

The reconstruction of oral defects with buccal fat pad

Alper Alkan^a, Doğan Dolanmaz^b, Emel Uzun^a, Erdal Erdem^c

^a Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Ondokuz Mayıs University, Samsun, Turkey

^b Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Selçuk University, Konya, Turkey

^c Department of Oral and Maxillofacial Surgery, Faculty of Dentistry, Ankara University, Ankara, Turkey

Summary

Questions under study: 1) to evaluate the success of buccal fat pad used in the reconstruction of oral defects, 2) to clarify its indications and size limitations, 3) to identify risk factors if there were any.

Methods: in this prospective clinical study, buccal fat pad was used in 26 patients with different indications which included 5 defects resulting from tumour excisions, 3 maxillary cysts, 3 secondary maxillary cyst defects and 15 oro-antral communications. All defects were in the maxilla with a maximum size of 5×3 cm. Patients were evaluated for signs of flap epithelialisation, infection, fistulae recurrence and facial contour deficiency.

Results: the epithelialisation process was completed after 3 to 4 weeks without any complications in 22 patients. However, partial dehiscence of the graft occurred in 2 patients with large maxillary defects. We also observed serious bleeding during the operation of one of our cases. Because of the small fistula, 1 patient was re-operated.

Conclusion: the results of this series support the view that the use of buccal fat pad is a simple, convenient, and reliable method for the reconstruction of small to medium-sized oral defects.

Key words: buccal fat pad; defect; oro-antral; oral

Introduction

Various surgical techniques have been suggested for the closure of oral defects such as primary closure, buccal mucosal graft, split thickness skin graft, allogenic graft, regional rotational flap, and distant flap. The type and size of the defect determine the technique to be used. The use of the buccal fat pad (BFP) as a grafting source in the closure of intra-oral defects has gained popularity in the last quarter of this century. Because of the ease of access and rich blood supply, its use in oral defects is an attractive concept. Its use as a pedicle graft for oral reconstruction was first reported by Egyedi in 1977 [1]. He also recommended coverage of the exposed BFP with a skin graft. In 1983, Neder [2] reported the use of the BFP as a free graft for intra-oral defects. In 1995, the pedicled fat pad graft was used in four cases of palatal re-

construction of cleft patients by Hudson et al. [3]. In separate articles in 2000, Rapidis et al. [4] and Hao [5] used pedicled buccal fat pad flaps for reconstruction of medium sized post-surgical oral defects most of which were malignant lesions. In that series, partial dehiscence of the graft was observed in 2 patients and failure in 1 patient that were possibly caused by too large amount of fat transfer.

The encouraging clinical studies during the last 10 years, led us to refrain partially from the conventional methods in the reconstruction of oral defects. The purpose of this study is to show the results and our clinical experience related to the use of the BFP in the repair of intra-oral defects in 26 patients.

Anatomical considerations

Few detailed descriptions of buccal fat pad and its clinical significance can be found in the literature [6–12]. The buccal fat pad is an anatomically rounded and biconvex structure that is of great importance in the facial contour. It is an adipose tissue surrounded by a thin capsule and located inside both masticatory spaces in the oromaxillo-facial region [13]. The BFP has a central body with four extensions: pterygopalatine, temporal, pterygoid, and buccal [10]. The central body and buccal extension account for approximately 50% of the BFP and are the most clinically significant portions [5].

The blood supply of the BFP is from three sources: the maxillary, superficial temporal and facial artery [7].

The physiology of buccal fat tissue is not totally clarified. However, it is thought that the buccal fat pad is closely associated with the muscles of mastication. It plays an important role in masticatory function especially in the infant during suckling. Its size diminishes as the infant grows with the accompanying growth of the surrounding facial structures [6]. In the adult, the BFP enhances inter-muscular motion and resembles orbital fat in appearance and function [14].

