Original Article

Comparison of Pedicled Buccal Fat Pad Flap with Buccal Flap for Closure of Oroantral Communication

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Abstract

Introduction: Oroantral fistula (OAF) is a common occurrence. It mostly follows removal of the maxillary molars because there is anatomically a close relationship between the root apices of these teeth and the antrum

Purpose: To comparative evaluation of two surgical procedures, i.e., buccal flap and pedicled buccal fat pad (BFP) flap in closing the oroantral communication (OAC). Also evaluation the post-operative sequaele, e.g., pain, swelling, restriction of mouth opening and loss of vestibular depth and duration of surgery and will compare between both groups.

Materials and Methods: 20 patients with OAC, were selected randomly for the two different procedures, i.e., buccal advancement flap and pedicled BFP graft.

Results: Both surgical techniques were successful in closing the OAC. In spite of statistical evidence for its weaknesses, BFP flap is a simple and reliable procedure for the closure of OAC/fistula, and in the hands of an experienced surgeon, it can be carried out easily with minimal complications.

Conclusion: Surgery time was longer in BFP group since gentle and careful handling of tissues were strictly followed in order not to disrupt the blood supply of the flap. Post-operative pain and swelling were also more in this group at early post-operative phase; however, they were never intolerable to the patients with medications and at 1 month review both these post-operative sequel came down to baseline.

Keywords: Buccal advancement flap, Pedicled buccal fat pad graft, Oroantral fistula

INTRODUCTION

Oroantral fistula (OAF) is a common occurrence. It mostly follows removal of the maxillary molars because there is anatomically a close relationship between the root apices of these teeth and the antrum.[1,2] Usually, an OAF <2 mm in diameter will close spontaneously, but when there is more than a 3 mm defect, or there is inflammation in the antrum or periodontal region, the opening often persists.[3] Variable methods for the closure

of OAF have been reported in the literature, such as the buccal sliding flap and palatal flap.[4] However, these procedures have not always provided satisfactory results. A pedicled graft of the buccal fat pad (BFP), which enables the closure of oral defects even up to an area of 60 mm × 50 mm[5] and a thickness of 6 mm,[6,7] has often been used for the reconstructions of intraoral defects.[5,8] Since the procedure was first introduced by Egyedi.[6] In this study, we examined the effectiveness of the BFP for the closure of OAFs. An OAF is a pathological condition in which the oral and antral cavities have a permanent communication using a fibrous conjunctive tissue lined by epithelium. Oroantral communication (OAC) is an open connection between the oral cavity and the maxillay sinus. The maxillary sinus takes up a large part of the body of maxilla, generally extending into the alveolar process bordering the apices of posterior teeth. OACs is a common occurrence in routine dental practice following the removal of posterior

