

Posteriorly based lateral tongue flap for reconstruction of large palatal-alveolar fistulas in cleft patients

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ABSTRACT

Background: Large palatal fistula in cleft patients is a difficult situation, especially with previous multiple surgeries, which have led to severe scars in the palatal mucosa. Tongue flaps are useful aids in such situations. **Materials and Methods:** Seven cleft patients who were reconstructed by posteriorly based lateral tongue flap between 2005 and 2012 were studied. Variables such as flap-ability to close the fistula, remaining tongue shape at least 1 year after operation, and speech improvement (patients' self-assessment) were evaluated. **Results:** Age range of the patients was 14–45 years. The male-to-female ratio was 2/7. Posteriorly based lateral tongue flap effectively closed the large fistula in 6/7 of patients. The largest dimensions of fistula closed by this flap was 5 cm × 1.5 cm. Follow-up of 2–7 years showed that the tongue never returned to the original size and remained asymmetrical. In addition, the nasal speech did not improve dramatically after the closure of large palatal/alveolar fistulas in this age group. **Conclusion:** Posteriorly based lateral tongue flap is an effective method to solve the problem of large palatal fistulas in adult cleft patients. The most useful indication for this flap is a large longitudinal palatal fistula, extending to the alveolar process. Asymmetrical tongue shape after surgery is the rule and speech improvement depends on patient's age and location of fistula.

Keywords: Palatal fistula, reconstruction, tongue flap

INTRODUCTION

Reconstruction of large palatal fistulas in cleft patients is often extremely challenging.^[1] Because of adjacent mucosal atrophy and insufficient volume, closure of large fistulas is too difficult.^[2] Tongue flaps are appropriate techniques in such situations.^[3] The replaced tissue is mucosa therefore, it is an ideal reconstruction: "Replacement of the lost tissue with the similar tissue." Tongue flaps have many variants, including anteriorly, or posteriorly based flaps with axial or random pattern blood supply from dorsal, ventral or lateral portion of the tongue.^[4-7] Tongue flaps can be used in the reconstruction of the oral cavity in cleft surgery, congenital deformities, and intraoral reconstructions after pathologic resections or traumatic avulsions. It has been reported as a mucosal coverage for reconstruction of ramus, angle, body and symphysis of the mandible, floor of the mouth, soft and hard

palate, maxillary alveolar region, oronasal and oroantral fistula closure, and buccal mucosal replacement. Lower lip and even the tongue itself can be reconstructed by this flap.^[8,9]

Posteriorly based lateral tongue flap is an appropriate flap for reconstruction of large palatal and alveolar fistulas.^[10] The

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experience of the authors in this study about this flap in cleft patients is explained.

MATERIALS AND METHODS

Seven cleft patients who underwent reconstruction by posteriorly based lateral tongue flap between 2005 and 2012 were studied. Variables such as flap's ability to close the fistula, the remaining tongue shape at least 1 year after surgery, and speech improvement (patient's self-assessment and parents' opinion) were evaluated. The surgical procedure was as follows:

Preparation of the recipient site

The two-layer closure is the goal of this surgery. Nasal-side closure is often achieved by turning over the palatal mucosa on the edges and suturing together in the midline (hinged flap).

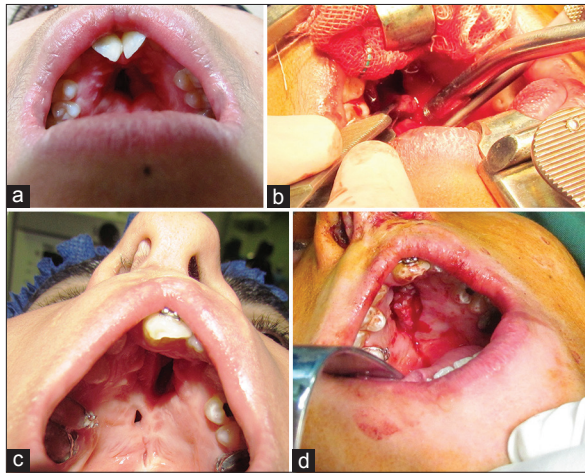


Figure 1: (a) Palatal fistula at the junction of primary and secondary palate. Inferior turbinate is visible through the fistula. (b) Anteriorly based inferior turbinate flap was used to assist in the nasal-side closure. (c) Palatal fistula with visible nasal septum through it. (d) Hinged flap from inversion of adjacent palatal mucosa and vomer flap

