

Causes and treatments of oroantral communications: Experience with 103 cases

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Abstract

Aim: In this study, we aimed to evaluate the etiologic factors, location and surgical technique for patients with oroantral communications (OAC).

Materials and Methods: A total of 103 patients who had chronic or acute OAC and underwent surgical correction were reviewed retrospectively. The data that was recorded included gender, age, fistula location, fistula size, duration of the fistula, etiology, treatment modality, and any related complications.

Results: Extraction of the first molar is associated with the highest incidence (41.75%) of OACS. Complete healing was observed in 68 patients with suturing. Surgical intervention was necessary for 35 patients. The surgical methods used for closure of the OACS included palatal-rotational flaps (PRF) in two patients, buccal flaps (BF) in 18 patients, and Bichat's buccal fat pad (BFP) in 15 patients. Treatment in 5 cases resulted in failure, and four of these patients received a second treatment. In one case the patient refused any further surgical intervention and was treated with an obturator prosthesis.

Conclusion: Location, size of the defect, and duration of the OAC are essential factors in the choice of technique. Surgeons should choose the correct approach or modify it in accordance with the characteristics of the particular OAC.

Keywords: Buccal fat pad; oroantral fistula; oroantral communications

INTRODUCTION

The term "Communication" describes a non-anatomical path between the oral cavity and the maxillary sinus (oroantral, OAC) or between the oral cavity and the nasal cavity (oronasal, ONC). In most cases, Valsalva manoeuvre is sufficient for clinical diagnose of OAC or ONC communications.

There are many causes of OAC and ONC. Although the incidence is very low (5%), the extraction of posterior maxillary teeth is the most common cause of OAC (80%). Because of the distance between two cavities in that region ranges from 1 to 7 mm, a close anatomical relation could be present in some patients (1).

An OAC of less than 3 mm in diameter tends to close spontaneously, whereas those larger than 3 mm generally require surgical closure (2, 3). Different approaches described for the treatment of larger Oroantral and Oronasal communications. Among these, Rehrmann's buccal flap

(4), palatal-rotational flap (5) and Bichat's buccal fat pad (BFP) (6) techniques are the most common. The main aim of these techniques is to ensure adequate blood supply to the flap to seal the communication. Because when the communications do not spontaneously heal within 2 to 3 weeks, they are accepted as chronic fistulas, and surgical correction is necessary in these cases (7). It is generally accepted that all of these defects should be closed within 24 to 48 hours to prevent chronic sinusitis and the development of fistulas, (8). Therefore early treatment of communications considered as an important factor in the management of oroantral communications because the closure of acute oroantral defects has a high success rate, approaching 95% while the success rate of secondary procedures is reported as low as 67% (3, 9).

In this study, we aimed to evaluate the etiologic factors, location and surgical technique for patients with oroantral communications.

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MATERIALS and METHODS

A total of 103 patients with chronic or acute oroantral communication who underwent surgical correction at the Karadeniz Technical University Faculty of Dentistry Department of Oral and Maxillofacial Surgery between 2014 and 2018 were reviewed retrospectively. The data recorded included gender, age, fistula location, fistula size, duration of the fistula, etiology, treatment modality and any related complications. The success criteria were complete closure of the communication. This study was approved by the Research Ethics Committee of the Faculty of Medicine at Karadeniz Technical University, Trabzon, Turkey (2017/36).

Deciding the closure technique

Before deciding the treatment modality, the size of the bony defect and patients' medical history were evaluated. In patients with chronic OACs, the size of the underlying bony defects was evaluated with CT scans. When an OAC occurred during the surgical procedure such as tooth extraction or cyst enucleation, the severity of the communication was evaluated according to the clinical findings. Patients were asked to blow gently through the nose while their mouth open and nostrils were pinched together. Presence of passage was confirmed with air or bubbling of blood coming out from the surgical site. Probing was not performed to prevent pushing any contaminated root fragments or foreign bodies into the maxillary sinus.

