission

The rate of improvement in nasal emission among group A (n=32) after the surgery was 28%, where as in group B (n=32) overall improvement was seen in 81.25% patients. This shows that the percentage of patients with improvement was higher in group B. (x2=16.14, p < 0.05). (Figure 3).

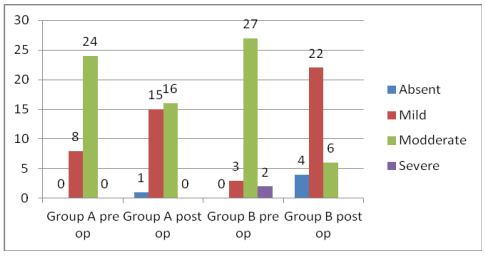

Figure 3

B. Nasal turbulence- The rate of improvement in nasal turbulence among group A (n=32) after the surgery was 15.62%, where as in group B (n=32) overall improvement was seen in 81.25% patients. This shows that the percentage of patients with improvement was higher in group B. (x2=25.02, p=0.00). (Figure 4).

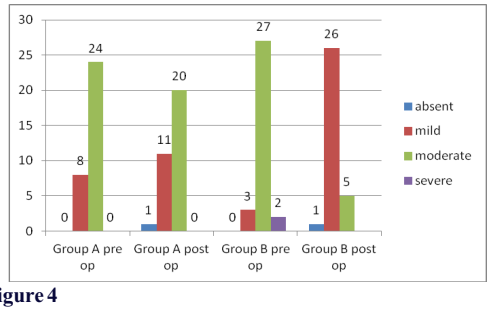

Figure 4

C. Hyper nasality – The rate of improvement in hyper nasality among group A (n=32) after the surgery was 25%, and in group B (n=32) overall improvement was seen in 81 % patients. This shows that the percentage of patients with improvement was higher in group B. (x2=18.13, p=0.00). (Figure 5).

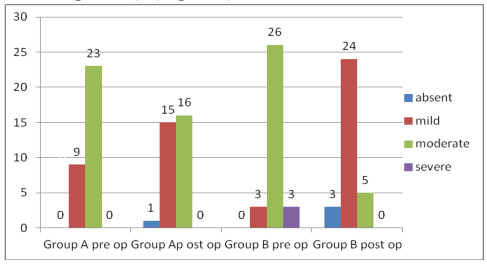

Figure 5

D. Speech intelligibility – The rate of improvement in Speech intelligibility among group A (n=32) after the surgery was 25.6%, where as in group B (n=32) overall improvement was seen in 90.6 % patients. This shows that the percentage of patients with improvement was higher in group B. (x2=33.2, p=0.00). Details are given in (Figure 6).

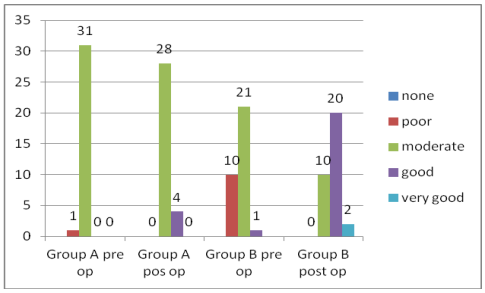

Figure 6

E. VPI– The rate of improvement in VPI among group A (n=32) after the surgery was 12.5%, where as in group B (n=32) overall improvement was seen in 84.3 % patients. This shows that the percentage of patients with improvement was higher in group B. (x2=30.28, p=0.00). (Figure 7).

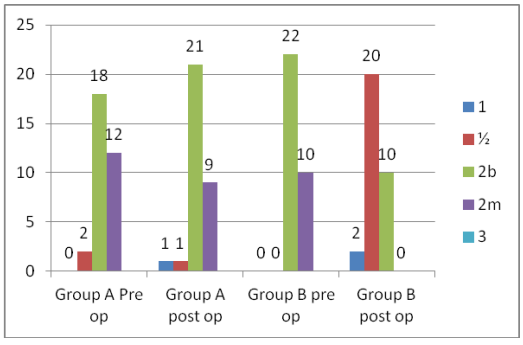

Figure 7

F. Tympanometry - The rate of improvement in tympanometry among group A (n=32) after the surgery was 6.25%, where as in group B (n=32) overall improvement was seen in 12.5 % patients. This shows that the percentage of patients with improvement was not significant in group B. (x2= .184, p>0.00). (Figure 8).There was no significant improvement seen in middle ear function in group B patients.

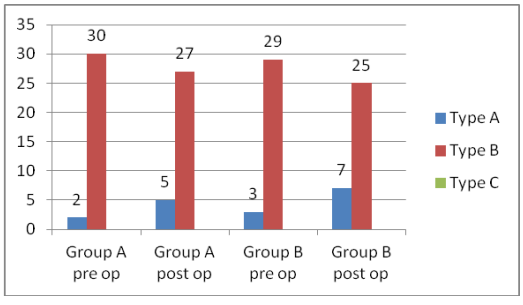

Figure 8

Post operative complications- All patients recovered well in both the groups. None of the patient showed post operative complications in during the surgery, post operative hospitalization or follow up period. There was no any increased incidence of post op complication especially wound dehiscence or fistula was noted in group B patients.

