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The tongue flap for large palatal fistulas, a success or a failure? Our 15-year experience

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ABSTRACT

Large palatal fistulas after cleft palate surgery are difficult to treat using local mucoperiosteal flaps alone, particularly if multiple attempts to close the fistulas have resulted in tissue scarring. In this study, we present our 15-year surgical experience with tongue flaps for large palatal fistulas. A total of 34 patients who underwent tongue flap surgery at our institution between January 2000 and January 2015 were retrospectively analyzed. An anteriorly-based dorsal tongue flap was used for the treatment of anteriorly localized large palatal fistulas in all patients. Data including demographic characteristics of the patients, previous surgeries, localization of the fistula, time between the first and second surgery, and complications were recorded. Factors affecting the surgical success were evaluated. Of the patients, 21 were males and 13 were females with a mean age of 11.7 ± 6.9 (range: 4 to 29) years. Detachment of the tongue flap was observed in nine patients after surgery. Seven of the patients with detachment were male aged ≤ 6 years ($p < 0.05$). Resuturing the flap back to the defect did not significantly affect the results. Our study results suggest that proper patient selection and attentive and rigorous surgical technique have a critical importance in the tongue flap repair and tongue flap is not recommended for patients who are under seven years of age.

Introduction

Large palatal fistulas are relatively common complications following cleft palate surgery and remain a challenge for plastic surgeons due to the lack of convenient regional tissues. These defects usually involve two types of mucosal tissue and attempts at closing anterior palate fistulas using local tissue often yield a high failure rate.

Anterior pedicle dorsal tongue flap was first described by Guerrero Santos and Altamirano in the treatment of large palatal fistulas [1]. Currently, tongue flaps are proven to be effective in treating large palatal fistulas which are not amenable to closure using local mucoperiosteal flaps [2].

Tongue flaps receive excellent blood supply and can be raised from the dorsum of the tongue based on the anteriorly, posteriorly, or laterally as a random pattern flap [3]. The pedicle is divided approximately two to three weeks after the initial operation. This procedure does not interfere with speech, despite the tongue being used as a donor site. In addition, speech intelligibility and hypernasality are improved after the operation due to reduced nasal eminence [4–6]. Detachment and bleeding are the most common complications of using tongue flaps [6].

In the present study, we report our 15-year, single-center surgical experience with tongue flaps for large palatal fistulas secondary to cleft palate repair.

Materials and methods

A total of 34 consecutive patients who underwent tongue flap surgery at our institution between January 2000 and January 2015 were retrospectively analyzed. Data were retrieved from the hospital database. Only patients who were treated for palatal fistulas following the cleft palate repair were included in this study. Anterior palatal fistulas were located in the repaired palate, starting from the alveolar margin to the anterior third of the palate. All surgeries were performed by two surgeons in an equal number (17/17).

Data including demographic characteristics of the patients, previous surgeries, localization of the fistula, time between the first and second surgery, and complications (i.e. detachment or flap failure) were recorded. Factors affecting the surgical success were evaluated.

A written informed consent was obtained from each parent. The study protocol was approved by the Marmara Ethics Committee. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Surgical technique

All operations were performed under general anesthesia with oral intubation. A Dingman mouth gag was inserted. Local anesthetics including lidocaine + epinephrine solution (5 mg/kg; Jetokain® Ampoule 2 ml, lidocaine HCl 20 mg/mL, epinephrine HCl 0.0125 mg/mL, Adeka, Istanbul, Turkey) were infiltrated around the fistula. An incision was made around the fistula and mucosal flaps were turned into the defect and sutured together (Figure 1), thus closing the first layer (nasal layer) of the fistula. However, the defect size was enlarged using this method. The Dingman mouth gag was removed, after the dimensions of the defect were