According to the clinical evaluation, mild cases treated

with a simple suture by bringing the wound edges closer. In other cases, although buccal flap was our first choice because it was less invasive, cases with larger defects, patients with a history of smoking, bad oral hygiene or any systemic disease which could interfere the healing process such as diabetes, chronic kidney disease, BFP technique was preferred to ensure complete closure.

Closure Techniques

Patients with chronic OAC evaluated for the existence of chronic sinusitis before surgical intervention. Before the closure of the communications, removal of the sinus pathologies with the fistula tract was performed. Antral infection was eliminated with antibiotics, and antral irrigation carried out with physiological saline.

The buccal advancement flap was raised after two vertical incisions having a trapezoidal shape in the buccal vestibule with enough space between the incisions to cover the bony defect. Advancement of the flap was provided by a single horizontal incision on the periosteal surface. The buccal flap was placed over the defect and sutured.

For the buccal fat pad technique (Figure-1) vestibular horizontal incision was performed from posterior to the first premolar and extended to the posterior margin of the fistula to expose the BFP. Blunt dissection through the buccinator muscle and the fascia was made to expose the BFP. Mobilization, and the advance of the pedicle BFP was carried out with pressure on the cheek to help the herniation of the fat. Closure of the flap was performed in two layers using absorbable sutures.

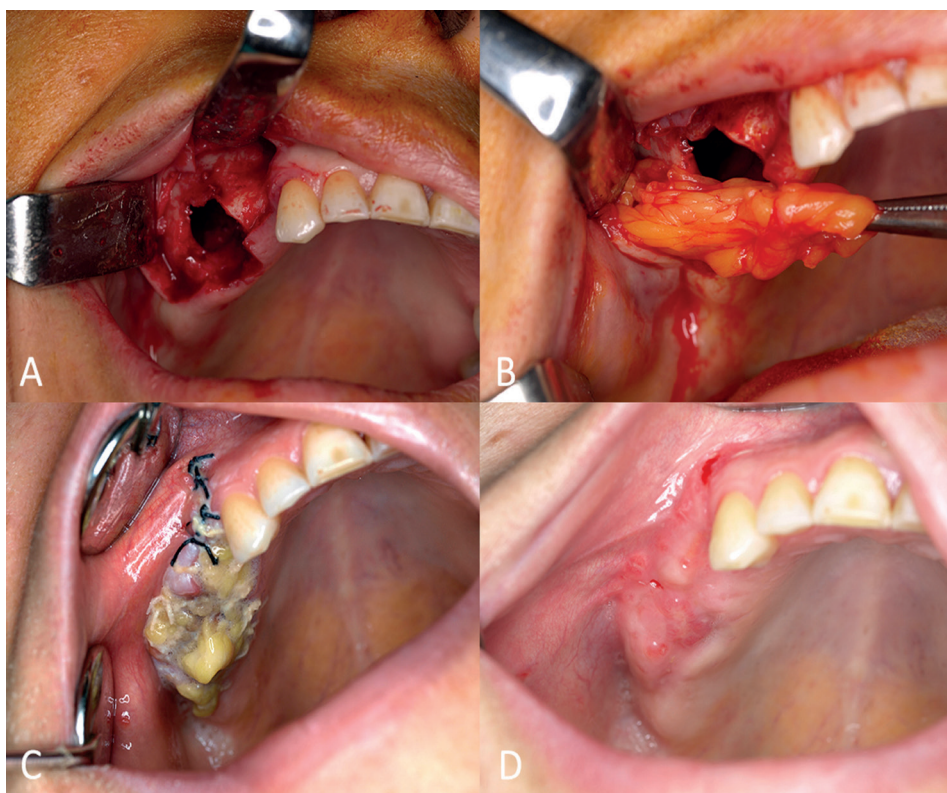


Figure 1. Closure of an Oroantral Communication by Bichat's Buccal Fat Pad Technique
A, Elevation of the flap; B, Dissection of the Bichat's Fat Pad; C, Third day post-operatively; D, three weeks post-operatively.