Patients and methods

During the years 1998 and 2002, the BFP was used as a pedicled graft in the reconstruction of medium-sized intra-oral defects in 26 patients (17 males and 9 females) ranging in age from 15 to 60 years. The indications for the use of the BFP and the location of the reconstructed region are presented in table 1. Our success criterion in the present study was the complete epithelialisation of the graft. In addition, the patients were also evaluated for infection of the graft, fistulae recurrence, and facial contour deficiency.

All the defects were in maxilla with a maximum size of 5×3 cm. The indications of BFP applications were: 3 secondary maxillary cyst defects (fig. 1A), 15 oro-antral communications (fig. 2A), 5 defects resulting from tumour excisions (fig. 3A), and 3 maxillary cysts. All procedures were performed by different surgeons. Of the 15 patients who had oro-antral communication (OAC) following ex-

traction of maxillary teeth, 11 underwent primary closure with the buccal fat pad; 4 patients were treated with the BFP after unsuccessful attempts at fistulae closure using different techniques.

Buccal fat pad was used to close the large bone defects which occurred after enucleation of the cyst epithelium, and to prevent the probable secondary cyst defect in 3 patients with maxillary cyst. One of these cysts was in the maxillary sinus.

The Caldwell-Luc procedure together with the use of BFP was performed in only 3 patients. The others had been performed simultaneously with maxillary cyst enucleation (table 1) and secondary cyst defect had occurred.

The surgical technique described by Stajcic [15] was used in 25 of our cases. "Initially, the wound edges around the defect were incised to obtain raw surfaces. The BFP was approached via a short horizontal incision (1–1.5 cm)

Figure 1
The BFP in the reconstruction of a secondary cyst defect.
A. Preoperative view of the defect.
B. BFP bluntly mobilised to obliterate the defect.
C. Region 1 month after surgery.

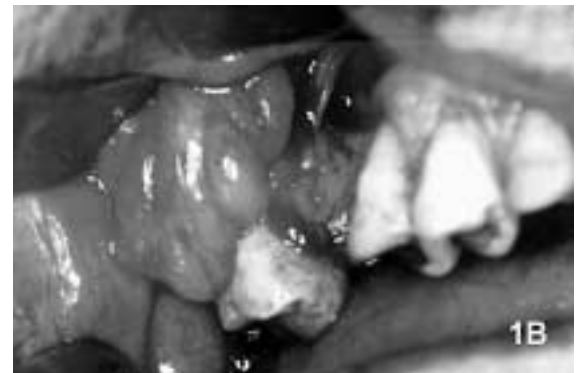


Table 1
Summary of clinical details in 26 cases.

P	F/M	Age (yr)	Indications	Anatomic Location (all of in maxilla)	Follow-up (month)	Complications	Caldwell-Luc Procedure
1	M	60	Residual cyst	AC and lat. maxillary wall	12	-	-
2	M	30	Radicular cyst	AC and lat. maxillary wall	6	Severe bleeding	-
3	M	23	Radicular cyst	AC and lat. maxillary wall	6	-	+
4	F	15	PGCG	AC and hard palate	6	Partial necrosis	-
5	M	37	OAC	AC	1	-	-
6	M	37	OAC*	AC	3	-	-
7	F	17	Secondary cyst defect	AC and lat. maxillary wall	6	-	(+)
8	M	38	Secondary cyst defect	AC and lat. maxillary wall	18	-	(+)
9	M	35	Pleomorphic adenoma	Hard palate	6	Partial necrosis	-
10	M	44	Epulis granulomatosa	AC	6	-	-
11	F	36	OAC	AC and lat. maxillary wall	8	Small fistula (re-operated)	-
12	F	48	OAC*	AC	24	-	+
13	F	25	OAC	AC	6	-	-
14	M	29	Secondary cyst defect	AC and lat. maxillary wall	12	-	(+)
15	M	48	OAC	AC	6	-	-
16	M	46	OAC*	AC and lat. maxillary wall	6	-	-
17	M	22	OAC	AC	1	-	-
18	M	32	OAC*	AC	6	-	+
19	M	42	OAC	AC	6	-	-
20	M	38	OAC	AC	6	-	-
21	F	57	OAC	AC	6	-	-
22	M	26	OAC	AC	6	-	-
23	F	33	OAC	AC	1	-	-
24	F	31	OAC	AC	6	-	-
25	F	45	PGCG	AC and hard palate	6	-	-
26	M	42	Pleomorphic adenoma	Hard palate	1	-	-