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maxillary teeth because of their close relationship to maxillary sinus.[9] Diagnosis of oroantral can be made in several ways: The first is to examine the tooth once it is removed. If a section of bone is adhered to the root ends of the tooth, the surgeon can be relatively certain that a communication between the sinus and mouth exists. To confirm the presence of communication, the best technique is to use the nose blowing test. After the diagnosis of OAC has been, the surgeon must determine the approximate size of communication because treatment will vary on the size of the opening. Immediate closure of OACs, preferably within 24-48 h is recommended to minimize the risk of maxillary sinusitis and the development of fistula. Surgical closure still seems to be the treatment of choice for closure of OACs, although numerous alternative techniques have been proposed.[9] The primary suture of the gingiva is used for simple closure of small OACs. However, a study by VON WOWERN showed that the primary suture resulted in relatively large number of failures. Therefore, mucosal closure using a buccal mucoperiosteal flap or palatal rotational flap seems preferable, especially for larger OACs.[9] Size of the communication anything more than 4 mm will be taken up for our study.[10] The BFP has also proved to be suitable for closure of OACs, especially for failure of buccal or palatal flap. The most common surgical technique for closure of an acute oroantral perforation is the buccal flap procedure described by Rehrmann.[8] Great care must be taken to develop the flap with correct undermining and horizontal periosteal releasing incision to create a water tight closure without tension. Although it is a simple and versatile flap, which allows a simultaneous Caldwell-Luc operation, it has some disadvantages, of which the permanent reduction of vestibular height is the most important and could be a problem for edentulous patients requiring prosthesis. Recently, a pedicled BFP flap has been increasingly used in the repair of OAC. Anatomically, the BFP consists of a central body and four extended processes - Buccal, pterygoid, superficial, and deep temporal extensions. The blood supply to the BFP is derived from the buccal and deep temporal branches of the maxillary artery, transverse facial branches of the superficial temporal artery, and small branches of the facial artery. Therefore, the BFP as a pedicled graft with an axial pattern should possess favorable characteristics for the reconstruction of intraoral defects, especially in the posterior maxillary region. The main reported disadvantage for this flap is the unpredictable limitation in mouth opening. A pedicled graft of the BFP enables the closure of oral defects even up to an area of 60 mm × 50 mm and the thickness of 6 mm. It has often been used for the reconstructions of intraoral defects since the procedure was first introduced by Yih WY.[2] The purpose of this study is to compare primarily the successful closure of the OAC by these two methods and secondarily to assess the post-operative sequelae such as pain, swelling, reduction in mouth opening, and loss of vestibular depth

in these two methods (pedicled BFP flap and buccal flap). In this procedure, a broad-based trapezoid mucoperiosteal flap is created and sutured over the defect. Its broad base assures adequate blood supply. Consequently, high success percentages (93%) have been reported. Disadvantages of the Rehrmann method include the risk of reduction of the buccal sulcus depth and manifest post-operative pain and swelling. The Rehrmann flap, which is also known as buccal advancement flap is fashioned by mobilizing the vestibular mucosa, is commonly used for this purpose.[5]

MATERIALS AND METHODS

Patients were chosen from the Outpatient Department of Oral and Maxillofacial Surgery of BIDSH, Patna. 20 patients with OAC were selected randomly for the two different procedures, i.e., buccal advancement flap and pedicled BFP graft. Size of the bone defect (OAC) was measured by UNC 15 periodontal probe preoperatively. OAC defects were measured bucco palatally and mesiodistally. The larger value of the two groups was used in our study. The patients were reviewed at 48 h, 1 week and at 1 month postoperatively for assessment of following:
A. Closure of OAC
B. Pain
C. Swelling
D. Restriction of mouth opening
E. Loss of vestibular depth.

For statistical analysis, Data obtained were compiled on a MS Office Excel Sheet. Data obtained were compiled on a MS Office Excel Sheet (version 2010). Data were subject to statistical analysis using Statistical package for social sciences (SPSS version 22.0, IBM). Results are expressed as frequencies of males and females participating in the present study and mean age of the participants. Descriptive statistics such as mean, standard deviation, min and max values for variables like size of bony defect, time required for surgery have been depicted. For all the statistical tests, $P < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study as 80%.

Inclusion Criteria
1. Patients were selected between 15 and 60 years of age
2. Patients with OAC without sinus infection were selected only
3. Patients were chosen without any significant medical disease that may compromise healing
4. Same surgeon performed all the surgeries.

Exclusion Criteria
1. Patients with sinus infections were excluded from our study

2. Patients having preexisting medical conditions that could influence the wound healing were excluded from this study
3. Patients of age between 14 and 62 years were treated in this study
4. Mentally challenged or uncooperative patients were excluded from this study.

Surgical Procedure

All the operations were performed under local anesthesia which was achieved by anesthetising posterior superior alveolar nerve, middle superior alveolar nerve, greater palatine nerve with 2% lignocaine with 1:80,000 adrenaline.