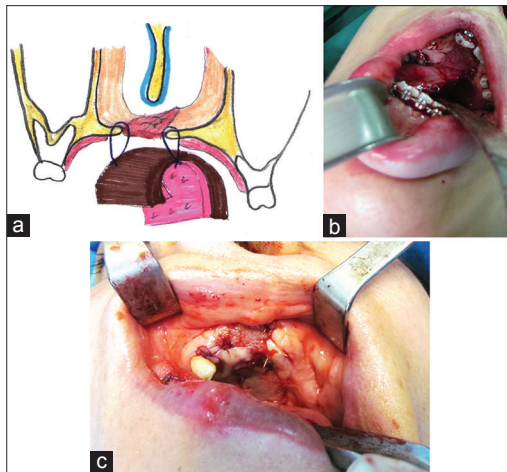


Figure 3: (a) Schematic representation. Two bone sutures are used for suspension of the tongue flap. (b and c) Posteriorly based lateral tongue flap in place

In cases where the nasal septum was accessible through the fistula, elevating the mucosa from one side of this structure was useful (vomer flap). In a case the inferior turbinate was used as anteriorly based mucosal flap, it was sutured to the edges of the reflected palatal mucosa to provide nasal floor sill [Figure 1].

Preparation of the donor site

Based on the location of the fistula, the incision design on the tongue differs. In maxillary alveolar process fistula extending posteriorly to the hard palate, the incision in the midline of the tongue tip was considered for the beginning of flap elevation. If the fistula was limited to the hard palate, the incision began one centimeter away from the tongue midline because of the need for less length. Based on the width of the defect, up to 1/3 of the tongue width could be included in the flap design. Full-thickness incision of the tongue from the anterior to the posterior direction creates posteriorly based lateral tongue flap. In such cases, the flap should not extend posteriorly to the circumvalvate papilla. Great caution was exercised so that the flap pedicle would not become thin when the incision extended posteriorly [Figure 2].

When there was a need for more width, the elevated flap could be incised from below in longitudinal direction. It converted the thick, narrow flap to a thin wide one. The flap was sutured to the recipient palatal mucosa. For further augmentation, one bone suture on each side of the fistula, in intact bone was applied for suspending the flap to aid in better tolerance of flap weight [Figure 3].



Figure 2: Posteriorly based lateral tongue flap. Note preservation of the tongue tip

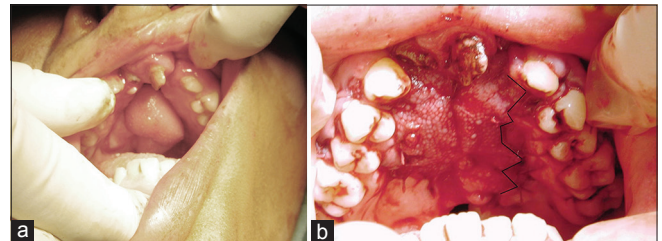


Figure 4: (a) Remaining palatal fistula between the transferred tongue. (b) Z-plasty and pedicled flap from the transferred tongue flap are used to interdigitate two tissues. Note the conspicuous tongue papilla

Pedicle division

All the flaps were divided 3 weeks after the first surgical operation. The remaining tongue pedicle was not returned to its original site in three cases and the muscular part of the pedicle was used for correction of the whistle deformity as free muscle transfer and the mucosal part for vestibuloplasty in anterior maxillary region to release the adhesion between the upper lip and premaxilla or to cover the denuded area after midline frenectomy. The proximal part of the pedicle was returned to the donor site in the other four cases. If fistula remained between the flap and the palate, then Z-plasty and pedicled flap from the transferred tongue flap were used to interdigitate these tissues [Figure 4].

RESULTS

Demographic data of seven cleft patients with large alveolar/palatal fistulas, in which posteriorly based lateral tongue flap was used for soft-tissue reconstruction, are presented in Table 1. The age range of the patients was 14–45 years. The male-to-female ratio was 2/7. In three patients, this flap was used for closure of the large palatal fistula. In two patients, this flap was used for bilateral alveolar cleft repair simultaneous with bone grafting. The forked design was not used in these bilateral alveolar cleft patients, and only larger alveolar cleft was covered by tongue flap and smaller alveolar cleft was closed with the conventional buccal sliding flap.