Nasoendoscopy

Nasoendoscopy was performed in patients who were cooperative. Among Group A, in 12 patients Nasoendoscopy was performed. Pre operative uvula movement was found to be restricted in all patients. Post operatively In 2 patient uvula movement was found to be good and good closure of velopharyngeal apparatus was seen, while in 10 patients uvula movement was found to be restricted.

In Group B Nasoendoscopy were performed In 10 patients. Pre operative uvula movement was found to be restricted in all patients. Post operatively In 7 patient uvula movement was good and good closure of velopharyngeal apparatus was seen, while in 3 patients uvula movement was found to be restricted.

DISCUSSION

Levator veli palatini muscle is primarily responsible for palatal elevation and production of sound.[4] After palatal repair speech should be evaluated by an objective assessment following a standardized protocol.[5]

Various methods of cleft palate repair are described by various surgeons.Von Langenbeck's palatoplasty uses two parallel incisions along the cleft side, two parallel incisions along the alveolus and then two layer closure of the defect. Veau- Wardill- Kilner, V-Y push back palatoplasty is a modification of Von Langenbeck's technique to release the palatal length for improved function. Furlow's palatoplasty is also known as double reversing Z- plasty for soft palate to increase length of soft palate. Bardach Two- Flap Palatoplasty is a modification of Von Langenbeck technique in which incisions are made along cleft margin and alveolar margin, these are joined anteriorly to free the mucoperiosteal flaps, soft plate is repaired in straight line, Levator veli palatine muscle dissection and reconstruction is performed and hard palate is closed. Two staged Palatoplasty, in which soft palate and lip is repaired early and hard palate is repaired later. Hole in one repair is the procedure in which both palate and are repaired together. [8]

Victor Veau first advocated re-approximation of levator palatini muscle in midline during palatal repair. Krien O.B. introduced modification of Wardill- kilner V-Y push back technique, in which submucosal dissection of the muscles on the nasal side is done and then reconstruction of palatal muscles in midline and three layer closure is done.[5]

A retrospective study was one done by Sullivan S R et al. on 58 patients of submucous cleft palate to compare speech outcomes among three procedures, two- flap palatoplasty with muscle retropositioning, double opposing Z- plasty and pharyngeal flap. They concluded that double-opposing z- plasty is more effective than two-flap palatoplasty with muscular retropositioning and in children older than 4 years, primary pharyngeal flap was found to be more effective. [9]

Sommerlad B C 2003 conducted a study on various methods of palatoplasty. This prospective study was done for 442 palatal repairs between 1978 to 1992. Comparison was done between two methods of palatoplasty. Evidence from independent assessment suggests that more radical muscle dissection improves velar function, but speech improvement was not significant enough to perform intravelar veloplasty routinely.[10]

Andrades P et al studied effect of introduction of intravelar veloplasty between two study groups, with special emphasis on immediate post operative complications, oronasal fistula rate and speech outcome . They concluded that there were no differences in post-operative complications between two groups. Perceptual speech evaluation demonstrated significantly better speech outcome and significantly lower rate for secondary palate surgery for velopharyngeal insufficiency in intravelar veloplasty group. [11]

A prospective cohort study was done by Mohamed E et al. on 70 patients. They compared two layer palatoplasty with three layer palatoplasty. Patients were divided in two groups, group A (Veau class 2) included 32 patients and group B (Veau class 1) included 38 patients. In each group two-layer palatoplasty without intravelar veloplasty was compared with three-layer palatoplasty with intra velar veloplasty. They found that palatal muscle repair results in better speech outcome and greater resolution of secretory otitis media but incidence of palatal fistula rate was greater . [12]

A retrospective study was done by Doucet et al. on speech outcome of palatal repair with and without intravelar veloplasty on 40 children with complete unilateral cleft lip and palate. Patients were treated according to two different protocols: Malek protocol (lip and soft palate repair without intravelar veloplasty at 3 month and hard palate repair at 6 month) and Talmant protocol (lip and soft palate repair with intravelar veloplasty at 6 month and hard palate repair at 16 month). Main outcome measures evaluated were speech intelligibility, velopharyngeal insufficiency and incidence of complications. They found that speech intelligibility and velopharyngeal incompetence was better in children who were operated by intravelar veloplasty. There was no significant increase in post operative complications. [13]

RESULT

Result of our study shows that speech outcome can be significantly improved in patients who undergo radical intravelar veloplasty as compared to palatoplasty without radical intravelar veloplasty. However no significant deference in post operative complications or middle ear function could be recorded among the groups.

CONCLUSION

Different methods of palatoplasty are done by different authors. Study comparing two methods of palatoplasty is not done in Indian population. Such comparative study would help in identifying the best method of palatoplasty for children of cleft palate. The present prospective observational study gives us an insight about the dynamics of palatal musculature and its reconstruction in cleft palate deformity. However limitation of our study is small sample size. A robust randomized controlled design with longer follow up and a may be required to give more significant result.

Conflicts of interest- None
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