



The Versatility of Double-Layered Closure Using the Pedicled Buccal Fat Pad and Reherman Buccal Advancement Flap in the Reconstruction of Oro-Antral Defects a Prospective Clinical Study

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Abstract

Aim: To evaluate the efficacy of double-layered closure using the Pedicled Buccal Fat Pad and Reherman flap in the closure of oro-antral defects.

Background: Oro-Antral Communications (OACs), the most common complication after extraction of posterior maxillary teeth, treatment of cysts & tumors, trauma or infections, can cause difficulty in speech, mastication, and overall hygiene of the patient. Smaller OACs (2 mm or less) close spontaneously without any surgical intervention, while, larger OACs remain patent and get epithelialized to develop an oro-antral fistula leading to chronic maxillary sinusitis and patient discomfort. Multiple surgical methods have been developed to treat OACs; however, combination of Buccal Fat Pad (BFP) with Reherman flap is the most sought after method for closure of oro-antral communications.

Materials & Methods: A prospective clinical study including 35 patients diagnosed with chronic OAF >5 mm requiring surgical closure was conducted. All the patients were treated with BFP and Reherman Flap. Follow up was done up to 6 months to evaluate post-operative outcome such as infections, relapse/failure of closure of defect or any other complication resulting in failure of treatment.

Results: Complete epithelialization (successful outcome) was observed with no post-operative complications in all cases.

Conclusion: Pedicled Buccal Fat Pad (BFP) and Reherman flap is a straightforward, convenient, durable and reliable method for the treatment of oro antral defects.

Introduction

An Oro-Antral Communication (OAC) is an unnatural opening existing between oral cavity and maxillary sinus. It is of variable size and is usually a common complication after dental extractions, particularly in the posterior maxillary region due to the close proximity of the root apices of the maxillary posterior teeth with the floor of the maxillary sinus [1-3]. Its frequency ranges between 0.31% and 4.7% following the extraction of upper teeth [4]. It can also occur as a result of iatrogenic complications while performing dental procedures such as surgical removal of cysts or as a complication due to infection of the antral filling used to stabilize zygomatic complex fracture [5-8]. Various pathological lesions of the maxillary sinus, periodontal infections and trauma can also result in the formation of an OAC [9]. Other causes of OAC may be tumors removal, Infections, as a Sequelae of Radiation therapy or congenital maxillary defects where large amounts of bone is removed as a part of resection [10,11]. Like other oral defects, OAC too, is a condition where in the patient experiences severe difficulty in speech, mastication/swallowing and constant agony due to halitosis due to the food lodgement in the sinus and ensuing chronic maxillary sinusitis affecting the overall confidence and oral health related quality of life of the patient. To address the issue and provide relief in such cases, firstly, the sinus must be provided with a complete closure and secondly, it should be rendered infection free with adequate drainage supported by appropriate decongestants [12]. To achieve a successful closure of the oro-antral communication, many treatment methods have been recommended in the past and new ones keep getting updated in the long list of options.

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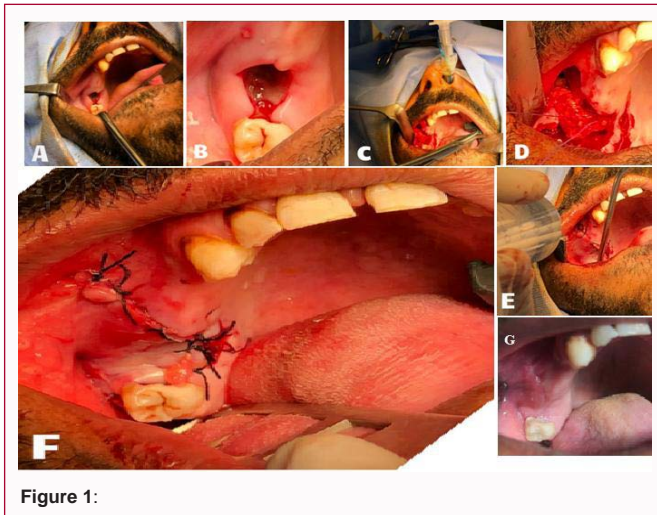