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calculated. The anteriorly-based tongue flap was designed such that the base of the flap lies beneath the posterior border of the fistula, when the mouth is closed. The length of the flap was adjusted so the flap just starting from the anterior to the circumvallate papilla was long enough to extend across the anterior–posterior dimensions of the fistula. The width of the flap was adjusted to be no more than half the width of the tongue anteriorly in the midline and distally tapers to be equal in size to the width of the fistula after turnover flaps were created. The flap was designed like a tie which makes primary closure easily without dog-ear formation, and the distal end of the flap may be wider than the starting point of the flap (Figure 2). However, still, the width of the distal portion was smaller than the half of the tongue, as the base of the tongue was wider than the tip. The depth of the flap was approximately five to seven mm in thickness which could involve a thin layer of the muscle along with it. The submucosal plexus was utilized as the major source of blood supply for the tongue flap. The layer of the muscle was included to protect the submucosal plexus. An anteriorly-based tongue flap was marked according to the previous calculation (Figure 3). A local anesthetic solution was infiltrated through the incision lines. The flap was incised and elevated using the Fomon scissors. The donor site was closed over using a running round 3-0 suture
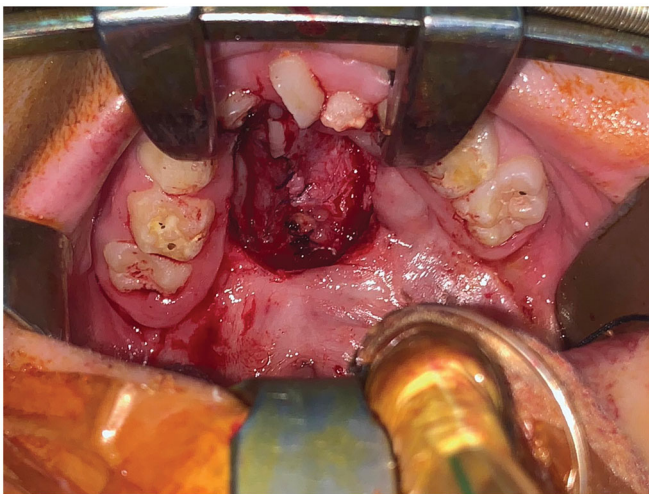

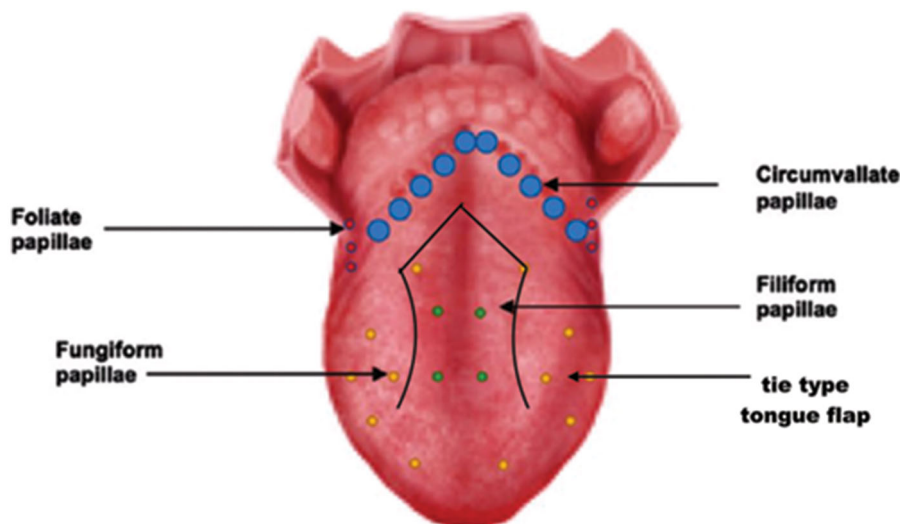Figure 1. Repair of nasal lining with turnover flaps.

(Monocryl® poliglecaprone 25, Ethicon US LLC, Somerville, VA, USA). The Dingman mouth gag was replaced and the flap was anchored to the palatal mucosa around the fistula using 3-0 suture (Monocryl® poliglecaprone 25, Ethicon US LLC, Somerville, VA, USA) mattress sutures, from the posterior to the anterior direction in a 270-degree fashion (Figure 4). No additional fixation devices were used.

Three to four weeks after the initial surgery, the pedicle was divided and the posterior part of the flap was anchored to the posterior part of the fistula (Figure 5).

All patients were given postoperative wound care including liquid diet, tooth brushing, and mouth wash with limited jaw movements. The patients were scheduled for weekly visits in the outpatient setting.

Statistical analysis

Statistical analysis was performed using the SPSS version 15.0 software (SPSS Inc., Chicago, IL, USA). Descriptive data were expressed in mean ± standard deviation (SD), median (min-max) values or number and frequency. For the univariate analyses, the chi-square test and t-test were used. A univariate analysis was performed and significant variables were included in a multivariate stepwise logistic regression model. A p value of $p < 0.05$ was considered as significant.

Results

Of the patients, 21 (61.7%) were males and 13 (38.2%) were females with a mean age of 11.7 ± 6.9 (range: 4 to 29) years. Seven patients (20.6%) underwent primary palatoplasty at our institution, while the remaining 27 patients (79.4%) underwent the procedure in an external center and were referred to our center. The most common type of cleft was bilateral cleft lip/palate ($n = 25$), followed by cleft lip and palate ($n = 5$), cleft palate ($n = 3$), and median cleft ($n = 1$). Demographic and clinical characteristics of the patients are shown in Table 1.

