Comparative Study of 2 Palatoplasty Techniques to Assess Speech and Fistula in Primary Cleft Palate Patients

Rao J.K. Dayashankara, MDS *Sanjay Singh, MDS*
G.N. Suma, MDS *Krishna Gokkula, MDS*
Vivek Kumar, MDS *B.S. Sursh, MDS*

ABSTRACT

Purpose: To assess the Quality of speech and the incidence of post operative fistula in each technique after 6 months follow up study.

Methods: This prospective study consists of 24 patients in the age group of 18 to 36 months, male 12 and female 12. All the patients were divided into two groups—Group I-12 patients for two layer closure, Group II-12 patients for three layer closure. Exclusion criteria was submucous clefts, any identified syndrome and patients with hearing loss. All the patients have undergone pre-operative speech assessment by the speech therapist. At end of 6 months, speech analysis was done based on three parameters, i.e. nasality (A), Articulation (B) and intelligibility (C).

Results: Patients with radical muscle dissection (three layer) group had statistically significant (P=0.023) improvement in nasal resonance compared to the conservative technique (two layer) in the younger age group. But there was no statistically significant difference in the articulation and the intelligibility of speech.

Conclusion: Radical dissection and palatal muscle reconstruction confers better functional results regarding nasal resonanace, especially in younger age group. Quality of speech in the elder group, patients 25-36 months old in both the technique groups was almost the same. The incidence of fistula was slightly more in the radical dissection group.

(J Dent Child 2011;78:13-18)

Received November 15, 2009; Last Revision March 8, 2010; Revision Accepted March 8, 2010.

KEYWORDS: PRIMARY CLEFT PALATE SURGICAL TECHNIQUE, GROWTH AND DEVELOPMENT, CHILDREN WITH SPECIAL HEALTH CARE NEEDS

The ideal surgical technique for management of a congenital cleft palate deformity continues to be a source of great controversy. There are more disputes, misunderstandings, and misconceptions related to palatoplasty than to any other surgical procedure used to treat cleft lip, palate, and associated nasal deformities.[1] At the same time, there are some very well-designed and well-executed studies with different findings, leading to controversial conclusions.[1]

Surgical correction of cleft palate has the functional objective of achieving optimum results in the development of speech, hearing, swallowing, dental arch formation, and facial growth. Of these, normal speech is the most important and most difficult to obtain. The paramount goals of treatment of cleft palate are to achieve normal speech without incurring maxillofacial growth disturbances and minimize hearing loss and middle ear complications.[2]

Cleft lip and palate treatment is a continuously evolving subject in the international scientific world. Surgical

Dr. Dayashankara is professor and head, Department of Oral and Maxillofacial Surgery, and Dr. Suma is professor, Department of Oral Medicine and Radiology, SGT Dental College, Hospital and Research Centre, Gurgaon, Haryana, India; Dr. Gokkula is associate professor, Dr. Kumar is postgraduate student, and Dr. Singh is professor, Kothiwal Dental College, Moradabad, Uttar Pradesh, India; and Dr. Sursh is professor, Department of Pediatric Dentistry, Mahaveer Teethankar Dental College and Hospital, Moradabad, India.
Correspond with Dr. Dayashankara at dayash9@rediffmail.com

techniques are continuously evolving, and different protocols have been adopted in various centers.[3] Also, there are controversies regarding the duration of postoperative stay. Short stay cleft palate surgery has been demonstrated to be safe, given adequate oral intake, competent parents, and a safe home environment.[4] Oronasal fistula is a recalcitrant complication following palatoplasty, resulting in nasal emission during speech and deglutition. Surgical technique and experience are factors associated with a low incidence of fistula.[5]

The purpose of this study was—using Pinto's modification of Wardill-Kilner palatoplasty with and without radical dissection of the levator veli palitini muscle (**LVP**)—to evaluate the results on speech and the occurrence of postoperative fistula in 2 different age groups.[7-9]

METHODS

The Kothiwal Dental College and Hospital, Moradabad, India approved the study which included a consecutive series of 24 18- to 36-month-old children (12 males, 12 females; mean age=27.7 months) who underwent cleft palate repair between 2005 and 2009 at the Department of Oral and Maxillofacial Surgery, SGT Dental College, Hospital and Research Centre, Gurgaon, Haryana, India. All patients were randomly selected. Informed consent was obtained from all parents/guardians, and no adults were included in the study. No children were known to be mentally impaired or have associated syndromes.