Figure 1:

Most important and commonly opted methods for repair of Oro-Antral Communications include Local and Distant Flaps, Bone Grafts, Tissue Membranes and others [11]. Recently, Heister introduced an adaptation of local soft tissue flap which was popularized by Bichet, called Buccal Pad Fat Flap, which has won the appreciation of many health care professionals in correcting the oro-antral defects due to its superiority in performance. Buccal Pad Fat Flap is superior to other methods because of its advantage of location and ease of performance, which makes BFP an increasingly sought method used in the repairs of OACs [7]. BFP is situated along the posterior maxilla and upper fibres of the buccinators, a location which makes it suitable choice for local soft tissue flap. The quick epithelialisation of the uncovered fat is a characteristic feature of the pedicled BFP flap which is histologically proven, acts as an added advantage. The BFP derives its blood supply from maxillary artery (buccal and deep temporal branches), the superficial temporal artery (transverses facial branches), and branches of the facial artery. These blood vessels form the lobar subcapsular plexus by freely anastomosing with each other [13]. Owing to its rich blood supply, it can be considered as the most beneficial pedicled graft. The rich blood supply may also justify the high success rates with this flap [14-16]. Since the PBF is advantageous in terms of its use for Oro-antral communications, maxillary defects, prosthetic reconstructions as well as in cases of Oral Sub mucous Fibroses, the present study presents a comprehensive view of the efficiency of BFP in combination with Reherman Flap in the long term successful closure of Oro-Antral Communications [14-20].

Methodology

On successful clearance from the institutional ethics committee a prospective clinical intervention study was conducted. Patients requiring surgical closure for oro-antral defects (>5 mm) were included in the study (Figure 1). Treatment for the patients was conducted in the department of Oral and Maxillofacial Surgery, Al Qurayyat, Kingdom of Saudi Arabia. The patients were explained in detail about the procedure, risks, outcomes and alternative procedures. Before including in the study, all the patients were administered the informed consent and patients willing to be followed-up upto 6 months were included. Patients were excluded if they were above ASA2, required radiation therapy following surgery, suffering from chronic systemic illnesses and if they were immunocompromised. The study was conducted over a period of 1 year from September 2018 to August 2019.

A total of 35 patients under the age group of 22 to 56 years were included in the study, surgery was performed after the patients were given amoxicillin, metronidazole and decongestant nasal drops for 7 days preoperatively. In addition, irrigation of the maxillary sinus with normal saline was carried out for one week to ensure the absence of infection before surgery. After uneventful procedure of general anesthesia, adequate local infiltration, using 2% lidocaine with adrenaline 1:80,000, was done into the buccal vestibule of the affected side, a circular incision with a 2 mm margin was made around the OAF, and the epithelial tract and inflammatory tissue within the opening was completely excised (Figure 1). Two divergent cuts were made from each end of the circular incision extending into the buccal vestibule. The trapezoidal mucoperiosteal flap was reflected to expose the lateral wall of the maxilla. To reach the buccal pad of fat, a 1 cm incision was performed, at the zygomatic buttress area, in the reflected periosteum and the fascial envelope of the buccal pad (Figure 1). Using a fine curved artery forceps, a gentle dissection was carried out to expose the yellow colored buccal pad of fat. Mechanical suction was avoided once the buccal fat pad was exposed. Then, the buccal pad of fat was gently advanced over the bony defect and sutured with 3 to 0 absorbable suture materials to the palatal mucosa without tension. Finally, the muco-periosteal flap if needed further extensions of the releasing incisions were given and advanced over the sutured buccal pad of fat and double layer closed over it without tension using non-absorbable suture material (Figure 1). Post-Operative Instructions and instructions for hygiene maintenance were provided to the patients. The patients were warned against blowing their noses for two weeks. The preoperative drugs along with analgesics were continued till one week after surgery. Follow up of the patients was on a weekly basis for first 2 months, and then 6 months after surgery (Figure 1). Assessment of all of the patients at periodic intervals was done based on the following parameters: the healing process, pain on a visual analogue scale (no pain, mild, moderate and severe), facial edema (using a measuring tape placed from tragus to soft tissue pogonion), sinus infection, maximum inter-incisal mouth-opening and an intra-oral peri-apical radiograph. Data obtained was processed using Microsoft word and Excel. Statistical Package for the Social Sciences, Version 21.0 (SPSS Inc., Chicago, IL, USA) was used for statistical analyses of data. Qualitative variables were represented with frequencies and percentages as applicable. Quantitative variables were explained with mean and standard deviations.

