Egypt, J. Plast. Reconstr. Surg., Vol. 39, No. 2, July: 137-141, 2015

Closure of Palatal Defects with Greater Palatine Artery Mucoperiosteal Island Flaps: Revisited

AHMED MOHAMED ALY, M.D.

The Department of Plastic Surgery, Faculty of Medicine, Zagazig University

ABSTRACT

Introduction and Objectives: Closure of oronasal fistula is a mandatory component for normal speech and swallowing, several techniques have been descried to achieve this goal, but greater palatine artery mucoperiosteal flap has many advantages between these options. In this report we will present our results after application of this flap for different types of palatal defects.

Patients and Method: Sixteen patients with oro-nasal fistulas result as a complication of palatoplasty, post-traumatic or after tumor excisions were treated with island mucoperiosteal flaps and followed to assess the anatomical and functional outcomes.

Results: All fistulas successively healed, none of our patients developed major postoperative complications, few minor complications occurred in the form of bleeding and wound dehiscence which responded well to conservative treatment. Patients showed a significant overall improvement in their speeches.

Conclusions: Greater palatine mucoperiosteal island flap is an excellent option for reconstruction of different types of palatine defects.

Key Words: *Palatal fistula – Oronasal – Greater palatine artery.*

INTRODUCTION

The oro-nasal continuity which may occur as a complication of cleft palate repair or after palatal tumor excision represents a great challenge to reconstructive surgeons **[1,2]**. The reported incidence of post primary palatoplasty fistulas varies widely ranging from 0% to 68% **[2,3]**. Large palatal defects cause significant speech problems and regurgitation of fluid and food particles into nasal cavity with subsequent sinusitis and otitis media, therefore they have to be repaired early **[4]**. Several techniques have been described to nullify these problems, **[5-18]** however reconstruction of the defect with like tissue was fascinating goal for surgeons. Since it was introduced by Gullane and Arena, the palatal island flap got the attraction of reconstructive surgeon and it was submitted to many modifications **[19-22]**. In this work we will study the effectiveness of island mucoperiosteal flap based on skeletonized greater palatine artery for closure of different types of palatal defects.

PATIENTS AND METHODS

This prospective study was conducted in the department of plastic surgery, Zagazig University from August 2010 to September 2014; sixteen patients with a mean age of 22.93±18.35 years (range 2.5 to 54 years) suffering from palatal fistulas with nasal tone and regurgitation were treated with our elected technique after it had been approved by the university review committee. In these sixteen patients, six of them had palatal fistulas after correction of cleft palate, five patients with post traumatic oronasal fistulas and in five patients these defects were occurred after malignancy extirpation. Informed consents were taken from patients or patients' guardians after thorough explanation of the whole procedure and possible complications. The lengths of fistulas ranged from 9mm to 42mm at its maximal dimension, and for comparative purpose defects were classified as group A (7 patients) in which the length of defects the were less than 30mm, and group B (9 patients) in which the fistulas lengths were more than 30mm. Previous trials for repair of the fistulas were reported in two of our patients but the territory of flap has good quality of tissue. Most patients treated with unilateral flaps (13 patients) and in three patients bilateral flaps were harvested owing to large defects, Table (1) summarize demographic data of patients. Patients with most anterior palatal fistulas close to the alveolar margin were excluded from this study (type V, VI and VII Pittsburgh Fistula Classification System **[23]**) as well as those with multiple trails of repair and scared mucoperiosteum. General roles for palatal surgery in our unit were followed; the minimum time interval between fistula repair and last surgery was 6 months

to allow the inflammatory process to subside completely and giving the chance for spontaneous closure of the small fistulas. Preoperative dose of antibiotic (cefotaxim) 1h before surgery and continued on the same regimen postoperatively for 1 week in addition to miconazol oral jell. Two days postoperatively, the patients were allowed oral fluids only. For the rest of the week, they were allowed soft diet. Patient were followed every week for one month and every month for the next five months, during these visits patient were evaluated for surgical complication and anatomical closure of fistulas as well as functional outcome of the procedure. For assessment of functional status we used visual analog scale adapted from Kim et al. **[24]** range from 1 to 7, this scale was used to evaluate patients before surgery and repeated six months after surgery, audio samples were recorded of a fixed script to assist the previous goal.

