

Closure of Oroantral Communications With Bichat's Buccal Fat Pad

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Purpose: The aim of the present study was to evaluate the use of the pedicled buccal fat pad for the closure of oroantral communications (OACs) and to describe our experience with this surgical procedure.

Patients and Methods: A retrospective review of 161 patients treated at the University Hospital for Cranio-Maxillofacial and Oral Surgery in Vienna, Austria, from 2000 to 2005, with the diagnosis of an OAC was performed. All defects were closed by application of a buccal fat pad. Data were obtained from chart review, a compiled database, and clinical follow-up and included the location of the defect, the cause of the OAC, the modality of anesthesia, intraoperative complications, any complications during the process of wound healing, and any late adverse effects.

Results: The buccal fat pad for closure of an OAC was successfully used in 161 patients at our department. In 12 patients (7.5%), the closure of the OAC was insufficient, and a second operation was necessary. Excluding all severe and complicating cases such as tumor-related defects or previously treated cases, the overall success rate for closure of the OAC was nearly 98%. No late complications occurred, and all patients were free of pain or any limitations after the 6-month follow-up period.

Conclusions: According to the recommendations and anatomic limitations reported in published studies and discussed in the present report, the application of the buccal fat pad is a safe and reliable procedure for closing an OAC.

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Oroantral communications (OACs) are a common complication in dentoalveolar and maxillofacial surgery and are often seen, especially after complicated tooth extractions. The presence of an OAC itself is not a major problem; however, if proper treatment is not provided, severe complications with persistent sinusitis can occur. Therefore, the exact diagnosis and treatment of OACs is indispensable to avoid negative sequelae for the patient. A number of different techniques have been described for the closure of an OAC, and their application is now a routine procedure in oral and maxillofacial surgery. Since the first description of its application in 1977 by Egyedi,¹ the buccal fat pad (BFP) has become more and more

popular in oral surgery. Originally described as an anatomic structure without any obvious function, it was for a long period even considered a surgical nuisance.^{2,3} However, during the past 3 decades, it has proved of value for the closure of OACs and is a well-established tool in oral and maxillofacial surgery. In the present retrospective study, we report our experience with the BFP in the treatment of OACs in a large series of 161 patients.

Patients and Methods

A total of 161 patients with OACs of different origins were treated at the University Hospital for

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Cranio-Maxillofacial and Oral Surgery, Vienna Medical University, from 2000 to 2005. In most cases, the reason for the OAC was a complicated tooth extraction. Other reasons included surgical defects after tumor resection of the maxilla, cyst removal, sinus grafting, osteonecrosis, trauma, and peri-implantitis. The mean age of the patients was 39 years (range 15 to 90), and the number of men and women was 86 and 75, respectively. The patient details and distribution of the indications and localization of the OAC are listed in [Tables 1 and 2](#), respectively. Data were obtained by chart review, from the compiled database, and clinical follow-up. Usually the patients were dismissed from the follow-up program after 6 months, when the healing process was regular and no complications or any adverse effects had occurred. In the case of complications, the follow-up period was protracted until complete healing had been observed. Thus, the mean follow-up period was 6 months (range 3 to 11). The parameters evaluated included the location of the defect, the cause of the OAC, the anesthesia method, intraoperative complications, any complications during wound healing, and late adverse effects such as prosthetic difficulties, persistent pain, deformities, or limited mouth opening.

To ensure the healthy status of the maxillary sinus before surgery, all patients underwent a panoramic radiograph examination. In the case of a longer persisting OAC or acute maxillary sinusitis, the sinus was rinsed daily with an antiseptic solution (Betasidona; Mundipharma, Vienna, Austria) and saline solution, until the fluid draining from the nose was clear. This procedure is also important to ensure open and efficient drainage from the maxillary sinus to the nasal cavity. Computed tomography scans of the maxillary sinus were only taken on a symptom-driven basis when the clinical findings were doubtful. When detecting an OAC immediately after a tooth extraction, surgeons have always relied on the panoramic radiograph, the clinical signs, and the rinsing procedure. In problematic cases, the quick use of an endoscope can

Table 2. LOCALIZATION OF OAC AFTER TOOTH EXTRACTION (N = 130)

Maxilla (Tooth Position)	Patients (n)
Right	
Third molar	7
Second molar	15
First molar	27
Second premolar	7
First premolar	2
Total	58
Left	
Third molar	16
Second molar	13
First molar	34
Second premolar	8
First premolar	1
Total	72

Tooth numbers according to universal numbering system.