Abbreviations: AC: alveolar crest, F/M: female/male, lat: lateral, OAC: oro-antral communication, OAC*: failure of the previous operation, P: patient, PGCG: peripheral giant cell granuloma, (+): This procedure had performed at the same time with primary cyst enucleation.

Figure 2

The use of the BFP in the closure of an oro-antral communication.

A. Preoperative view of the OAC associated with resorbed alveolar crest.



B. BFP with preserved capsule luxated and placed over the OAC. The buccal mucoperiosteal flap sutured in its original position without tension.



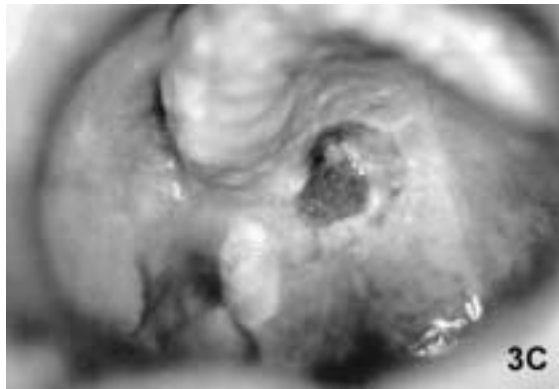
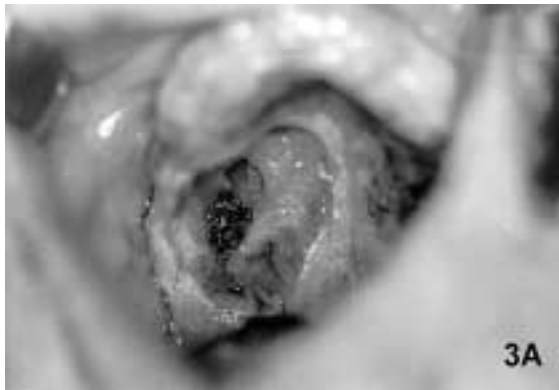
C. The view of the uncovered fat tissue during epithelialisation (1 week after surgery).



Figure 3

The use of the BFP in the reconstruction of a palatal tumour defect.

- A.** Clinical photograph of surgical defect resulted from a pleomorphic adenoma excision.
- B.** The BFP covers the surgical defect completely.
- C.** Three weeks post-operatively. The surface of the fat tissue is covered with healthy-looking oral mucosa.



through the periosteum after the buccal mucoperiosteal flap had been reflected. A curved haemostat was introduced through the periosteal incision aiming cranially, in the region of the third molar, and then withdrawn, wide open, in such a way that a submucosal tunnel was created. This manoeuvre was repeated, if necessary, until the BFP appeared in the mouth. After the BFP was mobilised intra-orally by blunt dissection, suction discontinued to prevent the aspiration of the fat. After the BFP was mobilised intra-orally by blunt dissection, the defect was then oblit-

erated and the surrounding mucosa was sutured closely to avoid secondary constriction of the flap (figs. 1B, 2B, 3B). The buccal mucoperiosteal flap was replaced in its original position without tension. The fat was left uncovered."

In one of our patients, who had a palatal defect resulting from tumour resection, the BFP was used by direct rotation without mucoperiosteal flap reflection.

In the postoperative period, all patients received prophylactic antibiotics and a soft diet for 1 week.

Results

All patients were followed up for at least 4 weeks postoperatively and were recalled for final assessment at 6 months. Only 5 patients did not return at the last follow-up examination. These patients were living in different cities far away from the University, but told us by phone that they didn't want to come back to the next follow-up, and had no problem with the site of surgery.