Surgical technique:

All operations were done under magnification using 3.5 magnifying loupe. After application of a mouth gag, the under surface of the palate tissue was infiltrated with epinephrine 1/200, 000 to minimize bleeding and facilitate flap dissection. Fibrous tissue at the margin of postpalatoplasy and traumatic fistulas was excised, then our flaps were designed considering five points, first it should centered over greater palatine artery, its size is slightly larger than the defect to allow tension free closure, its medial border is continuous with the outer border of the defect, it should not have any attachment to surrounding mucosa, and lastly the dissection in the soft palate was avoided if possible to minimize scarring with subsequence dysfunction. Formal elevation of the mucoperiosteal flaps was done using a blunt dissector; this dissection was continued till the greater palatine arteries were completely skeletonized down to their bony canal to facilitate the flap rotation. The flaps were rotated to the defect and secured to with surrounding mucosa with 5/0 polygalactine (vicrl).

RESULTS

All fistulas were completely closed. No significant bleeding per nose or infection was noticed in the early postoperative period. One patient in traumatic group had minimal postoperative bleeding which responded well anti-hemorrhagic drugs. Two patient showed minor wound dehiscence which responded well to conservative managements in two weeks. Our patients were followed for a period of 9-49 months with a mean of 29±12 months, with no report of fistula recurrence in any of them. Visual analog scale for Speech intelligibility improved from 4.6 to 6.1, from 4.6 to 6.8 and from 6.6 to 7 in post-palatoplasty, post-traumatic and post-ablative respectively. Statistical analysis of the previous results revealed an overall significant improvement in all patient, however this change was highly significant in post-palatoplasty and traumatic groups ($p<0.001$) but it was non-significant in post ablative group ($p>0.5$).

Table (1): Demographic data and results.

Patient	Age	Sex	Fistula size (mm)	Cause	Reconstruction method	PRVAS-SI	POVAS-SI
1	2.5	M	10X9	Postpalatoplasty	Unilateral flap	4	6
2	3	M	20x10	Postpalatoplasty	Unilateral flap	5	7
3	2.5	F	20x15	Postpalatoplasty	Unilateral flap	5	6
4	4	M	22x19	Postpalatoplasty	Unilateral flap	4	5
5	3	M	9x8	Postpalatoplasty	Unilateral flap	5	6
6	3	F	11x8	Postpalatoplasty	Unilateral flap	5	7
7	27	M	22x11	Traumatic	Unilateral flap	4	7
8	34	M	17x15	Traumatic	Unilateral flap	5	7
9	19	M	21x16	Traumatic	Unilateral flap	5	7
10	22	M	19x17	Traumatic	Unilateral flap	4	6
11	26	F	40x39	Traumatic	Bilateral flaps	5	7
12	39	M	37x35	Post ablation	Unilateral flap	7	7
13	54	M	38x32	Post ablation	Unilateral flap	7	7
14	50	F	42x39	Post ablation	Bilateral flaps	6	7
15	43	F	40x38	Post ablation	Bilateral flaps	7	7
16	35	M	42x33	Post ablation	unilateral flaps	6	7
						5.25±1	6.65±0.6
						$p<0.001$	

M = Male. PRVAS-SI = Preoperative visual analog scale for speech intelligibility.
F = Female. POVAS-SI = Postoperative visual analog scale for speech intelligibility.