Exclusion criteria included the existence of a submucous cleft palate, an identified syndrome, and/or hearing loss (sensorial or persistent conductive hearing loss despite tympanostomy). Data collected included: date of birth; sex; cleft palate type (classified according to Veau's Class I—soft palate; Class II—hard/soft palate extending to the incisive foramen; Class III—unilateral complete cleft lip/palate; and Class IV—bilateral complete cleft lip/palate); age at palatoplasty; and preoperative and postoperative assessments. Palatal interior and posterior fistulas also were recorded.

All pre- and postoperative examinations were carried out by the same surgeon, otolaryngologist, and speech therapist. Twenty-four patients underwent Pinto's modification of Wardill-Kilner palatoplasty with and without radical dissection of the LVP and tensor veli palatini (**TVP**) muscle (Table 1).

Table 1. Distribution of Patients

Age (mos)	Gender (N)	2-layer technique		3-layer technique	
		Class II	Class III	Class II	Class III
18-24	Males (6) Females (6)	4	2	3	3
25-36	Males (6) Female (6)	3	3	4	2

All patients were divided into 2 main groups, according to the palatoplasty technique: group 1, consisting of 12 patients treated with 2-layer palatoplasty (modified Wardill-Kilner V-Y pushback technique [**V-YPT**] without intravelar veloplasty; and group 2, consisting of 12 patients treated with 3-layer palatoplasty (Kriens technique [**KT**]) with intravelar veloplasty. Each group was further subdivided into: subgroup A (18- to 24-month-olds); and subgroup B (25- to 36-month-olds).

PALATOPLASTY TECHNIQUE

GROUP 1

In group 1, cleft palate repair was performed after each child had received the general anaesthesia and was positioned on the operating table with the head hyperextended. The Dingman retractor was fixed. A 1:200,000 adrenaline solution was injected beneath the mucoperiosteum of the hard palate and infiltrated in the mucosa on each side of the cleft velum, which aids dissection and hemostasis. The cleft's edges were pared with a no. 15 blade anteriorly to posteriorly toward the uvula. A short incision was made medially and behind the tuberosity.

The hamular process was fractured in these patients to free the TVP tendon, thus facilitating the posteromedial displacement of velar muscles and the mucoperiosteal flaps (Figure 2). The flap was then elevated off the bony palate with a Mitchell trimmer until the posterior palatine vessels and foramen were identified. This was followed by detaching the nasa mucosa from the hard palate's posterior border and medially elevating the lateral pharyngeal mucosa.

Anchoring sutures were placed, and the nasal layer was closed using 3-0 catgut sutures. The same sutures were passed through the oral layer later as anchoring sutures. This minimized the dead space and prevented the flap from falling. Lastly, 1 or 2 stay sutures were placed for the lateral releasing incision.

GROUP 2

In group 2, 12 patients underwent the same palatoplasty technique, but with radical dissection of the LVP (KT). LVP fibers were divided near the main mass of the velum without perforating the nasal mucosa. This muscle was retropositioned, which increased the velum's elasticity (Figure 6). All patients were given postoperative amoxicillin clavulanate antibiotics for 7 days and discharged after a week. Each was regularly seen at 1-month intervals for 1 year by the surgeons and speech therapist and received postoperative speech assessments and counselling by his/her parents regarding the importance of regular follow-up with the speech therapist.

Clinically significant fistulas were determined by the presence of either hypernasal speech, articulation problems, or fluid regurgitation from the nose. Speech

Table 2. Combined Speech Results of Both Groups According to 3 Parameters 6 Months after Surgery[10]

Group	Nasal resonance*				Total no. of patients	Articulation†				Total no. of patients	Intelligibility‡			Total no. of patients
	A1	A2	A3	A4		B1	B2	B3	B4		C1	C2	C3	
1	1	6	5	0	12	5	4	3	0	12	9	3	0	12
2	7	4	1	0	12	8	3	1	0	12	9	3	0	12

** A1=normal; A2=mild hypernasality; A3=moderate hypernasality; A4=severe hypernasality.*
† B1=normal; B2=1–2 consistent errors only with no deterioration in speech; B3=1–2 errors with deterioration in connected speech or ≥3 errors but intelligible; B4=multiple errors, but frequently intelligible.
‡ C1=always intelligible; C2=sometimes unintelligible; C3=unintelligible most of the time.