In 23 of the cases, signs of the BFP epithelialisation started in the first week and terminated at 3 or 4 weeks postoperatively (figs. 1C, 2C, 3C). Three months following the operation, we observed that the grafted adipose tissue was covered by a healthy-looking oral mucosa. Local infection was noticed in only 2 of the patients, who had large maxillary defects, on the 3rd postoperative days. In these cases, partial necrosis of the flap was de-

tected, which completely epithelialised later (table 1). None of the patients had aesthetic disturbance, limited mouth opening or facial paralysis. To date, no recurrence was seen and none of the patients needed an additional surgical intervention except one who was re-operated for a minor fistula recurrence (table 1).

We experienced severe arterial bleeding, in a case in which BFP was used to obliterate a maxillary cyst defect. The bleeding artery could not be found so a long gauze pack was forced into the defect and sutured to the adjacent tissue. It was removed gently after 3 days and the defect was covered by a vestibular advancement flap under local anaesthesia. In the follow-up period healing was uneventful.

Discussion

Intra-oral defects may be obturated with a prosthesis or closed with local flaps such as a buccal advancement flap, a palatal pedicled flap, or double layered closure flaps using buccal and palatal tissues [16, 17]. However, the aforementioned procedures produce large denuded areas, result in decrease of vestibular sulcus and cannot be used to close large defects [17]. Distant flaps (tongue, temporalis muscle or nasolabial flaps etc.) have also been successfully used for intra-oral reconstruction but, they are generally not preferred because of their invasiveness. In recent years, the use of BFP has gained popularity in the closure of oro-antral communications, reconstruction of secondary to maxillary cyst defects and intra-oral tumor resections [4, 5, 7, 13–20]. There are not many reports dealing with these issues.

Size limitations of BFP must be known in order to provide successful outcome. Rapisid et al. [4] have stated that in maxillary defects measuring more than $4 \times 4 \times 3$ cm, the possibility of partial dehiscence of the flap is high due to the impaired vascularity of the stretched ends of the flap. In buccal or retromandibular defects up to $7 \times 5 \times 2$ cm, reconstruction is accomplished due to the underlying rich vascular bed. Granizo et al. [13] have also stated that the closure of larger defects cannot be guaranteed without producing flap necrosis or creating a new fistula. Taken into consideration the above-mentioned issues, maximum defect size in the present study was selected as 5×3 cm.

Baumann and Ewers [7] have stated that it is very important to preserve the thin capsule of the BFP in order not to damage the small blood vessels. Although we could not preserve the thin capsule of BFP in 5 of our cases who had small to medium sized oral defects, complete epithelialisation of BFP occurred. These findings demonstrate that the size of the BFP is important in the success of the procedure rather than preservation of the thin capsule, which partially provides its blood supply. It seems that previous reports also support our findings [4, 5, 13–15, 17].

Hao [5] reported that the ideal defects to be reconstructed with a BFP are the maxillary defects due to their close anatomical location. However, it can be applied in areas ranging from the mouth angle to the retromolar trigone and palate. In our study, all defects were in the maxilla and the maximum defect size was 5×3 cm. Our clinical observations showed that the BFP used in various sizes for the reconstruction of intra-oral defects did not produce any change in facial contour.

To date, reported complications with the use of the BFP flap are haematoma, partial necrosis, excessive scarring, infection or facial nerve injury [4, 17]. The severe arterial bleeding seen in the present study is the first to be reported. The blood loss was approximately 1000 ml. In this case, we had as yet little experience of the technique and could not achieve herniation of the BFP into the

oral cavity by blunt dissection. Therefore, we tried to pull the BFP out with haemostats, which may have resulted in laceration of the artery that supplies blood to the BFP. It must be kept in mind that BFP should be exposed by blunt dissection without causing any tension to pull it out.

The use of the BFP in patients with prior local radiotherapy, malar hypoplasia, thin cheeks or Down's syndrome is contraindicated [4, 6, 17]. We were not able to expose the BFP adequately in a patient with thin cheeks and we used it as a free graft to close the OAC. Unfortunately, the defect could not be obliterated completely. It was left to epithelialise spontaneously but this did not seem to have any influence on the final result.