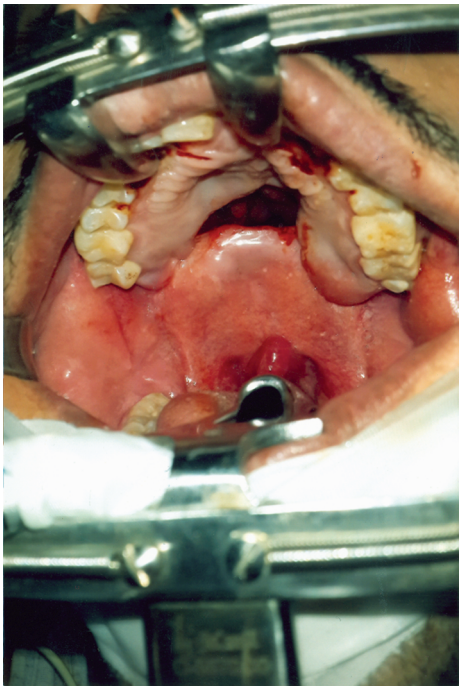

Fig. (1): Shows the palatal fistula.

Fig. (2): Flap elevation.

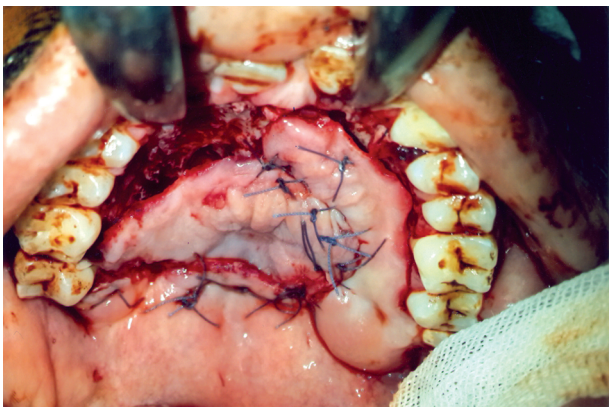

Fig. (3): Flap inset.

Fig. (4): Flap after healing of fistula.

DISCUSSION

Competent separation of nasal cavity from the oral one is an important element for the process of swallowing and speech, so many efforts were expended to achieve this goal in patient with oronasal fistulas. Methods currently employed for this task can be broadly divided into two groups: in the first one, local mucoperiosteal flaps are used in different forms **[5-8]**, the other group included the techniques that used additional tissues from the surroundings to close the defect, for example, tongue flap, **[25]** buccal mucosa flaps **[26,27]** which always need second stage surgery and anticipated tongue deformity and respiratory problems **[11]**. Nasolabial, submental and infrahyoid musculocutaneous flaps and be used but they add external skin incisions and poor tissue matching with recipient site **[28-30]** and finally a more complex techniques using free tissue transfer which needs personnel with high experience and it has high cost and morbidity **[17,18]**.

Since the palatal mucoperiosteal flap introduced in practice it was submitted to many research works to study its anatomical basis 31 and possible clinical applications. In addition to its usage in cleft palate repair and palatal defects closure, recent studies described its employment for reconstruction of nasal cavity, clival and other skull base defects after mobilization of descending palatine vessels **[32,33]**.

In our work palatal flaps was effective for closure of palatal defects with very low complication rate. We noticed that the size of defect doesn't have any effect on success rate as none of our groups showed higher complication rate than the other. In our work the flap designs was limited to epsilateral hemipalate, and in big defects more than 15cm^2 we prefer to use bilateral flaps to close it, although Magdy in his nice wok, the whole palatal lining was harvested based on only one neurovascular bundle without ischemia **[1]**. Regarding the causes of the palatal defects, we found that no group has higher complication than the other so the flap could be used safely regardless the type of palatal defects. Generally our work has a success rate comparable to the other studies, and all of them confirms the reliability of this technique **[1,24,34]**. Regarding the functional outcome our patient had significant improvement in speech intelligibility, however in post ablative group this improvement was not significant that is due to most of them did not have preoperative speech trouble apart from discomfort due to mass in the palate. Our patients had a very low complication rate (zero major and 12.5% minor complication), in his extensive review Seckel reported fistulization rate of 4-7% **[35]**. Which is a very low complication rate comparing to other methods of repair **[25]**.