Table 3. Statisctical Values for 3 Speech Parameters, per the Chi-square Test

Technique	Preoperative *P*-value	6 months Postoperative *P*-value	Statistical Significance
Nasal resonance	>.02	<.05	Significant
Articulation	<.40	>.05	Nonsignificant
Intelligibility	1.000	>.05	Nonsignificant

was evaluated via 3 parameters: (1) nasality; (2) articulation; and (3) intelligibility. Each parameter was subdivided, as follows[3]:

1. Nasality was divided into: A1=normal; A2=mild hypernasality; A3=moderate hypernasality; and A4=severe hypernasality.
2. Articulation was divided into: B1=normal; B2=1 to 2 consistent errors only, with no deterioration in speech; B3=1 to 2 consistent errors with deterioration in connected speech or 3 or more errors but intelligible; and B4=multiple errors and frequently unintelligible.
3. Intelligibility was graded into: C1=intelligible at all times; and C2=sometimes unintelligible; C3=unintelligible most of the time.
4. Velopharyngeal incompetence was diagnosed clinically by the surgeons and speech therapist.

RESULTS

No major perioperative or postoperative complications occurred throughout the study, except in 1 patient who had secondary bleeding 48 hours following surgery.

Many patients showed improvement in their 6-month postoperative speech in both groups. Both 2-layer and 3-layer palatoplasty resulted in improved articulation, nasal resonance, and intelligibility. Statistically, however, group 2 patients had significantly better nasal resonance (P>.02) than group 1 patients (see Table 2). Statistical values of articulation (P<.37; Table 2) and intelligibility (P<.54; Table 3) were nonsignificant. There was no statistically significant difference in preoperative speech in both groups (P<.40).

In subgroup a for both groups, there was significant improvement in nasal resonance (P<.04; Table 1). No other statistically significant improvements in other speech parameters were found.

The postoperative values of speech assessment (nasal resonance, articulation, and intelligibility) for both groups were statistically significant when compared with preoperative speech assessment values, which indicates that both techniques improved speech quality.

The N-Par and Wilcoxon signed rank tests were used to detect significant differences within a group (intragroup) as follows: Within-group analysis=comparison between preoperative and 6-months postoperative nasal resonance, articulation (P=.006 for group 1 and P=.003 for group 2, both statistically significant), and intelligibility (P=.002 for groups 1 and 2, statistically significant).

Postoperative palatal fistulas were encountered in 4 subjects. Hence, both techniques were considered equally appropriate for palatoplasty.

DISCUSSION

Cleft palate surgery is one of the greatest challenges for oral and maxillofacial surgeons. A good result requires esthetic functional closure without impairment of facial growth, allowing normal speech development. Speech is a complex phenomenon that is best learned once, and the younger the better.

In 1993, Haapanen and Rintala[8] compared quality of speech after using the mucoperiosteal palatal V-YP technique and the Cronin modification in the primary treatment of cleft palate. They took 77 subjects who had undergone primary palatoplasty for analysis. One-stage closure of the soft and hard palate was done for 43 patients by the mucoperiosteal palatal V-YP, and 34 patients underwent the Cronin modification. They found patients receiving the Cronin modification achieved more normal nasal resonance than those that received the V-YPT. Both groups, however, had similar results for articulation.

In the present study, hypernasality was less improved in group 2, and there was no significant difference in articulation for both groups—two findings which were similar to Haapanen and Rintala's study. In 1993, Heliovaara et al.,[9] evaluated and compared long-term operative results of 1-stage closure of isolated cleft palate with either the V-YPT or Cronin modification. They compared the incidence of palatal fistula in their patients who had undergone palatoplasty and concluded that the incidence of fistula in both groups was similar (10%). In our study, by comparison, we found a fistularate of approximately 8% in group 1 and 16% in group 2.