The histological nature of the healing process of the BFP was first reported by Samman et al. [14]. He stated that no fat cells were seen in sections taken from healed sites, indicating at least partial fibrosis of the fat tissue. We also observed this finding macroscopically in a case of fistula recurrence during the second operation (table 1). Fat tissue had completely changed into fibrous tissue in that case.

The success rate of BFP in the reconstruction of oral defects is quite high in all the previous articles [3, 5, 7, 13–15, 17–21]. The technique is so simple that it has been performed by different surgeons in a very highly successful way [13]. Although the operations were performed by three different surgeons in this study, failure of the procedure was actually seen in only 1 patient who had serious bleeding. The epithelialisation process was completed successfully in the rest of the cases at the last examination. However, factors such as careful manipulation of the flap, knowledge of its size limitations, and correct incision and sutures used must be taken into consideration.

The use of BFP in small or medium intra-oral defects is a convenient, reliable and quick reconstructive method. The rich blood supply of the BFP and its easy mobilisation and fewer complications make it an ideal flap. Furthermore, the BFP is located closely to the defect to be covered diminishing the risk of infection [13]. Because of these features of the BFP, it can also be considered as a reliable closure of defects that could not be repaired by conventional procedures. Its sole disadvantage is that it can only be used once. However, if properly applied in selected cases, it results in complete success [4]. In the light of these findings, we hope that the BFP will be used more often for various purposes in the future.

Correspondence:

Dr. Alper Alkan

*Ondokuz Mayıs Üniversitesi, Diş Hekimliği
Fakültesi*

TR-55139, Kurupelit, Samsun

E-Mail: alpera@omu.edu.tr

References

- 1 Egyedi P. Utilisation of the buccal fat pad for closure of oro-antral and/or oro-nasal communications. *J Maxillofac Surg* 1977;5:241-4.
- 2 Neder A. Use of buccal fat pad for grafts. *Oral Surg Oral Med Oral Radiol Endod* 1983;55:349-50.
- 3 Hudson JW, Anderson JG, Russell RM, Anderson N, Chambers K. Use of pedicled fat pad graft as an adjunct in the reconstruction of palatal cleft defects. *Oral Surg Oral Med Oral Radiol Endod* 1995;80:24-7.
- 4 Ravidis AD, Alexandridis CA, Eleftheriadis E, Angelopoulos AP. The use of the buccal fat pad for reconstruction of oral defects: review of the literature and report of 15 cases. *J Oral Maxillofac Surg* 2000;58:158-63.
- 5 Hao SP. Reconstruction of oral defects with the pedicled buccal fat pad flap. *Otolaryngol Head Neck Surg* 2000;122:863-7.
- 6 Stuzin JM, Wagstrom L, Kawamoto HK, Baker TJ, Wolfe SA. The anatomy and clinical applications of the buccal fat pad. *Plast Reconstr Surg* 1990;85:29-37.
- 7 Baumann A, Ewers R. Application of the buccal fat pad in oral reconstruction. *J Oral Maxillofac Surg* 2000;58:389-92.
- 8 Tideman H, Bosanquet A, Scott J. Use of the buccal fat pad as a pedicled graft. *J Oral Maxillofac Surg* 1986;44:435-40.
- 9 Stuzin JM, Wagstrom L, Kawamoto HK, Wolfe SA. Anatomy of the frontal branch of the facial nerve: The significance of the temporal fat pad. *Plast Reconstr Surg* 1989;83:265-71.
- 10 Dubin B, Jackson IT, Halim A, Triplett WW, Ferreira M. Anatomy of the buccal fat pad and its clinical significance. *Plast Reconstr Surg* 1989;82:257-64.
- 11 Jackson IT. Anatomy of the buccal fat pad and its clinical significance. *Plast Reconstr Surg* 1999;103:2059-63.
- 12 Tostevin PMJ, Ellis H. The buccal pad of fat: A review. *Clinical Anatomy* 1995;8:403-6.
- 13 Martin-Granizo R, Naval L, Costas A, Goizueta C, Rodriguez F, Monje F, et al. Use of buccal fat pad to repair intraoral defects: review of 30 cases. *Br J Oral Maxillofac Surg* 1997;35:81-4.
- 14 Samman N, Cheung LK, Tideman H. The buccal fat pad in oral reconstruction. *Int J Oral Maxillofac Surg* 1993;22:2-6.
- 15 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.
- 16 Guven O. A clinical study on oroantral fistulae. *J Craniomaxillofac Surg* 1998;26:267-71.
- 17 El-Hakim IE, El-Fakharany AM. The use of pedicled buccal fat pad and palatal rotating flaps in closure of oroantral communication and palatal defects. *J Laryngol Otol* 1999;113:834-8.
- 18 Pandolfi PJ, Yavuzer R, Jackson IT. Three-layer closure of an oroantral-cutaneous defect. *Int J Oral Maxillofac Surg* 2000;29:24-6.
- 19 Loh FC, Loh HS. Use of the buccal fat pad for correction of intraoral defects: Report of cases. *J Oral Maxillofac Surg* 1991;49:413-6.
- 20 Hanazawa Y, Itoh K, Mabashi T, Sato K. Closure of oroantral communications using a pedicled buccal fat pad graft. *J Oral Maxillofac Surg* 1995;53:771-6.
- 21 Fujimura N, Nagura H, Enomoto S. Grafting of the buccal fat pad into palatal defects. *J Craniomaxillofac Surg* 1990;18:219-22.