Conclusion:

We conclude that this method of repair has distinct advantages of being simple, a one-stage procedure, no donor-site morbidity with good aesthetic results, and finally its sensate nature which is not available in other reconstructive options.

REFERENCES

1- Magdy E.A.: The palatal island mucoperiosteal flap for primary intraoral reconstruction following tumor ablative surgery. Eur. Arch. Otorhinolaryngol., 268: 1633-8, 2011.

2- Murthy A.S., Parikh P.M., Cristion C., Thomassen M., Venturi M. and Boyajian M.J.: Fistula after 2-flap palatoplasty: A 20-year review. Ann. Plast. Surg., 63: 632-5, 2009.

3- Andersson E.M., Sandvik L., Semb G. and Abyholm F.; Palatal fistulas after primary repair of clefts of the secondary palate. Scand J. Plast. Reconstr. Surg. Hand Surg., 42: 296-9, 2008.

4- Lehman J.A.: Closure of palatal fistulas. Operative Techniques in Plastic and Reconstructive Surgery, 2: 255-62, 1995.

5- Denny A.D. and Amm C.A.: Surgical technique for the correction of postpalatoplasty fistulae of the hard palate. Plast. Reconstr. Surg., 115: 383-7, 2005.

6- Murrell G.L., Requena R. and Karakla D.W.: Oronasal fistula repair with three layers. Plast. Reconstr. Surg., 107: 143-7, 2001.

7- Honnebier M.B., Johnson D.S., Parsa A.A., Dorian A. and Parsa F.D.: Closure of palatal fistula with a local mucoperiosteal flap lined with buccal mucosal graft. Cleft Palate Craniofac. J., 37: 127-9, 2000.

8- Van Damme P.A. and Freihofer H.P.: Palatal mucoperiosteal expansion as an adjunct to palatal fistula repair: Case report and review of the literature. Cleft Palate Craniofac. J., 33: 255-7, 1996.

9- Kummer A.W. and Neale H.W.: Change in articulation and resonance after tongue flap closure of palatal fistula: Case reports. Cleft Palate J., 26: 51-5, 1989.

10- Argamaso R.V.: The tongue flap: placement and fixation for closure of postpalatoplasty fistulae. Cleft Palate J., 27: 402-10, 1990.

11- Abdollahi S., Jabbari B.M.Y., Reza R. and Ramin R.: Results of difficult large palatal fistula repair by tongue flap. Rawal Med. J., 33: 56-8, 2008.

12- Nakakita N., Maeda K., Ando S., Ojimi H. and Utsugi R.: Use of a buccal musculomucosal flap to close palatal fistulae after cleft palate repair. Br. J. Plast Surg., 43: 452-6, 1990.

13- Rintala A.: Labiobuccal mucosal island flap for closure of anterior palatal fistulae. Br. J. Plast. Surg., 43: 452-6, 1990.

14- Ashtiani A.K., Emami S.A. and Rasti M.: Closure of complicated palatal fistula with facial artery musculomucosal flap. Plast. Reconstr. Surg., 116: 381-6. Discussion 387-8, 2005.

15- Sarabahi S. and Tiwari V.K.: Orbicularis oris musculomucosal flap for anterior palatal fistula. Indian J. Plast. Surg., 39: 148-51, 2006.

16- Kuran I., Sadikoglu B., Turan T., Hacikerim S. and Bas L.: The sandwich technique for closure of a palatal fistula. Ann. Plast. Surg., 45: 434-7, 2000.

17- Krimmel M., Hoffmann J. and Reinert S.: Cleft palate fistula closure with a mucosal prelaminated lateral upper arm flap. Plast. Reconstr. Surg., 116: 1870-2, 2005.