In 1995, Grobbelaar et al.,[10] investigated the speech results of 5 different techniques for soft cleft palate repair and also assessed the timing for when repair can be performed to improve better speech results. A total of 184 patients underwent either a: Dorrance repair (25 patients); V-YPT (41 patients); Perko repair (19 patients); Von Langenbeck repair (79 patients); or a Furlow Z-plasty (20 patients). Speech was assessed for articulation, intelligibility, and resonance. Assessment was performed by 1 or 2 speech therapists. The follow-up period was between 3 and 24 years. They found that the Furlow Z-plasty and Perko repairs yielded the best speech results. In the V-YPT repair group, 39 of 41 patients achieved normal speech results, indicating that it was individually a favorable technique. Fistulas were uncommon after soft palate repairs. In the V-YPT repair group, 3 of 41 patients had palatal fistulas postoperatively, which required a second operative repair.

Similarly, the present study's patients underwent 2 different techniques: V-YPT and KT. Our conclusion was that there was no significant difference in the articulation and intelligibility for either technique.

Grobbelaar et al.'s study concluded that speech results were better when the palate was repaired no later than 6 months of age vs repairs completed at an older age. Similarly, the present study's speech results were significantly better in younger (18-24 months) than in older patients (24 to 36 months).

Marrion et al.,[11] studied: velopharyngeal function in nonsyndromic cleft palate patients; relevance of surgical technique; age at repair; and cleft type. All patients underwent palatal repair via the von Langenbeck technique and V-YPT. Patients were divided according to the age at repair: 8 to 10 months; 11 to 13 months; 14 to 16 months; and 16 months and older. They concluded that the type of repair was not a significant variable in attaining velopharyngeal closure compared to discrete time frames of age of repair (<6 months, 7-8 months, and >9 months) and further concluded that the younger children did not have better velopharyngeal function than older children. Technique also was not a significant variable.

In our study, both the V-YPT and KT produced satisfactory results in terms of velopharyngeal function. Comparatively, however, KT was better than V-YPT. The age of repair showed that younger children had better velopharyngeal function (especially in terms of nasal resonance) than older children who received the KT.

In 2003, Sommerlad[12] developed a palate repair technique that combines minimal hard palate dissection with radical retropositioning of the velar musculature and tensor tenotomy. He proved that the assessment of speech results in palate re-repair and submucous cleft palate repair suggests that more radical muscle dissection improves velar function. Or study supports these findings, as we found better speech results (velar function) in patients who had undergone the KT, which was similar to Sommerlad's results.

Sommerlad et al.,[13] questioned whether velar surgery was worthwhile for submucous cleft palate (**SMCP**) and evaluated whether results were dependent on the degree of the anatomical abnormality. They concluded that there was significant improvement in hypernasality, nasal emission, and velopharyngeal closure. SMCP severity did not correlate with the degree of preoperative speech abnormality, but was a significant predictor of surgery outcome: Patients with less severe SMCP (total score=0-3) had less satisfactory end results and lesser degrees of improvement.

In our study, both the V-YPT and KT gave satisfactory results in terms of velopharyngeal function; hence, velar surgery appears worthwhile for cleft palate repair. Improvement was a nondependent variable regarding cleft types. In 2007, Hassan et al.,[7] compared V-YPT without intravelar veloplasty vs KT with intravelar veloplasty regarding postoperative functional outcome of Eustachian tube and velopharyngeal competence. They concluded that in the V-YPT for both groups, there was a greater tendency for resolution of secretory otitis media in the early postoperative period, less time required for extrusion of the grommet tube, and a lower incidence of recurrent secretory otitis media.

In the present study, the incidence of postoperative velopharyngeal incompetence was greater in group 1 patients, while the incidence of palatal fistula was greater in group 2 patients. Both techniques showed good speech improvement after palatoplasty. Not much difference was found in speech in relation to the techniques compared, however, except for nasal resonance in KT palatoplasty, which is a more challenging technique than the modified V-YPT. The incidence of palatal fistula was more in KT palatoplasty than V-YPT.

Figure 1. Photo of the preoperative cleft palate showing involvement of both the hard and soft palate before the 2-layer palatoplasty technique.