Results

Total number of patients reviewed was 35. Average age of the patients was 33.5 ± 7.05 Yrs. Male Female ratio was 1.2:1 with 19 male patients and 16 female patients. Dental extraction of teeth with associated periapical cysts was the most common (n=30, 85.7%) reason for developing OAC. Maxillary first molar region was more frequently affected (n=26, 74.3%), followed by maxillary second molar region (n=3, 8.5%) and maxillary premolar region (n=6, 17.1%). Majority of the patients had defects of size 5 to 10 mm (n=31, 88.5%) and 4 patients had defects of size >10 mm (n=4, 11.5%). The size of the bony defect found after raising a flap ranged from 2 mm to 14 mm. The duration of the OACs ranged from 0 to 24 months with a mean duration of 2.9 ± 4.2 months (Table 1). All the participants of the study underwent closure of OAC with double layered technique using buccal fat pad and Reherman (buccal advancement) flap. Half the patients with large OAC defects (>10 mm) developed dehiscence, where as only 2 patients with smaller OAC defects (5 mm to 10 mm) developed dehiscence. Out of 31 patients with a defect size of 5 mm to 10 mm,

Table 1: Demographic and Baseline characteristics.

Sl. No	Age/Gender	Etiology	Site	Size	Duration (months)	Outcome	PO Trismus	PO Swelling	PO Pain	PO Infection/ Sinusitis
1.	43/M	Dental Extractions	1 st Molar	>10 mm	5	Successful closure	None	None	None	None
2.	34/M	Dental Extractions	1 st Molar	7.2 mm	2	Successful closure	None	None	None	None
3.	56/M	Dental Extractions	1 st Molar	>10 mm	24	Flap Dehiscence	Present	None	None	Present
4.	25/F	Dental Extractions	1 st Molar	6.4 mm	1	Successful closure	None	None	None	None
5.	27/M	Other Minor Surgical Procedures	2 nd Molar	5.3 mm	0	Successful closure	None	None	None	None
6.	30/F	Dental Extractions	1 st Molar	6.0 mm	0	Successful closure	None	None	None	None
7.	32/M	Dental Extractions	1 st Molar	7.5 mm	3	Successful closure	None	None	None	None
8.	34/F	Dental Extractions	1 st Molar	5.5 mm	4	Successful closure	None	None	None	None
9.	39/F	Dental Extractions	1 st Molar	8.1 mm	6	Successful closure	None	None	None	None
10.	45/M	Dental Extractions	1 st Molar	>10 mm	10	Flap Dehiscence	None	None	None	None
11.	29/F	Dental Extractions	1 st Molar	4.9 mm	1	Successful closure	None	None	None	None
12.	31/F	Other Minor Surgical Procedures	2 nd Molar	5.2 mm	6	Flap Dehiscence	None	None	None	None
13.	28/M	Dental Extractions	1 st Molar	8.0 mm	0	Successful closure	None	None	None	None
14.	35/F	Other Minor Surgical Procedures	2 nd Molar	9.1 mm	0	Successful closure	None	None	None	None
15.	45/F	Dental Extractions	Premolar	>10 mm	3	Successful closure	None	None	None	None
16.	36/M	Dental Extractions	Premolar	8.7 mm	2	Successful closure	None	None	None	None
17.	42/F	Dental Extractions	1 st Molar	2.8 mm	1	Successful closure	None	None	None	None
18.	28/M	Dental Extractions	Premolar	3.8 mm	1	Successful closure	None	None	None	None
19.	36/M	Dental Extractions	1 st Molar	6.2 mm	4	Successful closure	None	None	None	None
20.	33/F	Dental Extractions	1 st Molar	5.1 mm	4	Successful closure	None	None	None	None
21.	42/F	Dental Extractions	1 st Molar	5.8 mm	2	Successful closure	None	None	None	None
22.	26/M	Dental Extractions	Premolar	3.0 mm	1	Successful closure	None	None	None	None
23.	25/F	Dental Extractions	1 st Molar	6.0 mm	2	Successful closure	None	None	None	None
24.	22/F	Dental Extractions	1 st Molar	6.2 mm	0	Successful closure	None	None	None	None
25.	31/M	Dental Extractions	1 st Molar	7.1 mm	3	Successful closure	None	None	None	None
26.	29/F	Dental Extractions	Premolar	4.0 mm	1	Successful closure	None	None	None	None
27.	33/M	Dental Extractions	1 st Molar	5.6 mm	2	Successful closure	None	None	None	None
28.	36/M	Dental Extractions	1 st Molar	6.3 mm	6	Flap Dehiscence	None	None	None	None
29.	29/M	Dental Extractions	1 st Molar	3.9 mm	2	Successful closure	None	None	None	None
30.	28/F	Other Minor Surgical Procedures	1 st Molar	9.5 mm	0	Successful closure	None	None	None	None
31.	39/F	Dental Extractions	1 st Molar	3.5 mm	1	Successful closure	None	None	None	None
32.	30/M	Dental Extractions	1 st Molar	5.0 mm	1	Successful closure	None	None	None	None
33.	32/M	Dental Extractions	1 st Molar	4.8 mm	2	Successful closure	None	None	None	None
34.	28/M	Dental Extractions	Premolar	2.7 mm	0	Successful closure	None	None	None	None
35.	35/M	Dental Extractions	1 st Molar	5.6 mm	2	Successful closure	None	None	None	None

