

The Buccal Fat Pad Flap: An Option to Prevent and Treat Complications Regarding Complex Zygomatic Implant Surgery. Preliminary Report

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Purpose: To evaluate the use of the buccal fat pad flap (BFPF) technique as an option to prevent complications in the treatment of patients with atrophic maxillae rehabilitated after complex zygomatic implant surgery.

Materials and Methods: A retrospective study was made of completely edentulous patients submitted to zygomatic implant surgery between May 2005 and November 2007. Patients with severely atrophic maxillae received conventional and zygomatic implants and were followed after the implants were loaded. Preoperative evaluation included panoramic radiography and computed tomographic scans of the maxilla to identify the anatomic conditions and presence of pathology. **Results:** Eight male patients with a mean age of 57 years and atrophic maxillae were rehabilitated with zygomatic implants placed using the BFPF technique. The BFPF technique was used in complex situations, including oroantral communication-associated sites, areas that had lost the sinus wall, and extrasinus implant placement. A total of 16 conventional implants, 4 long (21-mm) tilted implants, and 22 zygomatic implants was placed. The patients were rehabilitated with fixed prostheses and were followed for a minimum of 15 months. None of the conventional implants failed and none of the zygomatic implants failed or presented with soft tissue complications. **Conclusion:** The BFPF presented a high success rate, demonstrating that it is a viable and predictable treatment option to prevent and treat soft tissue complications in complex zygomatic implant surgery. *INT J ORAL MAXILLOFAC IMPLANTS* 2012;27:905–910.

Key words: buccal fat pad flap technique, complication prevention, zygomatic implants

The use of the buccal fat pad pedicled flap to cover grafts to correct maxillary defects, as well as to close oroantral communications and in procedures associated with implant placement, has been described in the literature.^{1–6} The buccal fat pad flap (BFPF) technique provides adequate blood supply to the flap and is one of the best options for closure of oroantral communications.⁷ Some authors have used the BFPF in sinus grafting to prevent sinus membrane perforation³ and to repair large perforations in the sinus membrane during augmentation surgery.⁴

Treatment with zygomatic implants was introduced for the rehabilitation of atrophic maxillae without the use of grafts.^{8–10} This technique was introduced by Brånemark in 1988 and was used in 81 patients with a 97% success rate.⁹ The classic technique proposed the use of standard implants in the anterior maxilla, with a

zygomatic implant placed on each side of the posterior maxilla.^{8,10–13} Stella and Warner¹⁴ presented a modification (the “slot technique”) that featured a minimal opening of the sinus wall and implant placement that was better suited to the prosthetic design. Peñarrocha et al¹⁵ confirmed the success of the technique of Stella and Warner in 21 patients. Aparicio et al¹⁶ presented extrasinus placement of the implant, which further simplified the surgical technique and reduced patient discomfort. In the extrasinus approach, no opening of the sinus wall is made and the implant path is along or lateral to the sinus wall, so that the zygomatic bone can be visualized and the implant engaged in it. Several follow-up studies have reported high survival rates, although soft tissue problems related to the penetration of the intraoral mucosa and the maxillary sinus also have been discussed.¹⁷ One concern cited by Aparicio et al¹⁶ is the long-term effect of mucosal contact with implant threads and the exposure of the soft tissue at the lateral aspect of zygomatic implants.

Bothur et al¹⁸ presented a new technique that used multiple zygomatic implants in critical conditions, and the use of four zygomatic implants has been confirmed by other authors as a viable alternative with a high success rate.¹⁹ However, in some cases, during implant site preparation, the buccal sinus wall is absent, and

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Fig 1 Oroantral communication and implant with buccal approach.



Fig 2 Quad zygomatic with extrasinus approach.



Fig 3 Mucosal fenestration with implant exposure.

the extrasinus placement of implant promotes direct contact with the mucoperiosteal flap, which carries the risk of mucosal fenestration¹⁶ (Figs 1 to 3).

Petruson²⁰ examined the maxillary sinuses of 14 patients with zygomatic implants using sinuscopy and found no signs of adverse reactions. However, Becktor et al²¹ observed sinusitis and oroantral communications more frequently than exposed implant threads.

The aim of this article is to propose the use of the BFPF technique to prevent and treat soft tissue complications. This clinical study involved complex cases in zygomatic implant surgery with intraoperative complications that increased the risk of postoperative oroantral communications and soft tissue problems.