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be very helpful. We only closed the OAC using a BFP if the status of the sinus was considered healthy.

All procedures were undertaken in a fully equipped operating room under sterile conditions as regulated by the hospital authorities. Articaine was used for local anesthesia, or the operation was performed with the patient under general anesthesia. The approach for raising the BFP was done by a horizontal incision of the periosteum posterior to the area of the zygomatic buttress after raising a mucoperiosteal flap. In the case of tumor resection, the BFP often pops out arbitrarily through the larger incisions used for tumor removal. It was then mobilized by blunt dissection and exposed until the desired volume was available for the planned closure. Next, it was carefully and gently advanced into the defect until tension-free adaptation was possible. Only resorbable sutures were used. Depending on the size of the defect, duration of the persisting OAC, and amount of remaining mucosal tissue, the procedure varied as follows ([Figs 1-6](#)):

1. In the case of an intraoperatively detected OAC after a minor surgical procedure such as tooth extraction, cyst removal, or necrosectomy, the defect was closed immediately using the pedicled BFP, which was expanded and sutured to the adjacent mucosal margins, as described by Hanazawa et al.⁴ The mucoperiosteal flap was then replaced and fixed to the BFP.
2. Depending on the mass of the mobilized BFP, horizontal mattress sutures were additionally applied between the adjacent mucosal margins of the palate and the vestibular sulcus to minimize the uncovered BFP surface and reduce the volume.

Table 1. CAUSE OF OROANTRAL COMMUNICATION

Cause	Patients (n)
Tooth extraction	130
Tumor	7
Cyst	9
Osteonecrosis	5
Trauma	4
Sinus graft	4
Peri-implantitis	2
Total	161

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3. In cases in which the OAC had persisted for some time and an organized fistula had developed between the maxillary sinus and oral cavity, the fistula was excised and inverted as an inner layer, followed by the expansion of the BFP as described.
4. When the BFP was used to close large defects after tumor resection, maximal mobilization of the flap was done, and the whole accessible BFP was engaged.

Results

The BFP for closure of an OAC was successfully engaged in 161 patients at our department. The maximal defect size was 56×42 mm after tumor resection. The surgical procedure was performed using local anesthesia in 107 patients and with the patient under general anesthesia in 54 patients. In 12 patients (7.5%), closure of the OAC was insufficient, and a second operation was necessary. Of these 12 patients, 3 had had large defects after tumor resection and 6 had had a chronic and complicating recurrent OAC after other attempts at closure. Excluding all severe and complicating cases, such as tumor-related defects