18- Schwabegger A.H., Hubli E., Rieger M., Gassner R., Schmidt A. and Ninkovic M.: Role of free-tissue transfer in the treatment of recalcitrant palatal fistulae among patients with cleft palates. Plast. Reconstr. Surg., 113: 1131-9, 2004.

19- Gullane P.J. and Arena S.: Palatal island flap for reconstruction of oral defects. Arch Otolaryngol., 103: 598-9, 1977.

20- Gullane P.J. and Arena S.: Extended palatal island mucoperiosteal flap. Arch. Otolaryngol., 111: 330-2, 1985.

21- Moore B.A., Magdy E., Netterville J.L. and Burkey B.B.: Palatal reconstruction with the palatal island flap. Laryngoscope, 113: 946-51, 2003.

22- Anani R.A. and Aly A.M.: Closure of palatal fistula with local double breasted mucoperiosteal flaps. Journal of Plastic, Reconstructive & Aesthetic Surgery, 65: 237-40, 2012.

23- Smith D.M., Vecchione L., Jiang S., Ford M., Deleyiannis F.W., Haralam M.A., et al.: The Pittsburgh fistula classi-

fication system: A standardized scheme for the description of palatal fistulas. Clef Platate Craniofac. J., 44: 590-4, 2007.

24- Kim H., Hwang J., Lee W.J., Roh T.S., Lew D.H. and Yu I.S.: Palatal mucoperiosteal island flaps for palate reconstruction. Arch. Craniofac. Surg., 15 (2): 70-4, 2014.

25- Vasishta S., Krishnan G., Y.S. Rai Y. and Anil Desai A.: The Versatility of the Tongue Flap in the Closure of Palatal Fistula. Craniomaxillofac. Trauma Reconstr., 5 (3): 145-60, 2012.

26- EL-Leathy M.M. and Attia M.F.: Closure of Palatal Fistula with Bucco-labial Myomucosal Pedicled Flap. Annals of Pediatric Surgery, 5 (2): 104-8, 2009.

27- Bianchi B., Ferri A., Ferrari S., Copelli C. and Sesenna E.: Myomucosal cheek flaps: Applications in intraoral reconstruction using three different techniques. Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod., 108: 353-9, 2009.

28- Ducic Y. and Burye M.: Nasolabial flap reconstruction of oral cavity defects: A report of 18 cases. J. Oral Maxillofac. Surg., 58: 1104-8, 2000.

29- Martin D., Pascal J.F., Baudet J., Mondie J.M., Farhat J.B., Athoum A., et al.: The submental island flap: A new donor site. Anatomy and clinical applications as a free or pedicled flap. Plast. Reconstr. Surg., 92: 867-73, 1993.

30- Gangloff P., Deganello A., Lacave M.L., Verhaeghe J.L., Lapeyre M., Maire F., et al.: Use of the infra hyoid musculo-cutaneous flap in soft palate reconstruction. Eur. J. Surg. Oncol., 32: 1165-9, 2006.

31- Maher W.P.: Distribution of palatal and other ar teries in cleft and non-cleft human palates. Cleft Palate J., 14: 1-12, 1977.

32- Oliver C.L., Hackman T.G., Carrau R.L., Snyderman C.H., Kassam A.B., Prevedello D.M. and Gardner P.: Palatal flap modifications allow pedicled reconstruction of the skull base. Laryngoscope, 118: 2102-6, 2008.

33- Hackman T., Chicoine M.R. and Uppaluri R.: Novel application of the palatal island flap for endoscopic skull base reconstruction. Laryngoscope, 119: 1463-6, 2009.

34- Genden E.M., Lee B.B. and Urken M.L.: The palatal island flap for reconstruction of palatal and retromolar trigone defect revisited. Arch. Otolaryngal Head Neck Surg., 127: 837-41, 2001.

35- Seckel N.G.: The palatal island flap on retrospection. Plast. Reconstr. Surg., 96: 1262-8, 1995.