For all patients, the indication for the tongue flap procedure was an anteriorly-localized large palatal fistula sized >1 cm which could not be treated using local mucoperiosteal flaps alone. Ten patients (29.5%) had a history of at least one previous attempt to close their fistulas using other techniques.
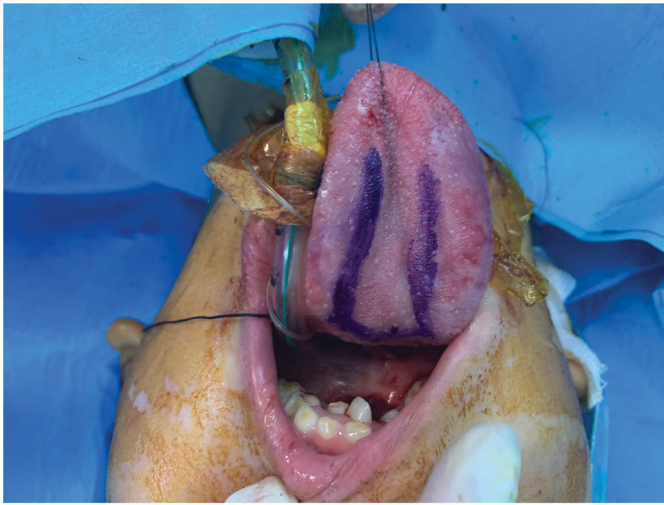

Figure 2. Schematic diagram of the tongue flap.

Figure 3. Drawing of anteriorly-based tongue flap.

Figure 4. Flap sutured to defect.

Figure 5. Four weeks after the division of the tongue flap.

Table 1. Demographic and clinical characteristics of patients.

	Success group	Failure group	p value
Total, n	25	9	
Sex, n			
Female	13	0	0.0061
Male	12	9	
Cleft type			
Bilateral CLP	19	6	
Unilateral CLP	2	3	0.1381
Cleft palate	3	0	
Median cleft	1	0	
Fistula size, mean (cm)	1.35 (SD: 0.173)	1.2 (SD: 0.158)	0.0243
Age, years, mean (range)	5.4 (4–9 years)	14 (5–29 years)	0.0002

CLP: Cleft lip and palate.

An anteriorly-based dorsal tongue flap was used in all patients. The mean time from the initial surgery to the second surgery was 31 ± 6.8 (range: 19–46) days.

Detachment of the tongue flap was defined as early separation of the flap from the oral roof, thus leading to flap loss and failure to close the fistula. Among 34 patients, nine (26%) had flap detachment. The mean age of the patients with and without detachment was 5.45 years and 14 years, respectively ($p < 0.05$). When the patients were divided into two groups according to age, there were seven cases of detachment in the first patient group (≤ 6 years) and two in the second patient group (>6 years) ($p < 0.05$). Attempts to resuture the flap back to the palatal defect failed in two patients, and both flaps were detached again during follow-up (Table 2).

The mean diameter of the fistula was 1.35 cm (SD: 0.173) cm in the treatment success group and 1.2 cm (SD: 0.158) cm in the treatment failure group, indicating a statistically significant difference ($p < 0.05$).

Univariate analysis showed that age, sex, operation time, and fistula size were significant variables. However, multivariate stepwise logistic regression analysis revealed that only age was a significant variable using the with omnibus test of the model coefficients ($p = 0.0001$, Nagelkerke R^2 0.847, Hosmer and Lemeshow test $p = 0.992$, and classification table percentage 94.1%) (Table 3).

Discussion

Palatal fistula is a common complication of primary palatoplasty following cleft palate repair. Its incidence reportedly varies between 11 and 25% in the literature [7]. Although small fistulas may remain asymptomatic, larger fistulas may present with nasal regurgitation and speech problems. Although most of the oro-nasal fistulas are surgically treated with local mucoperiosteal or buccal flaps, the surgical options for closure of large, recurrent palatal defects are limited [8]. An anteriorly-based dorsal tongue flap is a safe and effective method for closure of large palatal fistulas resistant to most other treatment methods [9].

The tongue flap offers several advantages such as the use of adjacent tissues, abundance of tongue tissues, ease of rotation, rich and reliable vascular supply of the tongue in cases of scarred palatal tissue due to previous failed attempts, and low morbidity to the donor site [6]. The main disadvantages of the procedure include requiring a two-staged procedure, intubation and

Table 2. Treatment success and treatment failure rates according to age groups*.