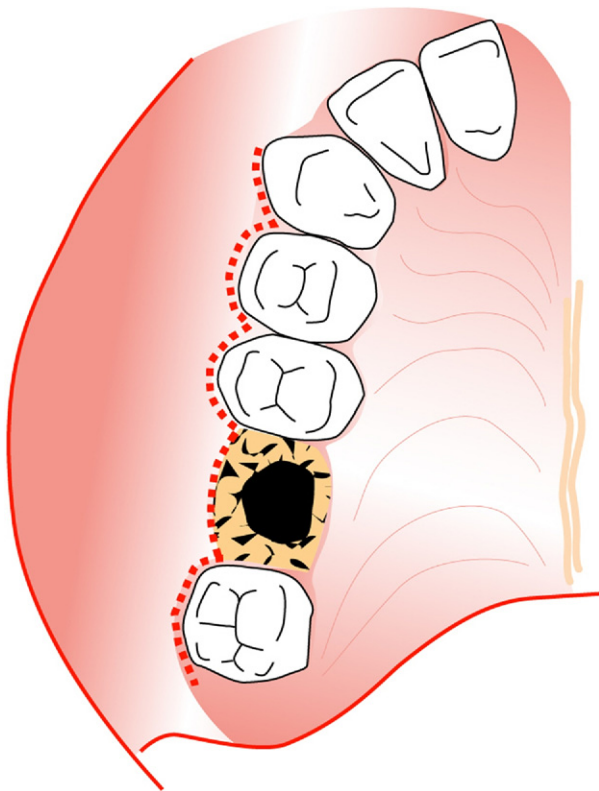


FIGURE 1. OAC after tooth extraction of first molar. Incision for raising mucoperiosteal flap indicated as red dotted line.

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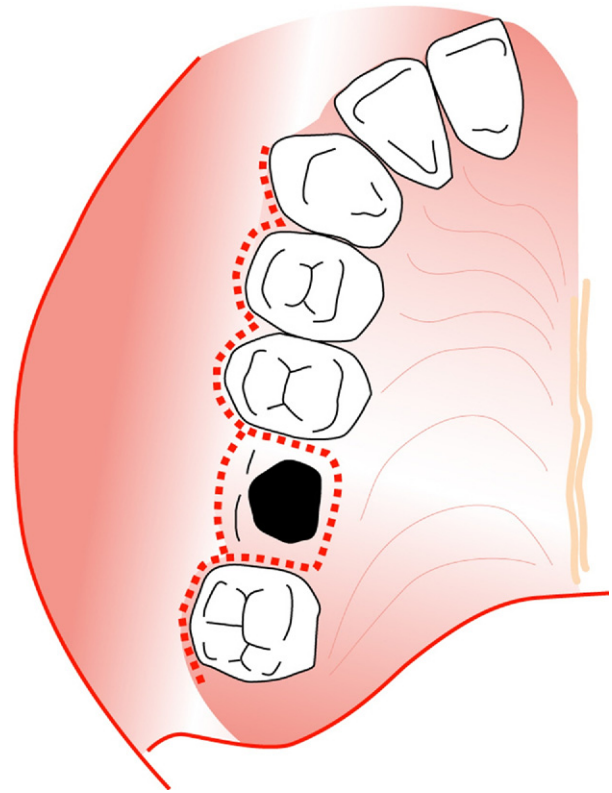


FIGURE 2. Planned incision in case of longer persisting OAC with epithelialized fistula.

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or previously treated cases, the overall success rate for the closure of OAC was nearly 98%. The details of the evaluated complications are listed in Table 3.

The typical clinical course of the exposed BFP in the oral cavity was as follows (Figs 7-11). The surface turned from the typical fatty yellow to a paler yellow/white color after 3 to 4 days. Usually the surfaces became a lighter and lighter red after 1 week, and strong granulation was visible until the complete coverage of the fatty surface by newly formed re-epithelialized mucosa. The sometimes initially voluminous tissue showed continuous shrinkage and reached the normal mucosal level after 3 to 4 weeks. The depth of the vestibular sulcus increased continuously in almost all cases, and prosthetic rehabilitation was feasible in all cases. The 8 patients with pain persisting longer than 2 weeks or a limited mouth opening had a delayed healing progress, but were all 8 were free of any limitations at the end of the follow-up period. Mouth opening exercises and analgesics were prescribed to these patients.

Discussion

The use of the BFP for the closure of OAC has been previously reported.^{4,9} Its successful application has