In one patient, it was used for reconstruction of premaxilla after the previous premaxillectomy, and in one edentulous patient for reconstruction of the unoperated unilateral wide complete cleft of the alveolar process and palate [Figure 5].

The largest dimensions of fistula, closed by this flap was 5 cm × 1.5 cm. Treatment failure occurred only in one case, where this flap had been used for coverage of bone graft in an edentulous premaxilla. Speech quality did not improve dramatically after surgery (patient's self-assessment and parents' opinion), and tongue shape at least 1 year after surgery remained to some degree asymmetric, in all the cases. The least changes were seen in the cases in which the proximal part of the flap was reinserted into the tongue in the second surgery for pedicle division [Figure 6]. One patient needed revision surgery to reduce the bulk [Figure 7], and residual fistula remained between the tongue flap and surrounding palatal tissues in two patients [Figure 8].

DISCUSSION

Posteriorly based lateral tongue flap is a good option for oral-side coverage of large oronasal fistulas.^[11] It does not limit the mobility of remaining tongue, and it is a good choice for reconstruction of central defects of the palate. Its location inside the dental arches and long pedicle prohibit application of maxilla-mandibular

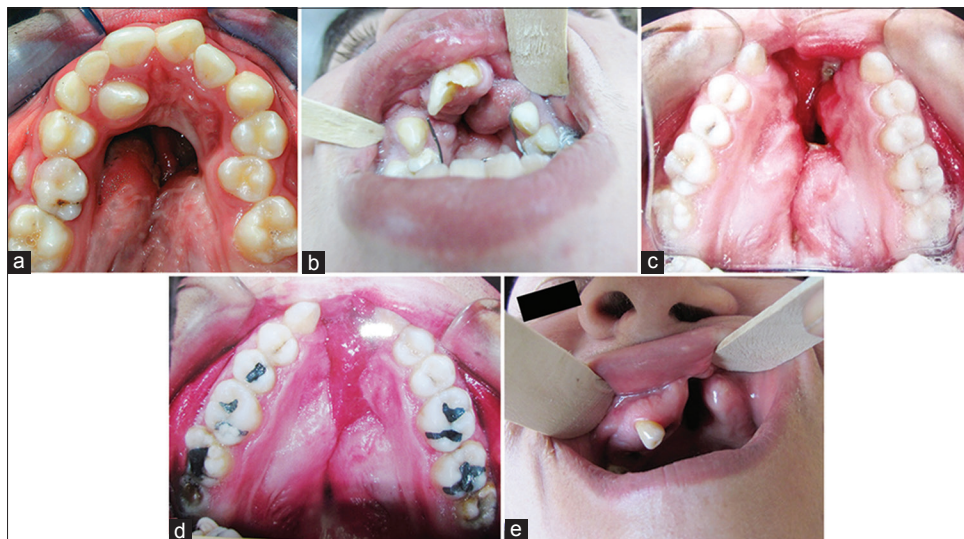


Figure 5: (a) Anteriorly located large palatal fistula closed by posteriorly based lateral tongue flap. (b) In bilateral alveolar cleft patient the oral-side coverage of the larger side was obtained by the tongue flap. (c) Premaxillectomy adult patient before surgery. (d) After 6 years of follow-up (without bone grafting). (e) In edentulous unilateral complete cleft of the alveolar process and palate

Table 1: Data of cleft patients in which posteriorly based lateral tongue flap was used for reconstruction of alveolar/palatal fistula

Patient number	Age	Sex	Type of alveolar cleft	Location of fistula	Dimensions of fistula (maximal length × width) (cm)	Success/failure	Comment	Follow-up (years)
1	18	Male	Bilateral	Premaxilla	4×1	Success	Previous pre-maxillectomy	6
2	54	Female	Unilateral	Alveolar process and hard palate	5×1	Success	Virgin cleft in edentulous patient	2
3	14	Male	Bilateral	Bilateral alveolar cleft	2×1	Success	van der Woude syndrome	2
4	14	Female	-	Palatal	2×2	Success	-	2
5	18	Female	Bilateral	Palatal	5×1.5	Success	-	5
6	16	Female	Unilateral	Palatal	2×1	Success	-	3
7	23	Female	Bilateral	Edentulous premaxilla	2×2	Failed	-	7