All patients of Groups A and B were treated by same surgeon. Preoperatively patients were given chlorohexidine mouthwash 0.2% for mouth rinsing, before giving local anesthesia. The flap design of choice was either buccal flap or pedicled buccal fat of pad flap. Incisions were given with BP blade No. 15. At first, fistulas tract was excised. Width of the Margins of the flap (in cases of buccal flaps) was planned as per the width of the defect so that it was wide enough to rest on bone when advanced to cover the osseous defect. Flap was released to the depth of buccal vestibule; periosteum was incised on the deep surface of the flap to allow advancement of soft tissue to cover osseous defect without tension (Figure 1). Flaps were positioned with minimum tensions with margins supported by underlined bone to ensure adequate closure of fistulas defect (Figure 2). After flap reflection, smoothening of bone margins, irrigation of socket with normal saline was done in all cases. In case of pedicled BFP flap – after infiltrating local anesthesia, circular incisions with 3 mm margins were made around OAC and epithelial tract and any inflammatory tissue within the opening were completely excised. Two divergent cuts were then made from each end of circular incision extending into the vestibule. The trapezoidal buccal mucoperiosteal flap was then reflected from the alveolar process and the lateral wall of maxilla. The pedicled BFP flap was exposed through 1 cm long vertical incision in the reflected periosteum posterior to zygomatic buttress. Pedicled BFP flap gently teased out by blunt dissection with the artery forceps (Figure 3) and gently advanced into bony defect and secured to palatal mucosa with 3-0 mersilk suture with round body needle (Figure 4). All patients were reviewed on 2nd day, 7th day and at 1 month postoperatively. The patients were instructed to eat soft meals for 10 days and to protect the repaired area. Patients were advised to sneeze with mouth open to avoid traumatizing the wound from air pressure in sinus area. Same medications were given postoperatively after closure of OACs in both groups. (1) Capsule amoxicillin 500 mg with clavulanic acid 125 mg 8 hourly for 7 days, (2) tablet ibuprofen 400 mg and paracetamol 500 mg

Figure 1: Group 1 patients and closure of oroantral communication by using buccal flap - release of buccal mucoperiosteal flap

Figure 2: Group 1 patients and closure of oroantral communication by using buccal flap - oroantral communication closed with the buccal advancement flap with 3-0 black silk suture
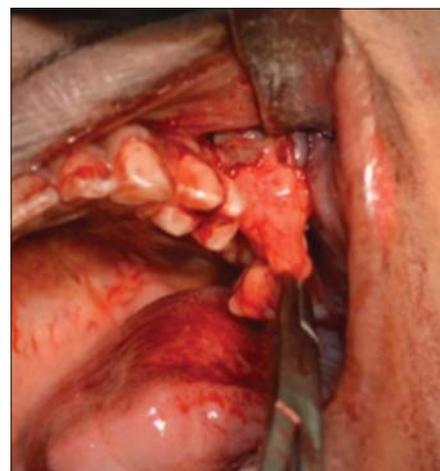

Figure 3: Group 2 showing closure of oroantral communication by using pedicled buccal fat pad flap - buccal fat pad released by blunt dissection

12 hourly for 5 days, and (3) otrivin nasal drop for 7 days (xylometazoline hydrochloride 0.1%).

Post-operative Assessment

Pain

Post-operative pain was measured by patients rating 12 h after surgery using a visual analog scale of 10 units on a three-point scale with 0-4 as mild pain, 5-8 as moderate pain, 9 -10 as severe pain.

Swelling

According to the technique used by Chukwuneke *et al.*,[11] post-operative swelling was evaluated by multiplication of two measurements. Tragus-commissure and lateral canthus-gonial angle lines and compared with pre-operative values at 48 h and 1 week and 1 month postoperatively using the following formula:

$$\frac{\text{Postoperative value} - \text{preoperative value}}{\text{Preoperative value}} \times 100 = \% \text{ of facial swelling}$$

Mouth opening

Maximum mouth opening (MMO) was evaluated by measuring the interincisial distance or the distance between the two alveolar ridges in edentulous patients preoperatively (MMOI) and comparing it with measurements at 48 h, 1 week and 1 month postoperatively (MMO2).