The many reasons why you should choose SMW to publish your research

What Swiss Medical Weekly has to offer:

- SMW's impact factor has been steadily rising, to the current 1.537
- Open access to the publication via the Internet, therefore wide audience and impact
- Rapid listing in Medline
- LinkOut-button from PubMed with link to the full text website <http://www.smw.ch> (direct link from each SMW record in PubMed)
- No-nonsense submission – you submit a single copy of your manuscript by e-mail attachment
- Peer review based on a broad spectrum of international academic referees
- Assistance of our professional statistician for every article with statistical analyses
- Fast peer review, by e-mail exchange with the referees
- Prompt decisions based on weekly conferences of the Editorial Board
- Prompt notification on the status of your manuscript by e-mail
- Professional English copy editing
- No page charges and attractive colour offprints at no extra cost

Editorial Board

Prof. Jean-Michel Dayer, Geneva
 Prof. Peter Gehr, Berne
 Prof. André P. Perruchoud, Basel
 Prof. Andreas Schaffner, Zurich
 (Editor in chief)
 Prof. Werner Straub, Berne
 Prof. Ludwig von Segesser, Lausanne

International Advisory Committee

Prof. K. E. Juhani Airaksinen, Turku, Finland
 Prof. Anthony Bayes de Luna, Barcelona, Spain
 Prof. Hubert E. Blum, Freiburg, Germany
 Prof. Walter E. Haefeli, Heidelberg, Germany
 Prof. Nino Kuenzli, Los Angeles, USA
 Prof. René Lutter, Amsterdam,
 The Netherlands
 Prof. Claude Martin, Marseille, France
 Prof. Josef Patsch, Innsbruck, Austria
 Prof. Luigi Tavazzi, Pavia, Italy

We evaluate manuscripts of broad clinical interest from all specialities, including experimental medicine and clinical investigation.

We look forward to receiving your paper!

Guidelines for authors:

http://www.smw.ch/set_authors.html

Impact factor Swiss Medical Weekly



All manuscripts should be sent in electronic form, to:

EMH Swiss Medical Publishers Ltd.
 SMW Editorial Secretariat
 Farnsburgerstrasse 8
 CH-4132 Muttenz

Manuscripts: submission@smw.ch
 Letters to the editor: letters@smw.ch
 Editorial Board: red@smw.ch
 Internet: <http://www.smw.ch>