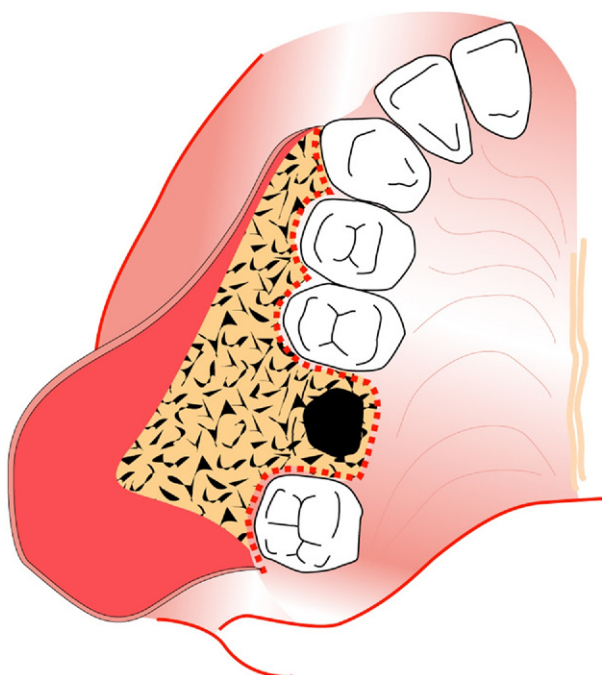


FIGURE 3. View after raising of mucoperiosteal flap.

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been documented for reconstruction of the palatal region, buccal mucosa, closure of oronasal fistulas, coverage of the surface of bone grafts, and reconstruction after post-traumatic defects in the maxillary

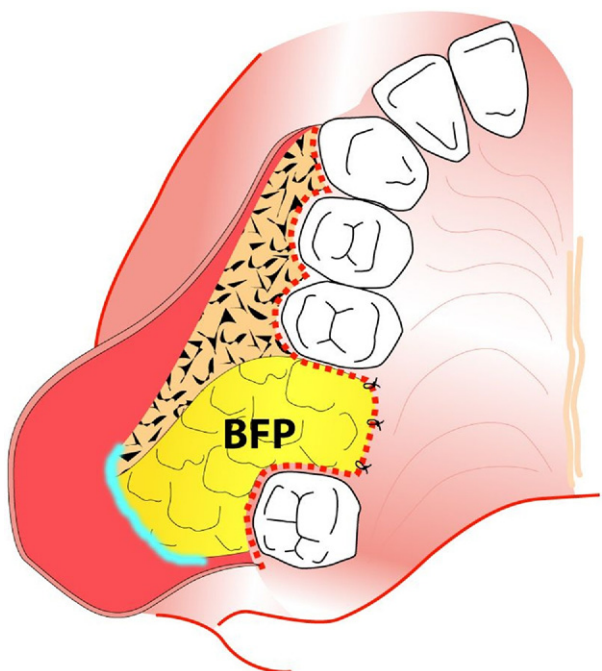


FIGURE 4. BFP expanded into defect after incision of periosteum (turquoise line).

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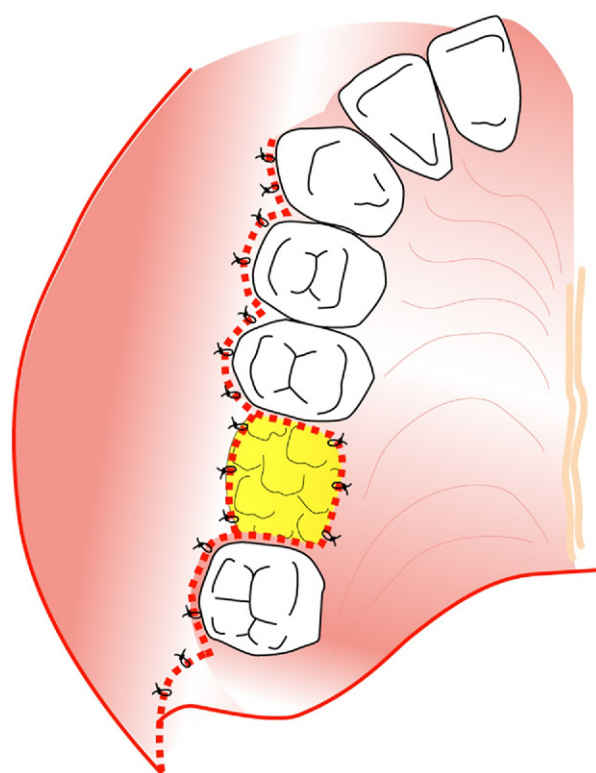


FIGURE 5. View after closure of wound, with BFP surface left uncovered.