Duration

The duration of the procedure was measured from the beginning of incision till the last suture being used.

Vestibular depth

Vestibular depth was measured from free gingival margin adjacent to OAC to the mucobuccal fold by periodontal probe (UNC15 – It is a 15 mm long periodontal probe with millimeter markings at each millimeter and color coding at 5 mm, 10 mm, 15 mm).

Figure 4: Group 2 showing closure of oroantral communication by using pedicled buccal fat pad flap - buccal fat pad sutured to cover the defect

RESULT

This prospective, randomized clinical study was conducted at the Department of Oral and Maxillofacial Surgery between December 2013 and November 2015 and consisted of 20 healthy patients with OAC.

A total of 20 patients were included in this study where they were divided into two groups, with each comprising 10 patients. 10 patients were treated with conventional buccal advancement flap (Group 1) and 10 with pedicled BFP (Group 2).

Mean age (in years) of the patients in the Group 1 was 33.9 ± 10.56 and 32.9 ± 19.449 in the Group 2 and overall 33.40 ± 12.331. There was a nonsignificant difference in mean age between the two groups ($P > 0.05$). Out of 20 patient, male and female ratio was 14:6.

There was a statistically significant difference in size of the bony defects between the two groups with its mean higher in Group 2 ($P < 0.05$) (Graph 1). The mean value of pain was higher and statistically significant at the 2nd and 7th post-operative days in Group 2 ($P < 0.05$) and nil at 1 month after surgery in both the groups (Graph 2). Swelling was significantly higher in Group 2 on day 2 and on day 7 ($P < 0.05$). At 1 month, there was no significant difference in swelling in either group ($P > 0.05$) (Graph 3). Mouth opening was less in group 2 on day 2 and on day 7 which was statistically significant ($P < 0.05$) (Graph 4). However at 1 month postoperatively, there was no significant difference between the two groups ($P > 0.05$). Pre-operative vestibular depth was statistically
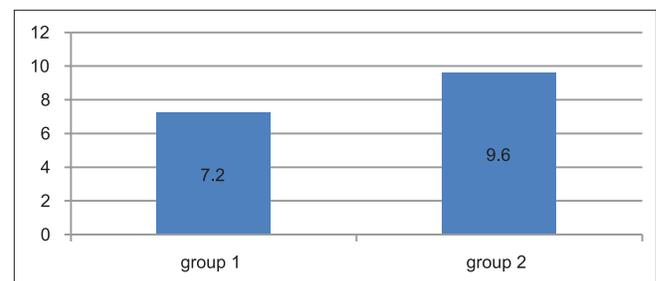
Graph 1: Size of bony defect in both groups
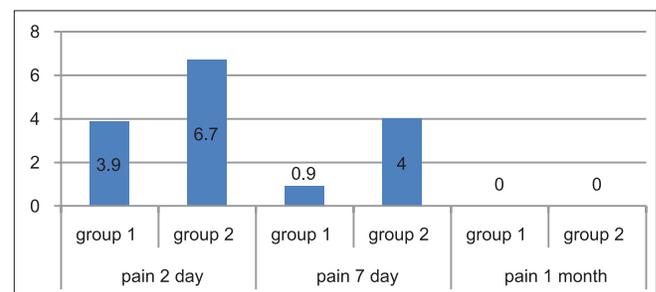
Graph 2: Comparison of pain in both groups

insignificant ($P > 0.05$). Initially, vestibular depth was less postoperatively in both the groups, but the mean value was higher in Group 2 at 2nd and 7th day and also at 1 month postoperatively ($P < 0.05$) (Graph 5). Time duration of surgery was higher in Group 2 and it was statistically significant also ($P < 0.05$) (Graph 6; Tables 1 and 2).