Drainage of the sinus was performed through the ostium postoperatively in all patients. Patients were informed to avoid nose blowing or any similar actions which could increase the intranasal pressure and impair the healing process.

The patients were prescribed Amoxicillin-clavulanate 1 g 2x1 and naproxen sodium 275 mg 2x1. A systemic decongestant (pseudoephedrine 60 mg 3x1) was also prescribed to maintain the patients were followed up until the complete closure is achieved. In one case with the removal of large osteonecrosis, BFP technique was not successful for complete closure. This patient refused any further surgical intervention and treated with an obturator prosthesis.

RESULTS

A total of 103 patients were treated for the closure of oroantral communication. Among these, 49 (47.57%) were men and 54 (52.43%) were women. Their age range was 13 to 87 years with a mean age of 39.80. Data analysis revealed that the highest number of the OACs was observed in the third decade then followed by the second decade (Table-1).

The etiology of the communications was tooth extraction in 89 (86.40%) patients, cyst enucleation in 8 (7.77%), osteonecrosis in one (0.97%) and surgical deformity in one patient (2.9%). In three patients, OACs were present on a residual alveolar crest as chronic fistulas with no specific etiological factors such as surgery or trauma (Table-1).

Extraction of the first molar has the highest incidence (41.75%) for oroantral communications followed by extraction of the second molar (24.27%), third molars (11.66%), first premolars (3.88%) and second premolars (4.85%) consecutively in all extractions (Table-1).

Chronic fistulas were observed in 23 patients, and the duration of the fistulas was varied from 4 weeks to 35 years. In 80 patients, existence of acute OACs were diagnosed with a simple nose-blowing test after tooth extraction or cyst enucleation (Table-1).

Surgical intervention was necessary for 35 patients, and in 67 patients, simple suturing was sufficient for complete closure. The surgical methods used consisted of 21 buccal flaps, 13 Bichat's buccal fat pad and two palatal-rotational flaps (Table-2).

For the buccal flap advancement technique, 15 of the 18 patients healed uneventfully. In two cases, OAC was still present at post-operative one week follow-up; however, complete closure was achieved in these cases two weeks without any secondary procedures. For the other case, the BF technique was not sufficient for complete closure in two weeks period, therefore a secondary closure with BFP performed and healed uneventfully (Table-2).

Complete closure was achieved in 12 of the 13 patients with the BFP technique. In this one particular case, OAC has occurred after necrosis of the alveolar bone in a patient with chronic kidney disease. BFP was unsuccessful for the

closure of the defect of this patient which later managed with prosthetic obturators (Table-2).

Table 1. Distribution of the Cases

Characteristic	Patients	Duration (Acute / Chronic)
Gender		
Male	49 (47.57%)	
Female	54 (52.43%)	
Decade		
1	5 (4.85%)	4 (80.00%) / 1 (20.00%)
2	20 (19.42%)	18 (90.00%) / 2 (10.00%)
3	28 (27.18%)	24 (64.28%) / 4 (35.72%)
4	25 (24.27%)	19 (76.00%) / 6 (24.00%)
5	15 (14.56%)	8 (53.34%) / 7 (46.66%)
6	7 (6.80%)	3 (42.85%) / 4 (57.15%)
7	2 (1.94%)	2 (100%) / 0 (0.00%)
8	1 (0.97%)	1 (100%) / 0 (0.00%)
Etiology		
Tooth extraction	89 (86.40%)	72 (69.84%) / 17 (16.49%)
Tooth no		
14	2 (1.94%)	2 (1.94%) / 0 (0.00%)
15	4 (3.88%)	3 (2.91%) / 1 (0.97%)
16	23 (22.33%)	17 (16.49%) / 6 (5.82%)
17	12 (11.65%)	11 (10.67%) / 1 (0.97%)
18	6 (5.83%)	5 (4.85%) / 1 (0.97%)
24	2 (1.94%)	1 (0.97%) / 1 (0.97%)
25	1 (0.97%)	0 (0.00%) / 1 (0.97%)
26	20 (19.42%)	16 (15.52%) / 4 (3.88%)
27	13 (12.62%)	13 (12.62%) / 0 (0.00%)
28	6 (5.83%)	4 (3.88%) / 2 (1.94%)
Cyst	8 (7.77%)	7 (6.79%) / 1 (0.97%)
Osteonecrosis	1 (0.97%)	0 (0.00%) / 1 (0.97%)
Crest resorption	3 (2.91%)	0 (0.00%) / 3 (2.91%)
Deformity	1 (0.97%)	0 (0.00%) / 1 (0.97%)
Tumor	1 (0.97%)	0 (0.00%) / 1 (0.97%)