Figure 6: (a-c) Tongue shape remained asymmetrical after posteriorly based lateral tongue flap harvest. (d) Reinsertion of the pedicle into the donor site with Z-plasty techniques, diminish this deformity but cannot prevent it completely. (e) Postoperative photograph taken 3 months after operation



Figure 7: Adult patient with van der Woude syndrome needed a third surgery for tongue flap debulking



Figure 8: Residual fistula at the posterior border of the tongue flap

fixation to prevent spontaneous pedicle separation.^[12] Flap blood supply, in this variant of tongue flap is an axial pattern, depends on branches of the deep lingual artery.^[13] It provides sufficient mucosa for coverage of the oral-side in such fistulas. Patients with remaining large palatal fistulas have the nasal escape of air and nasal speech. Closure of fistula should improve speech theoretically.^[14] However in this study, the speech did not improve dramatically after the closure of the large fistula, which might be attributed to patients' age and the establishment of speech habits. Therefore, closure of large palatal/alveolar fistulas in this age range (after 14 years or in adults) should be carried out with no promise to the patient about improvement in speech. More anterior location of fistulas in this series (hard palate and the alveolar process) was another contributing factor.

Anteriorly and posteriorly based tongue flaps have been used for reconstruction of palatal fistulas. The most common technique is anteriorly based, thin dorsal lingual flap [Table 2].^[15-22] Anteriorly

Table 2: Reconstruction of the large palatal/alveolar fistulas in cleft patients, by tongue flaps in the literature

Author/year	Tongue flap	Number of patients	Flap survival (%)
Pigott <i>et al.</i> , 1984	Anteriorly based	20	85
Assunção, 1993	Anteriorly based	12	100
Barone and Argamaso, 1993	Posteriorly based lateral flap	5	100
Coghlan <i>et al.</i> , 1989	Anteriorly based	20	85
Busic <i>et al.</i> , 1989	Anteriorly based	19	90
Guzel and Altintas, 2000	Anteriorly based	10	100
Kim <i>et al.</i> , 2001	Anteriorly based	14	100
Morel <i>et al.</i> , 2001	Posteriorly based lateral flap	7	85

based tongue flaps are the most commonly used tongue flaps for closure of anteriorly located large palatal fistulas in cleft patients. The reasons include less tongue asymmetry and possibility to raise thin (3 mm) flaps.

Few authors have used flaps from the lateral border of the tongue. The disadvantage of posteriorly based lateral tongue flap for closure of palatal fistula in anterior region is the thick nature of the flap, making it necessary to carry out a third surgery in some cases (in our series 16% of successful flaps) and leading to asymmetrical tongue shape. Reinsertion of maximal muscular bulk is strongly recommended to prevent a postoperative tongue deformity. Width limitation is the other restriction in this variant of tongue flap.

Posteriorly based lateral tongue flap has some advantages, including axial blood supply, not affecting the tongue mobility during the period of flap attachment to the palate and the most important factor, simplicity of the technique. We found bone suture technique to be a useful aid for suspending the tongue flap to the palate to prevent flap detachment in early postoperative period. Other ways suggested in the literature are anchoring the suture to the palatal mucosa (palatal sling), "parachuting and anchoring" the tongue to the nasal septum and "basket suspension" to support the tongue flap.^[23,24] Suggested flaps other than tongue flap for closure of huge palatal fistulas in cleft patients are: Facial artery musculomucosal flap, posteriorly based buccinator myomucosal flap, superiorly based pharyngeal flap and finally temporal muscle, temporoparietal fascia, and free flaps.^[25-29]

It is a belief that the narrowed donor portion of the tongue enlarges with time because the muscle is usually well-exercised but in our series hypertrophy of the tongue muscles did not compensate the volume and long-term follow-up (upto 7 years) showed that the tongue never returns to its original size and remains to some degree asymmetric. This should be considered before surgery, explained to the patient and parents as well as written consent obtained.

CONCLUSION

Posteriorly based lateral tongue flap is an effective method to solve the problem of large palatal fistulas in adult cleft patients. The most useful indication for this flap is a large longitudinal palatal fistula, extending to the alveolar process. Asymmetrical tongue shape after surgery is the rule and speech improvement depends on patient's age and location of fistula.

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Conflicts of interest

There are no conflicts of interest.

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