DISCUSSION

In this study, defects as large as 11 mm (the larger diameter between the buccopalatal and mesiodistal width of the defect were taken) were treated using pedicled BFP flap (PBFPF) (mean defect size 7.20 ± 10.33 mm). In this study, none of the procedures from either group failed to repair the oroantral defect with success rate of 100%. Egyedi[6] has used it to cover defects with <4 cm diameter; however, some authors have successfully used it for wider defects, such as Tideman, who covered a defect of 50 mm × 30 mm and Fujimura for a defect of the size of 60 mm × 50 mm × 30 mm.[6] Tideman *et al.* demonstrated that the BFP flap is epithelialized in 4-6 weeks. Gentle handling of tissues in every step of these operations was critical for success.

The rich blood supply of the PBFPF may explain its high success rate.[12] Despite the high success rate, some complications have been reported with PBFPF, including hematoma and swelling, infections, partial necrosis, massive hemorrhage, limitation of mouth opening, excessive scarring, and facial nerve injury.[13] Most of these complications have been attributed to low experience or invasive surgery.[14]

Pain scores were significantly higher in the Group 2 (PBFPF) compared with Group 1 (buccal flap) in our study. Nezafati *et al.* also experienced higher pain scores in PBFPF as compares to buccal flap in closure of OAC.[15] This finding shows that the pain induced by PBFPF is similar to that of other oral procedures and can be easily tolerated by patients. The most significant reported problem associated with PBFPF is limitation of mouth opening.

Repeated measurement analysis of variance showed that maxillomandibular opening was significantly less in the Group 2 (fat pad group) when compared with Group 1 (buccal advancement flap) on the 2nd and 7th post-operative day after surgery ($P < 0.005$).

This result is similar to the result of Colella *et al.*[16] in 2004 and Nezafati *et al.* in 2012,[15] Collela *et al.* and Chien *et al.*[17]
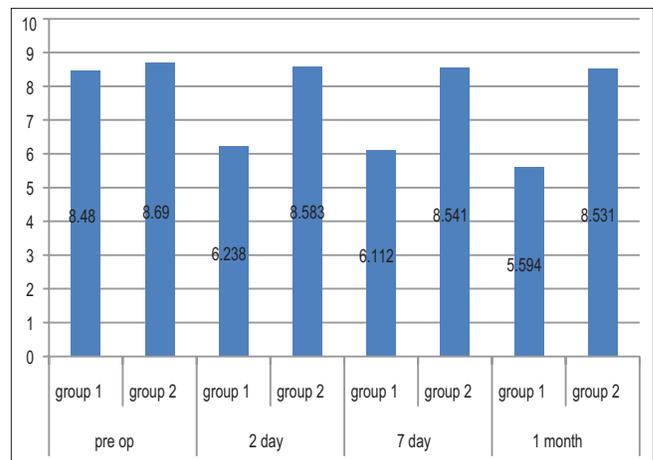
In the present study, all surgeries were carried out by one surgeon, and there were some differences in surgery
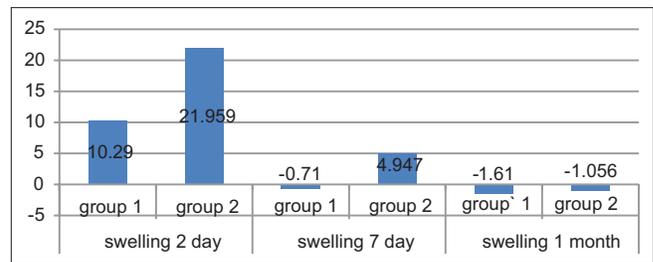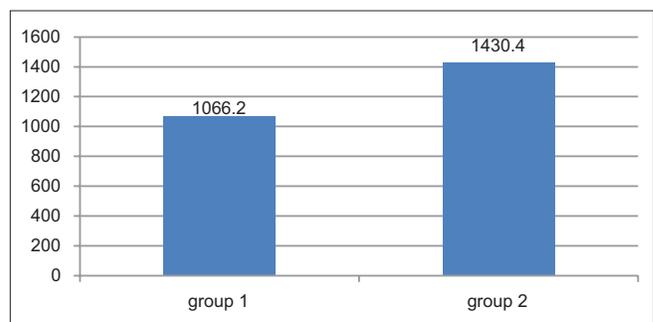