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region.⁴⁻⁹ Since its first description in 1732 by Heister¹⁰ and in 1802 by Bichat,¹¹ its potential clinical applications was hidden for almost 2 centuries. Today, the term “boule de Bichat” is still common in French reports, and within the German nomenclature the sole name “Bichat” is widely used to describe the BFP. Anatomically, it consists of a central body and 4 processes—the buccal, pterygoid, superficial, and deep temporal process.¹² The buccal and deep temporal branches of the maxillary artery, transverse facial branches of the superficial temporal artery, and branches of the facial artery provide the blood supply.¹²⁻¹⁴ Each process has its own capsule and is anchored to the surrounding structures by ligaments. The possible function of the BFP include the prevention of negative pressure in newborns while sucking, separating the masticator muscles from one another and from the adjacent bony structures, enhancement of intermuscular motion, and the protection of neurovascular bundles.^{5,12,15} The buccal process is located superficially within the cheek and is partially responsible for the cheek contour. The BFP seems to have its own mechanism of lipolysis, independent of the subcutaneous fat.^{14,16,17} Therefore, it can be applied even in thin or cachectic patients.¹⁸ Because of its rich blood supply, it can be considered as a pedi-

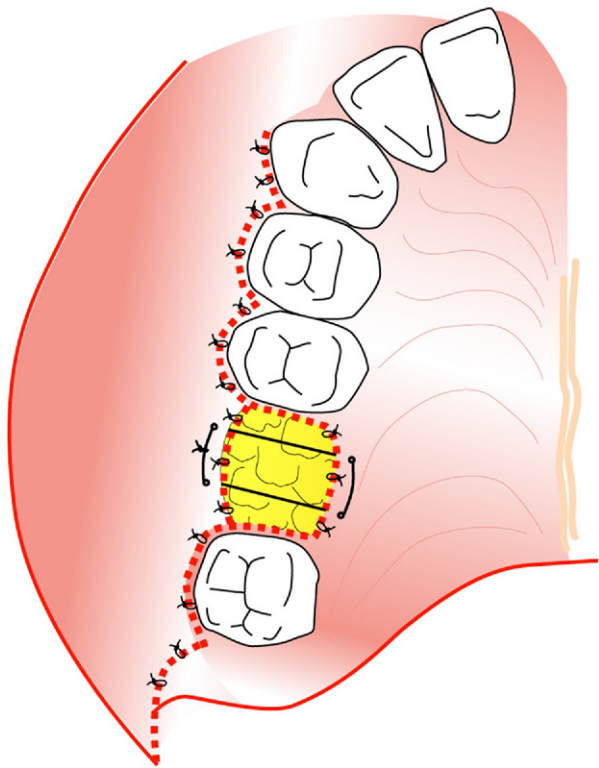


FIGURE 6. View after closure of wound, with horizontal mattress suture in situ, and BFP surface left uncovered.

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cled graft with an axial pattern and should be considered as an ideal and reliable tool for reconstructing defects in the maxillary region. In particular, the body and buccal process can be easily reached through the oral cavity and are therefore available for reconstructive procedures.¹⁸ The size of the covered defect has been up to $60 \times 50 \times 30$ mm in published reports.^{16,19} Furthermore, reports have been published of the successful closure of OAC after tooth extraction, although the reported series included only a small number of cases.^{4,7,20-22} In our series, we included 130 patients with an OAC after tooth removal, and the overall success rate for closure using the BFP

Table 3. COMPLICATIONS (N = 161)

Complication	n (%)
Intraoperative complication	0
Pain >2 wk	3 (2)
Limited mouth opening	5 (3)
Cheek deformity	1 (0.6)
Prosthetic problems	0
Recurrent OAC	12 (7.5)

Abbreviation: OAC, oroantral communication.

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FIGURE 7. Bisphosphonate-induced osteonecrosis in the right maxilla of a patient with lung cancer and osteolytic bony metastases before surgery.