Result shown as number (percentage). Abbreviations: BFP, Bichat's buccal fat pad; PRF, Palatal rotational flap; BF, Buccal flap; n, Number

Table 2. Treatment Techniques and Outcomes

Surgical Technique	Cases	Complications (%)	Secondary Treatment
Suturing	68 (66.02%)	1 (1.51%) (Dehiscence)	Buccal flap
Buccal flap	18 (17.48%)	3 (16.66%) (Incomplete closure)	Bichat's buccal fat pad
Bichat's buccal fat pad	15 (14.56%)	1 (6.66%) (Necrosis)	Obturator Prosthesis
Palatal rotational flap	2 (1.94%)	0 (0.00%)	None

Result shown as number (percentage)

DISCUSSION

Although OAC is a rare complication of tooth extraction, among the all etiological factors for OAC, tooth extractions have the highest incidence (10). It has been reported that posterior maxillary teeth are the main cause of OAC. Studies revealed a close relationship between the posterior maxillary teeth and nasal cavities (1, 11). Although different studies stated that the first molar is the most common etiological factor for OACs (12), some others reported that this incidence is varies depending on the study sample (3, 7, 13, 14). In our study, tooth extraction found to be the most common etiological factor for OAC 86 (83.49%). Although second molars reported being the most intimate relationship with maxillary sinus, in our study extraction of the first molar has the highest incidence (40.7%) followed by extraction of the second molar (23.3%), third molars (12.6%), first premolars (2.9%), and second premolars (3.8%) consecutively (11). Similar to our results, Punwutikorn et al. (12) reported the highest incidence of OAC after the first molar extraction.

Extraction of permanent teeth is common in patients with older ages. Studies reported that advanced age is a risk factor for incidence for postoperative sequelae and OACs (2, 7). Punwutikorn et al. (12) reported a high incidence of OACs in the 6th decade and older age group with no statistically significant difference between the different age groups in their study. In our study, the highest number of the OACs was in the third decade, then followed by second, which is similar to the results of Abuabara et al.'s study (2). In addition to the increased tooth extraction with older ages, maxillary sinus reaches its greatest size during the third decade; therefore, the incidence of OAC should be higher in these ages (15).

The size of communication and time of intervention is crucial in the management of OAC. Acute OACs generally occur after tooth extractions. These communications tend to be small if there is no other related pathologies and heals spontaneously (13). Even healing of defects up to 5 mm in diameter were reported to heal spontaneously (16). In contrast, some studies reported that healing in defects larger than 3 mm in diameter is hampered (17). In our study, 74 of the 103 patients suffered from OAC after tooth extraction. In these patients, the defect size

considered to be less than 5mm in diameter in accordance with the clinical findings. Patients were treated by simple suturing, and complete closure of OAC achieved in all these patients.

Management of larger acute OAC is a critical concern. Because when the treatment is delayed, 50% of the patients will experience sinusitis after 48 hours and 90% after two weeks (9). To prevent chronic sinusitis and the development of fistulas, all of these defects should be closed within 24 to 48 hours (18). Patients with chronic OAC should be evaluated for the existence of chronic sinusitis before surgical intervention. Sinus pathologies were eliminated before the closure of the communications in indicated cases when a defect is larger than 5 mm in diameter and or incomplete healing of the OAC is present surgical management is required for closure. The first published method for closing an oroantral fistula is first described by Rehrmann in 1936 (4). He described a simple and efficient buccal flap method, which is widely used nowadays. The simplicity and effectiveness of this technique are also proven in different studies (2, 7, 8). This procedure offers greater patient comfort with minimal postoperative pain and better results in comparison to the other techniques (19, 20). In 15 patients, we managed to close the communication with this technique; however, in three cases, we could not achieve complete closure. The poor perfusion of the buccal flap may cause unfavorably closure in these cases. A secondary BFP procedure was performed on these patients for complete closure.