Graph 3: Comparison of swelling in both groups
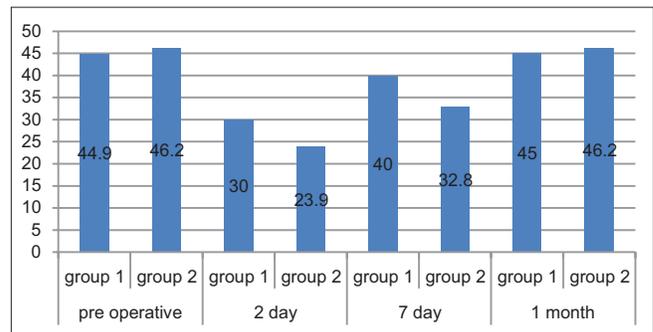
Graph 4: Comparison mouth opening of both groups

Graph 5: Comparison of vestibular depth in both groups

Graph 6: Comparison of duration in both groups

times between the two groups. Operating time was more in Group 2 (BFP group) when compared with Group 1 which was statistically significant ($P < 0.05$). Our result

Table 1: Intergroup comparisons

Variables	Groups	N	Mean±Standard deviation	Standard error mean	P value of independent t-test
Age (year)	1	10	33.90±10.567	3.341	0.862
	2	10	32.90±14.449	4.569	
Size of bony defect (mm)	1	10	7.20±1.033	0.327	0.000
	2	10	9.60±0.966	0.306	
Pain 2 day (VAS scale)	1	10	3.90±1.524	0.482	0.002
	2	10	6.70±1.889	0.597	
Pain 7 day (VAS scale)	1	10	0.90±0.994	0.314	0.000
	2	10	4.00±1.633	0.516	
Pain 1 month (VAS scale)	1	10	0.00±0.000[a]	0.000	-
	2	10	0.00±0.000[a]	0.000	
Swelling 2 day (%)	1	10	10.290000±8.5120111	2.6917343	0.010
	2	10	21.959000±9.5278381	3.0129670	
Swelling 7 day (%)	1	10	-0.710000±1.9598469	0.6197580	0.001
	2	10	4.947000±3.9724749	1.2562069	
Swelling 1 month (%)	1	10	−1.610000±2.5566688	0.8084897	0.646
	2	10	−1.056000±2.7396764	0.8663617	
Pre-operative mouth opening (in mm)	1	10	44.90±2.601	0.823	0.243
	2	10	46.20±2.201	0.696	
Restriction of mouth opening 2nd day (in mm)	1	10	30.00±4.082	1.291	0.001
	2	10	23.90±2.558	0.809	
Restriction of mouth opening 7th day (in mm)	1	10	40.00±3.972	1.256	0.000
	2	10	32.80±3.490	1.104	
Restriction of mouth opening 1 month (in mm)	1	10	45.00±2.055	0.650	0.224
	2	10	46.20±2.201	0.696	
Pre-operative vestibular depth (in mm)	1	10	8.48±0.797	0.252	0.474
	2	10	8.69±0.443	0.140	
loss of vestibular depth 2 day (in mm)	1	10	6.238000±0.4826961	0.1526419	0.000
	2	10	8.583000±0.4527459	0.1431708	
loss of vestibular depth 7th day (in mm)	1	10	6.112000±0.5027657	0.1589885	0.000
	2	10	8.541000±0.4433822	0.1402098	
loss of vestibular depth 1 month (in mm)	1	10	5.594000±0.5840510	0.1846931	0.000
	2	10	8.531000±0.4401628	0.1391917	
Time duration of surgery (s)	1	10	1066.20±96.497	30.515	0.000
	2	10	1430.40±75.640	23.919	

VAS: Visual analog scale

was found to be similar with the study of Nezafati *et al.* in 2012.[15]