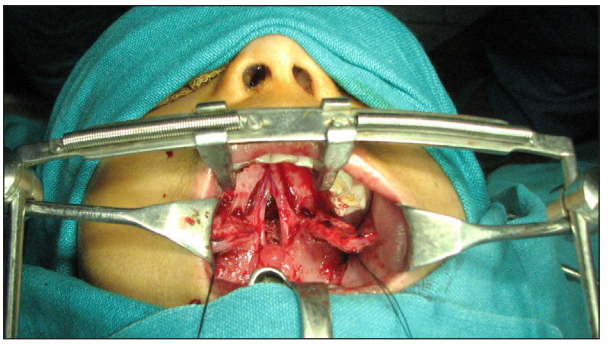

Figure 2. Intraoperative photo showing elevation of flaps during the 2-layer palatoplasty technique.

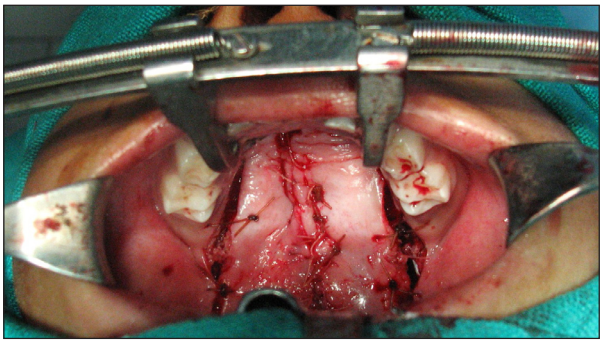

Figure 3. Photo taken immediately following the 2-layer palatoplasty technique.

Figure 4. Photo taken 6 months after the 2-layer palatoplasty technique.

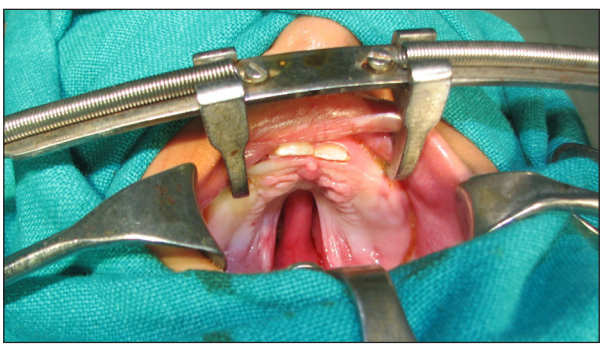

Figure 5. Photo of preoperative cleft palate showing involvement of both the hard and soft palate before the 3-layer palatoplasty technique.

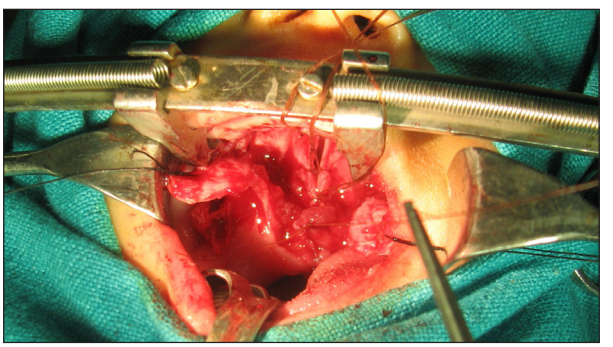

Figure 6. Intraoperative photo showing levator palatini muscle dissection during the 3-layer palatoplasty technique.

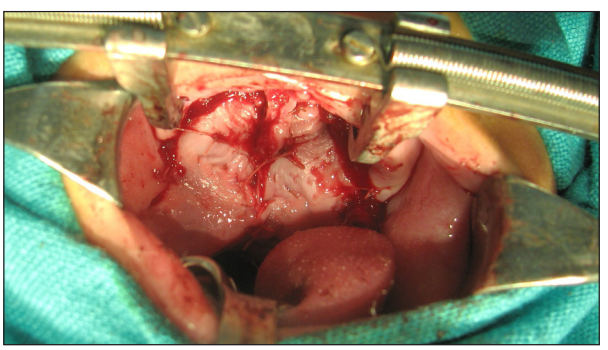

Figure 7. Photo taken immediately following the 3-layer palatoplasty technique.