2 patients had slight flap dehiscence post operatively due to closure under tension which resolved at the end of 1st week post-operative assessment. The 2 patients with a defect >10 mm had dehiscence post operatively due to buccal advancement flap loss, however the closure was not completely affected and by the end of 1st month post-

operative assessment, the dehiscence was reduced to minimum. One of the patients with larger OAC defect reported with post-operative trismus. There was mild facial edema noted in all the patients post-operatively, which reduced before post-operative assessment on day 7 (1 week). Post-operative pain was assessed using visual analogue

Table 2: Outcome at 6 months of the procedure.

Sl. No	Surgical Outcome	Post-Operative Trismus	Post-Operative Swelling	Post-Operative Pain	Post-Operative Infection/Sinusitis
1	Successful closure	None	None	None	None
2	Successful closure	None	None	None	None
3	Mild Dehiscence	Present	None	None	Present
4	Successful closure	None	None	None	None
5	Successful closure	None	None	None	None
6	Successful closure	None	None	None	None
7	Successful closure	None	None	None	None
8	Successful closure	None	None	None	None
9	Successful closure	None	None	None	None
10	Mild Dehiscence	None	None	None	None
11	Successful closure	None	None	None	None
12	Successful closure	None	None	None	None
13	Successful closure	None	None	None	None
14	Successful closure	None	None	None	None
15	Successful closure	None	None	None	None
16	Successful closure	None	None	None	None
17	Successful closure	None	None	None	None
18	Successful closure	None	None	None	None
19	Successful closure	None	None	None	None
20	Successful closure	None	None	None	None
21	Successful closure	None	None	None	None
22	Successful closure	None	None	None	None
23	Successful closure	None	None	None	None
24	Successful closure	None	None	None	None
25	Successful closure	None	None	None	None
26	Successful closure	None	None	None	None
27	Successful closure	None	None	None	None
28	Successful closure	None	None	None	None
29	Successful closure	None	None	None	None
30	Successful closure	None	None	None	None
31	Successful closure	None	None	None	None
32	Successful closure	None	None	None	None
33	Successful closure	None	None	None	None
34	Successful closure	None	None	None	None
35	Successful closure	None	None	None	None