Swelling was significantly higher in Group 2 ($P < 0.05$) with mean score of 21.950 ± 9.52% increase on 2nd day, mean score of 4.94 ± 3.97% increase on 7th day, and mean score of −1.75 ± 2.73% increase at 1 month when compared with Group 1 with mean score of 10.29 ± 8.59% increase on 2nd day, mean score of −0.710 ± 1.95% increase on 7th day, and mean score of −1.61 ± 2.15% increase at 1 month after surgery. At 1 month, there was no significant difference in swelling between both groups ($P > 0.05$). Therefore, the swelling was more in Group 2 as compared with Group 1 at the early post-operative period. This result was similar with works of Nezafati *et al.* in 2012[15] and Scott *et al.*[18] in 2004. The results (swelling) were predictable because dissection of deeply located BFP would be much more time consuming than the elevation of a buccal advancement flap. This

complication was well tolerated by the patients in our study both physically and psychologically and was never a major concern for the patients in our study.

Postoperatively vestibular depth was reduced in Group 1 when compared with Group 2 patients. The reduction of vestibular depth was less in Group 2 (BFP group), and the mean score of vestibular depth was higher in this group on 2nd, 7th and at 1 month ($P < 0.05$).

Our result was similar to the result of Nezafati *et al.* in 2012.[15]

Haraji and Raje in their series of 13 patients reported that when an OAC was closed with BFP, it healed without any esthetic disadvantage or disturbances of masticatory function. There was minimal obliteration of vestibular depth as compared to closure with buccal advancement flap.[19]

Table 2: Comparative result of two group

Variables	Pain	Group	Value
Defect size (mm)	Size of bony defect	Group 1	7.2
		Group 2	9.6
Pain (VAS)	Pain 2 day	Group 1	3.9
		Group 2	6.7
	Pain 7 day	Group 1	0.9
		Group 2	4
	Pain 1 month	Group 1	0
		Group 2	0
Swelling (mm)	Swelling 2 day	Group 1	10.29
		Group 2	21.959
	Swelling 7 day	Group 1	−0.71
		Group 2	4.947
	Swelling 1 month	Group 1	−1.61
		Group 2	−1.056
Mouth opening (in mm)	Pre-operative	Group 1	44.9
		Group 2	46.2
	2 day	Group 1	30
		Group 2	23.9
	7 day	Group 1	40
		Group 2	32.8
	1 month	Group 1	45
		Group 2	46.2
vestibular depth (in mm)	Pre-operative	Group 1	8.48
		Group 2	8.69
	2 days	Group 1	6.238
		Group 2	8.583
	7 days	Group 1	6.112
		Group 2	8.541
	1 month	Group 1	5.594
		Group 2	8.531
	Time duration of surgery (s)	Group 1	1066.2
		Group 2	1430.4

VAS: Visual analog scale

All OACs in this study were treated successfully with PBFP and were as successful as the buccal advancement flap. It (PBFPF) is considered the primary choice for repair of oroantral fistula by some surgeons,[20] whereas others like Samman *et al.*[21] justify its use only in cases where the buccal advancement flap is damaged and can be used as the primary option.

CONCLUSION

Both surgical techniques were successful in closing the OAC in this study. Surgery time was longer in BFP group since gentle and careful handling of tissues were strictly followed in order not to disrupt the blood supply of the flap. Post-operative pain and swelling were also more in this group at early post-operative phase; however, they were never intolerable to the patients with medications

and at 1 month review both these post-operative sequel came down to baseline. However, reduction of vestibular depth is much less with BFP procedure when compared with buccal advancement flap technique. Restriction of mouth opening was also observed to be an early post-operative complication, but this also had improved at 1 month in both the groups. In spite of statistical evidence for its weaknesses, BFP flap is a simple and reliable procedure for the closure of OAC/fistula, and in the hands of an experienced surgeon, it can be carried out easily with minimal complications. This study was limited by the small number of patients and repeating the study with larger groups will be our recommendation.