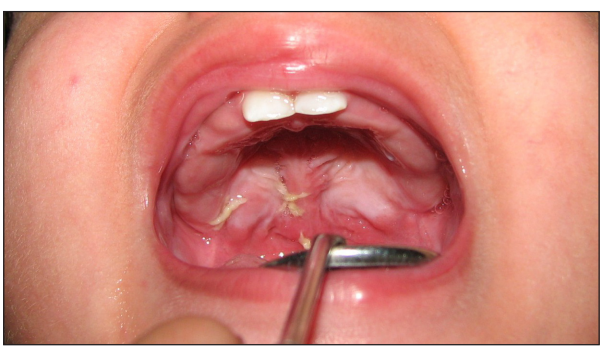

Figure 8. Photo taken 2 months following after the 2-layer palatoplasty technique.

CONCLUSIONS

Based on this study's results, the following conclusions can be made:

1. Both the 2-layer palatoplasty (modified Wardill-Kilner V-Y pushback technique [V-YPT]) without intravelar veloplasty and the 3-layer palatoplasty (Kriens technique [KT]) with intravelar veloplasty resulted in satisfactory cleft palate repair.
2. Speech evaluation results indicate that the KT is superior to the modified V-YPT for achieving normal nasal resonance, especially in younger children.
3. There was no significant difference in either technique regarding articulation and intelligibility of speech.
4. Cleft palate repair via V-YPT gives equally good speech results regarding articulation and intelligibility and results in a lower incidence of palatal fistula. KT patients, on the other hand had a higher incidence of postoperative fistula.
5. Timing of repair also is an important factor affecting speech after palatoplasty.

REFERENCES

1. Kenneth E, Sayler MD. Two-flap Palatoplasty—My Technique after 35 Years of Experience: Proceedings of the Cleft 2008 ICPF Fifth Congress, September 22-26, 2008, American Society of plastic surgeons, Dallas-FortWorth,Texas USA.
2. Grabb William C. General aspects of cleft palate surgery. In William C. Grabb, Sheldon W. Rosenstein, Kenneth R. Bzoch, editors. Cleft lip and palate, surgical, dental and speech aspects. 1st ed. London J. and A. Churchill Publishing; 1971:373.
3. Cascone P, Arangio P, Ramieri V, Foresta E. Cleft lip and palate: Technical strategies for the primary palatoplasty. J Craniofac Surg 2008;19:1343-7.
4. Bateman MC, Conejero JA, Mooney EK, Rothkopf DM. Short stay cleft palate surgery with intraoperative dexamethasone and marcaine. Ann Plast Surg 2006;57:245-7.
5. Moorthy AS, Parik PM, Cristion C, et al. Fistula after 2-flap palatoplasty: A 20-year review. Ann Plast Surg 2009;63:1-4.
6. Muzaffar AR, Byrd HS, Rohrich RJ, et al. Incidence of cleft palate fistula: An institutional experience with two-stage palatal repair. Plast Reconstr Surg 2001;108:1515-8.
7. Hassan ME, Askar S., Does palatal muscle reconstruction affect the functional outcome of cleft palate surgery? Plast Reconstr Surg 2007May;119:(6) 1859-65.
8. Haapanen MJ, Rintala AE. Comparison of quality of speech after Veau-Wardill-Kilner pushback operation and the Cronin modification in the primary treatment of cleft palate. Scand J Plast Reconstr Surg Hand Surg 1993;27:113-8.
9. Heliövaara A, Rintala A, Reijo RA. One-stage closure of isolated cleft palate with the Veau-Wardill-Kilner V-Y pushback procedure or the Cronin modification I: Comparison of operative results, Scand J Plast Reconstr Surg Hand Surg 1993;27: 49-54.
10. Grobbelaar AO, Hudson DA, Fernandes DB, Lentin R. Speech results after repair of the cleft soft palate. Plast Reconstr Surg 1995;95:1150-4.
11. Marrian EM, Labrie RA, Mulliken JB. Velopharyngeal function in nonsyndromic cleft palate: Relevance of surgical technique, age at repair, and cleft type. Cleft Palate Craniofac J 1998;35:95-100.
12. Sommerlad BC. A technique for cleft palate repair. Plast Reconst Surg 2003;112:1542-8.
13. Sommerlad BC, Fenn C, Harland K. Submucous cleft palate: A grading system and review of 40 consecutive cleft palate repairs. Cleft Palate Craniofac J 2004;41:114-23.