scale, which was mild to moderate during the first and second post-operative days. None of the cases had developed any sinus infection or chronic sinusitis. In most cases, after 7 days postoperatively, the exposed BFP was incorporated completely along with the gingiva, with a yellowish tinge in the central portion of exposed BFP. At 21 days, complete epithelialisation is observed in the grafted area. At 1 month, the BFP had changed into almost pinkish yellow color indicating complete integration into the tissue. At 2 months, there was complete healing of the operative site; however, in some patients the BFP had slight contractions due to the development of a granulation-like tissue indicating healing progress. Complete epithelialisation occurred in all cases and there were no postoperative complications at the 6-month follow up visit. In three of the cases, the BFP near

the mucosal border was reduced with scissors to prevent the risk of dental trauma while chewing. In other patients, such an operation was not required, and there was no significant healing difference, nor was there a difference in the post-operative complications between these patients. The BFP that was left hypertrophic reached an almost normal level by completing secondary epithelialisation. Excessive granulation and hypertrophy was noticed in one case but returned to a normal size through secondary healing in time. The difference between levels of pain or edema eventually disappeared completely. Post-operative assessment at the end of 2nd, 3rd, 4th week and at the end of 2nd and 6th month resulted in no severe complications in any of the patients regarding complete healing/epithelialization, edema, paraesthesia or post-operative pain. However one patient returned

with post-operative trismus, two patients had mild dehiscence and one patient reported mild symptoms of sinusitis indicating infection of the maxillary sinus.

Discussion

Successful closure of OAC, complete epithelialization and the absence of any post-operative complications like trismus or sinusitis are considered to be a successful outcome in the treatment of Oro-antral communications. Many previous studies have advocated different methods for the treatment of OAC. However, BFP with Reherman flap being a superior method of choice was chosen for the present study in treating 35 cases of oro-antral communications. In a similar clinical series of 75 cases, Dolanmaz reported successful healing of OACs using BFP in all the patients [21]. BFP was also compared with palatal rotation flap in a previous study where BFP proved to be a better choice in successful closure of OACs with an additional advantage of preserving the normal anatomical architecture of the oral mucosa [22]. Other methods of closure for OACs have been followed but were associated with some complications in an earlier study however, such complications were not observed with the present cases [15,16]. Post-operative pain and Trismus was noted in only one of the cases in the present study at the 6 month follow up. One of the previous study compared the PBF& Buccal advancement flap method with a Palatal Sliding flap and concluded that the outcome in terms of mouth opening or trismus or post-operative pain remained same between groups [23], while many other studies advocated use of BFP with Buccal Advancement Flap alone for closure of OACs [10,23-26]. Paraesthesia was a noted complication in one of the previous studies whereas the present study reported no complication of paraesthesia [27]. Visscher et al. reported maxillary sinusitis as a frequent complication; however the present study reported only one case of mild maxillary sinusitis at 6 months follow up. One alternative method was reported by Gacic B et al., [4] where the use of PLGA- β -TCP composite or hemostatic gauze resulted in successful closure of OACs, without any report of atrophy of the alveolar ridge, swelling, and pain, this finding was similar to the outcome of our present study providing a notion to compare the newer methods of closure with BFP. Small defects of OACs can be successfully closed with BFP alone; however larger defects need additional reinforcement in the form of a buccal advancement flap similar to the present study where successful closure was observed among all the patients with BFP and Reherman flap [24]. BFP has also been reported to be used for other procedures because of its numerous advantages and encouraging results. Owing to its simplicity, versatility, excellent blood supply, low rate of complications, minimal to no donor site morbidity, quick surgical technique because it is located in the same surgical field as the defects to be covered, good rate of epithelialisation and because it allows for replacement of the muco-periosteal flap without loss of vestibular depth this technique has been the most sought after method in the closure of OACs [21]. Providing a safe and reliable method of surgical closure for OACs had been a topic of interest since decades, however no single method could be completely accepted throughout the surgical fraternity as every method is associated with complications that are sometimes unavoidable. The present study was intended to assess the efficiency of BFP with Reherman flap in successful closure of OACs and the outcome was supportive. Hence BFP with Reherman flap can be used as a safe, reliable, effective and advantageous method in closure of OACs providing relief and safe/easy healing period for the patients. It can also be advocated to be used in case of failure/complications in closure of OACs following

other surgical methods to close OACs.

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