The blood supply of the palatal flap is better than the buccal flap (7). Today palatal flaps are well accepted and generally considered in large bony defects after described by Ashley(21) in 1939. Preservation of the vestibular sulcus and adequate blood supply made this technique a reliable choice in the closure of OAC. Palatal flap techniques are based on the greater palatine artery, and its integrity has been considered an imported success factor (22). The location of the defect is another important factor in the management of OAC. When OAC was situated in the maxillary tuberosity using palatal flaps becomes a challenging task due to the need for over-rotation of the flap. This over-rotation could possibly obstruct the bloody supply of the flap and limits its healing capabilities, especially when a second molar is present (23). Similar

to this, BFP is also reported to have reduced healing capabilities when an OAC is present in the third molar area (24-27). Although a surgeon feels comfortable with a specific approach, the location of the defect is crucial when deciding the surgical technique. If an OAC is present on the palatal mucosae, our treatment modality is generally consists of using PRF. We treated two patients with PRF. In one case an OAC has occurred after removal of mesially displaced right maxillary third molar. In the other case the reason was an ankylosed third molar. A palatal rotational flap was used for closure. In the other case OAC has occurred after removal of a pleomorphic adenoma on the hard palate which was on the trace of the greater palatal artery which prevents us using a standard palatal flap. In this case, a random palatal flap was raised for closure. Although the PRF technique depends on the greater palatine artery studies revealed that random palatal flaps could be nourished by the anastomoses from the ascending palatine artery in the soft palate (28). Reported successful Le Fort I osteotomies with ligation of the descending palatine artery also supports this view (29-31).

The Buccal fat pad was first described by Heister in 1732, who termed it "glandular molaris" (32). Today this tissue is termed as "Bichat's fat pad" since Bichat was credited with recognizing the true nature of the BFP. After Egyedi (10) described the technique of closure of oroantral communications using pedicled BFP in 1977, it has become a well-established technique. The popularity of the BFP has increased in recent years because of its reliability (32, 33). The BFP derives its blood supply from the branches of the maxillary artery, superficial temporal artery and facial artery. With its rich blood supply, BFP considered as a pedicled flap, and this also could explain the quick epithelization of the fat and high success rate of this flap (34-36). Successful applications of BFP for the closure of OAC and defects as large as 7 cm x 4 cm are reported in different studies (32, 34, 37, 38). Main advantages of this technique are the excellent blood supply of the flap, minor donor site morbidity and preserving the normal anatomy of the oral mucosa (32). In our study, the closure of nine chronic and six acute OACs managed with BFP. In one case BFP was unsuccessful in closing the communication which is later managed with obturators. In that case, the reason was the partial necrosis on the posterior alveolar bone. Although BFP has a high blood supply, the reason for failure in that case was the reduced healing capability of the surrounding tissues in our opinion. Reported complications of this technique are rare and range from 3.1% to 6.9% (32) to minimize the complications of BFP technique, BFP should not be sutured under tension to maintain its blood supply.

CONCLUSION

There are many techniques that have been described to close OAC in the literature. Local flaps are the most commonly chosen techniques by surgeons (21). Regardless of the technique, a tension-free closure and

infection-free sinus are crucial for a successful outcome. In our study, simple suturing was successful in the treatment of mild cases. BFP was successful in larger (>5 mm) defects. Location, defect size, and the duration of the AOCs are important factors while considering the surgical techniques. Even if a surgeon feels comfortable with a specific technique, there is no chance to use a single technique to manage all OACs. A surgeon should choose the right approach or modify it depending on the characteristics of the present OAC.

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