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was nearly 98%. Therefore, the BFP can be considered a safe method for closure. Earlier reported findings have supported our findings.^{4,7,20,21} The quick epithelialization of the uncovered fat is a characteristic feature of the pedicled BFP flap and histologically proven.^{4,18,22} The layer above the originally uncovered BFP consists of stratified squamous epithelium migrating from the adjacent mucosal regions. A crucial point for surgical success is the careful and gentle preparation of the BFP. Extensive pulling or fragmenting of the tissue can result in complete failure owing to a breakdown in the vascular supply of the flap. This can explain the high failure rate after tumor resection when reconstructing large defects exceeding 40×40 mm.⁹ Our findings revealed the same results, with a failure rate of 42% (3 of 7) after ablative tumor surgery. All these failures were large defects with diameters of more than 50×50 mm. Therefore, the BFP



FIGURE 8. View on first postoperative day after necrosectomy and decortification with consecutive OAC covered by BFP.

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FIGURE 9. View 1 week after surgery.

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can only be recommended for small tumor-related maxillary or palatal defects (stage T1 and small stage T2 tumors), if the margins of the defect can be approximated to reduce the OAC size.^{9,22,23} None of our tumor patients had undergone radiotherapy before surgery; however, we believe the engagement of a BFP flap for small tumor-related defects in previously irradiated patients is still worthwhile, especially in cases in which time-consuming restorative procedures are not possible. However, clinical data are not yet available to prove this theory.

When using the BFP for closing simple OACs resulting from tooth extractions, concerns could arise regarding the necessity of this procedure. Definitely, several other surgical methods exist for successful management of OACs. The one in most widespread use is the buccal sliding or advancement flap, which probably represents the standard procedure for OAC

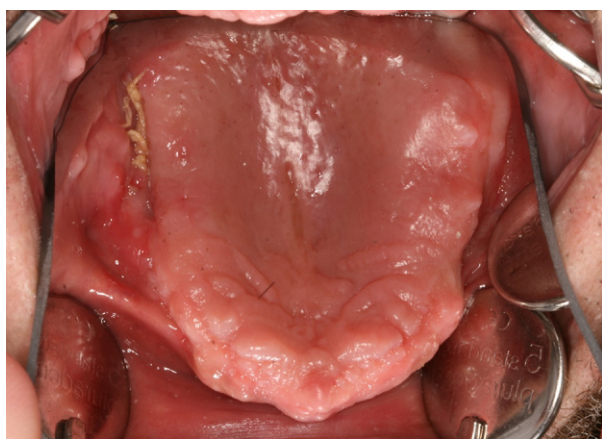


FIGURE 10. View 1 month after surgery showing only remaining resorbable sutures still visible and most of BFP already covered by new mucosal tissue (photographed using intraoral mirror).

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FIGURE 11. View 2 months after surgery showing complete restitution to original condition, with only slight groove next to alveolar ridge (photographed with intraoral mirror).

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closure. However, despite the simplicity and safety of the procedure, it has some drawbacks. First, it results in a decreased vestibular sulcus depth, thus complicating the prosthetic rehabilitation. Second, it cannot be applied in cases in which the gingival region has been severely damaged. Third, its success is questionable in difficult cases of previously operated OACs. The pedicled BFP flap seems to be the more reliable method in difficult cases, keeping in mind a proper operating technique.^{4,7} Therefore, it can be considered a true alternative for OAC closure.

We could not observe any problems regarding later prosthetic restorations in our study. These findings agree with other published reports.^{4,7,18} The reported 6 failures in the previously operated patients with recurrent OACs were because the maxillary sinus showed signs of infection at surgery or osteonecrotic material was not removed properly during the procedure. In all these cases, the surgeon responsible for the operation expressed concerns regarding the expected success of the OAC closure immediately after the procedure because of these reasons. Therefore, the absence of any inflammatory signs is absolutely mandatory for surgical success.

The main advantages of the pedicled BFP flap for OAC closure are that it is a simple procedure; is widely applicable; the incidence of failure is low; the negative side effects are rarely seen and mostly temporary; the prosthetic rehabilitation is feasible without limitations; it has minimal donor site morbidity; its success is independent of patient age and general condition; and it can be used in association with other flaps as a second layer.