REFERENCES

1. Ericson S, Finne K, Persson G. A clinical-radiographic review of treated Oro-antral communications. Int J Oral Surg 1973;2:185.
2. Killey HC, Kay LW. An analysis of 250 cases of Oro-antral fistula treated by the buccal flap operation. Oral Surg Oral Med Oral Pathol 1967;24:726-39.
3. Schuchardt K. Treatment of Oro-antral perforations and fistulae. Int Dent J 1955;5:159.
4. Yih WY, Merrill RG, Howerton DW. Secondary closure of oroantral and oronasal fistulas: A modification of existing techniques. J Oral Maxillofac Surg 1988;46:357-64.
5. Fujimura N, Nagura H, Enomoto S. Grafting of the buccal fat pad into palatal defects. J Craniomaxillofac Surg 1990;18:219-22.
6. Egyedi P. Utilization of the buccal fat pad for closure of Oro-antral and/or Oro-nasal communications. J Maxillofac Surg 1977;5:241-4.
7. Hai HK. Repair of palatal defects with unlined buccal fat pad grafts. Oral Surg Oral Med Oral Pathol 1988;65:523-5.
8. Stajcic Z. The buccal fat pad in the closure of Oro-antral communications: A study of 56 cases. J Craniomaxillofac Surg 1992;20:193-7.
9. Visscher SH, van Roon MR, Sluiter WJ, van Minnen B, Bos RR. Retrospective study on the treatment outcome of surgical closure of oroantral communications. J Oral Maxillofac Surg 2011;69:2956-61.
10. Peterson LJ, Ellis E, Hupp JR, Tucker MR. Oral and Maxillofacial Surgery. 4th ed. St. Loui: Mosby; 1998.
11. Chukwuneke FN, Oji C, Saheeb DB. A comparative study of the effect of using a rubber drain on postoperative discomfort following lower third molar surgery. Int J Oral Maxillofac Surg 2008;37:341-4.
12. Abuabara A, Cortez AL, Passeri LA, de Moraes M, Moreira RW. Evaluation of different treatments for oroantral/oronasal communications: Experience of 112 cases. Int J Oral Maxillofac Surg 2006;35:155-8.
13. Alkan A, Dolanmaz D, Uzun E, Erdem E. The reconstruction of oral defects with buccal fat pad. Swiss Med Wkly 2003;133:465-70.
14. Baumann A, Ewers R. Application of the buccal fat pad in oral reconstruction. J Oral Maxillofac Surg 2000;58:389-92.
15. Nezafati S, Vafaii A, Ghojazadeh M. Comparison of pedicled

buccal fat pad flap with buccal flap for closure of Oro-antral communication. Int J Oral Maxillofac Surg 2012;41:624-8.

16. Colella G, Tartaro G, Giudice A. The buccal fat pad in oral reconstruction. Br J Plast Surg 2004;57:326-9.

17. Chien CY, Hwang CF, Chuang HC, Jeng SF, Su CY. Comparison of radial forearm free flap, pedicled buccal fat pad flap and split-thickness skin graft in reconstruction of buccal mucosal defect. Oral Oncol 2005;41:694-7.

18. Scott P, Fabbroni G, Mitchell DA. The buccal fat pad in the closure of Oro-antral communications: An illustrated guide. Dent Update 2004;31:363-4, 366.

19. Haraji A, Zare R. The use of buccal fat pad for oro-antral communication closure. J Mashhad Den Sch Mashhad Univ Med Sci 2007;31:9-11.

20. Liversedge RL, Wong K. Use of buccal fat pad in maxillary and sinus grafting of the severely atrophic maxilla prepatory to implant reconstruction of partially or completely edentulous patients: Technical note. Int J Oral Maxillofac Implants 2002;17:424-8.

21. Samman N, Cheung LK, Tideman H. The buccal fat pad in oral reconstruction. Int J Oral Maxillofac Surg 1993;22:2-6.