	Age ≤ 6 years	>6 years	Total
Successful	9	16	25
Failed	7	2	9
Total	16	18	34

*Two-sided p value <0.05 (Fisher exact test).

Table 3. Multivariate analysis.

Variable	SE	OR	p value
Age[a]	.419	.378	0.020

SE: standard error; OR: odds ratio.
[a]Model log likelihood, significance of change 0.000.

extubation difficulties, limited oral functions, risk of detachment of the flap, and presence of bulky, soft tissues on the surface of the palate after flap separation [10]. Detachment, flap necrosis secondary to pressure by a hematoma, and airway obstruction are other serious complications of tongue flaps [11,12]. The rates of detachment, which is the most common complication, vary between 4 and 20% [1,13–15]. In our study, flap detachment occurred in nine of 34 (26%) patients.

A detailed analysis of nine patients with flap detachment revealed that most cases were males aged <6 years. When the patients were divided into two groups according to their ages, the group including patients aged ≤6 years showed a higher number of flap detachments than those aged >6 years ($n = 7$ vs. $n = 2$, respectively; $p < 0.05$). This finding suggests that this operation should not be performed under seven years of age.

In the present study, male sex and age of ≤6 years appeared to be risk factors for flap detachment. Excessive tongue movement and gravity contribute to flap detachment [11]. Based on our study results, we believe that preschool-aged children may experience excessive traction on the tongue flap due to inadvertent tongue movements, leading to early separation of the flap. A good nasal repair in tongue flap surgery is a prerequisite for success [8]. Turnover flaps raised from both sides of the fistula are sutured to each other to make the nasal lining. To prevent flap detachment, the raw surface of the turnover flaps must meet the raw surface of the tongue flap. Manipulation ability during the nasal mucosa repair is restricted due to the narrow width of the mouth in younger children. In our study, limited exposure and manipulation ability might have been accounted for the higher detachment rate of tongue flaps in young children. Using a facial artery myomucosal (FAMM) flap can be an alternative reconstructive method for this young patient group. However, this technique has certain limitations. In particular, the FAMM flap needs an open alveolar cleft as a gateway for transposing the flap to the palate [16].

In the literature, a variety of fixation techniques with wire sutures have been described for the prevention of detachment of tongue flaps [13]. In our study, we used no additional fixation methods, although we used a long pedicle and large tongue flaps with patient education and good oral hygiene to avoid flap detachment [17]. Avoiding the use of any wire fixation methods allows the surgeon to inspect and clean the flap properly.

In the present study, we also found that the fistula size was important. In the treatment success group, the mean fistula diameter was 1.35 cm, while it was 1.2 cm in the treatment failure group ($p < 0.05$). However, there is no study available in the literature on the fistula size. We speculate that the flap may be better adapted into large fistulas and flap can be secured with more sutures to prevent the dehiscence.

In the literature, various techniques have been described for the prevention of tongue flap detachment [13]. However, only one case in whom the tongue flap was salvaged after its detachment has been reported [13]. Similarly, in our study, the two attempts to resuture detached flaps resulted in recurrent detachment and ultimate flap failure. Hence, secondary suturing is speculated to be ineffective in case of intraoral wound breakdown, due to rapid infection and inflammation in the oral cavity [18]. We believe that rapid epithelialization and granulation of raw surfaces during the time duration between flap detachment and resuturing also interfere with flap reattachment.

In the current study, the majority of patients with fistulas were referred from external centers. Therefore, the incidence of fistula was not mentioned in this study. Since most of the patients were those with bilateral cleft lip and palate and had previous surgeries elsewhere, it is possible that the primary palatal repair did not include the premaxilla. The inadequate technique or the severity of the cleft size may be the reason behind the formation of fistulas.

Nonetheless, there are some limitations to this study. The retrospective nature and small sample size are the main limitations. In addition, the time between the initial and second operation varied between three to five weeks, which depended on the availability of the operating theater and communication with the family. However, it seems not to influence the success or failure rates, although it might have adversely affected the quality of life of the patients.

In conclusion, palatal fistulas are common complications after cleft palate repair. Tongue flaps may be a suitable alternative for treating large palatal fistulas, when local flaps are insufficient or previous attempts have failed. However, due to certain limitations of the procedure, tongue flaps should be used in only selected patients. Nevertheless, further large-scale studies are needed to draw a definite conclusion.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

An informed consent was obtained from each parent/legal representatives of the patient included in the study.

Disclosure statement

No potential conflict of interest was reported by the authors.

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