Its main drawback is that it can only be used once and limitations exist concerning the potential size of the defects to be covered. However, keeping in mind

its recommendations and limitations, its application is a safe and successful procedure for closing OACs.

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References

1. Egyedi P: Utilization of the buccal fat pad for closure of ore-antral and/or ore-nasal communications. *J Maxillofac Surg* 5:241, 1977
2. Messenger KL, Cloyd W: Traumatic herniation of the buccal fat pad: Report of a case. *Oral Surg Oral Med Oral Pathol* 43:41, 1977
3. Wolford DG, Stapleford RG, Forte RA, et al: Traumatic herniation of the buccal fat pad: Report of case. *J Am Dent Assoc* 103:593, 1981
4. Hanazawa Y, Itoh K, Mabashi T, et al: Closure of oroantral communications using a pedicled buccal fat pad graft. *J Oral Maxillofac Surg* 53:771, 1995
5. Dean A, Alamillos F, Garcia-LoPez A, et al: The buccal fat pad flap in oral reconstruction. *Head Neck* 23:383, 2001
6. Herring SM: Reconstruction of facial contour deformity with the buccal fat pad flap. *Ann Plast Surg* 29:450, 1992
7. Stajic Z: The buccal fat pad in the closure of oro-antral communications: A study of 56 cases. *J Craniomaxillofacial Surg* 20:193, 1992
8. Yeh CY: Application of the buccal fat pad to the surgical treatment of oral submucous fibrosis. *Int J Oral Maxillofac Surg* 25:130, 1996
9. Rapis A, Alexandridis CA, Eleftheriadis E, et al: The use of the buccal fat pad for reconstruction of oral defects: Review of literature and report of 15 cases. *J Oral Maxillofac Surg* 58:158, 2000
10. Heister L: *Compendium Anatomicum Norimbergae*, Germany. G. C. Weberi, 1732, p 146
11. Bichat F: *Anatomie generale, appliquee a la physiologie et a la medecine*. Paris, France, Brosson, Gabon et Cie, 1802
12. Zhang MH, Yan Y, Ming Q, et al: Anatomical structure of the buccal fat pad and its clinical adaptations. *Plast Reconstr Surg* 109:2509, 2002
13. Dubin B, Jackson IT, Halim A, et al: Anatomy of the buccal fat pad and its clinical significance. *Plast Reconstr Surg* 83:257, 1989
14. Stuzin JM, Wagstrom L, Kawamoto HK, et al: The anatomy and clinical applications of the buccal fat pad. *Plast Reconstr Surg* 85:29, 1990
15. Stuzin JM, Wagstrom L, Kawamoto HK, et al: Anatomy of the frontal branch of the facial nerve: The significance of the temporal fat pad. *Plast Reconstr Surg* 83:265, 1989
16. Tideman H, Bosanquet A, Scott J: Use of the buccal fat pad as a pedicled graft. *J Oral Maxillofac Surg* 44:435, 1986
17. Jackson IT: Anatomy of the buccal fat pad and its clinical significance. *Plast Reconstr Surg* 103:2059, 1999
18. Baumann A, Ewers E: Application of the buccal fat pad in oral reconstruction. *J Oral Maxillofac Surg* 58:389, 2000
19. Fujimura N, Nagura H, Enomoto S: Grafting of the buccal fat pad into palatal defects. *J Craniomaxillofacial Surg* 18:219, 1990
20. Hai KH: Repair of palatal defects with unlined buccal fat pad grafts. *Oral Surg Oral Med Oral Pathol* 65:523, 1988
21. Stajic Z, Todorovic L, Pesic V, et al: Tissucol, gold plate, the buccal fat pad and the submucosal palatal island flap in closure of oroantral communication. *Dtsch Zahnarztl Z* 43:1332, 1988
22. Samman N, Cheung LK, Tideman H: The buccal fat pad in oral reconstruction. *Int J Oral Maxillofac Surg* 22:2, 1993
23. Colella G, Tartaro G, Giudice A: The buccal fat pad in oral reconstruction. *Br J Plast Surg* 57:326, 2004