MATERIALS AND METHODS

Patients

Between May 2005 and November 2007, patients of the author's clinic with severely atrophic maxillae underwent therapy with conventional and zygomatic implants. Prior to surgery, an extraoral panoramic radiograph and computed tomographic scan of the maxilla to evaluate the patient's condition were performed. All patients presented with inadequate bone volume for placement of conventional implants in the posterior maxilla.

The following information was recorded for all patients: age, sex, general condition, number of zygomatic implants placed, length of the implants, number

of standard implants placed, type of prosthesis, antagonist dentition, duration of follow-up, and postoperative complications.

Included patients exhibited the following characteristics: (1) presence of a residual alveolar crest with less than 4 mm in width and height immediately distal to the canine pillar, (2) capacity to receive a minimum of two implants per quadrant of the alveolar crest, (3) an oroantral communication that appeared either before or after surgery, (4) substantial loss of the lateral sinus wall after placement of zygomatic implants, and (5) extrasinus placement of zygomatic implants that resulted in contact with mucosa and presented a risk of fenestration and implant exposure. Patients with general and local health conditions that prevented the use of general anesthesia and/or intraoral surgery were excluded from the study.

Surgical Protocol and Implant Placement

All surgeries were performed under general anesthesia and infiltration with local anesthesia (lidocaine 2% with epinephrine 1:100,000 to reduce bleeding). A supracrestal incision was performed from one side of the maxillary tuberosity to the opposite side, with two bilateral posterior buccal releasing incisions and one vertical mesiobuccal releasing incision.¹⁶

Extensive dissection of the maxillary and zygomatic bone was performed with a periosteal elevator. Buccal exposure of the nasal cavity floor, the infraorbital rim, and the zygomatic bone buttress area was performed. The palatal mucosa was reflected only to expose the

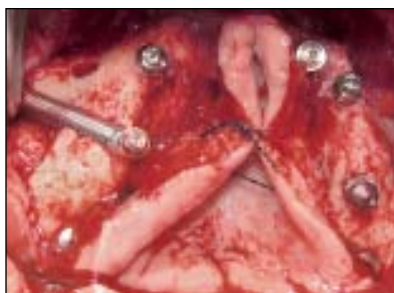


Fig 4 Buccal approach with loss of sinus wall.



Fig 5 BFP flap technique.



Fig 6 Clinical appearance at 1 week postoperative.

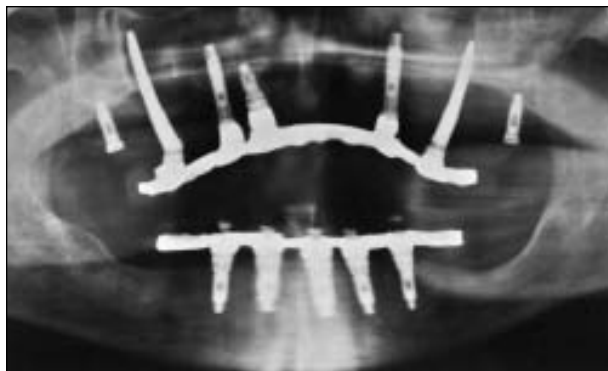


Fig 7 Panoramic radiograph after 1 week.



Fig 8 Prosthetic rehabilitation after 1 week.

remaining alveolar crest. Conventional and zygomatic implants were placed (Sistema Conexão, Conexão Sistema de Prótese). Standard protocol and manufacturer recommendations were followed for drilling, and implant placement varied by location and volume of the remaining bone.

The conventional implants were placed in the anterior region of the maxilla with a palatal approach because of the bone atrophy; in some situations, long tilted implants were placed with nasal anchorage. The classic technique,⁸⁻¹⁰ the "sinus slot technique,"¹⁴ the extrasinus technique,¹⁶ and four zygomatic implants¹⁸ were used in the patients, depending on individual conditions. In patients who received four zygomatic implants, anterior implants were initially placed, followed by the posterior implants.

The implants were placed with 45 Ncm of torque and were submitted to immediate loading. For the implants that could not be placed with 45 Ncm, prosthetic rehabilitation was performed after a period of 6 months.²²⁻²⁴ The flap was sutured with mononylon 5-0 (Johnson & Johnson/Ethicon), and sutures were removed after 1 week.

During the postoperative period, antibiotic therapy was prescribed (1 g cephalosporin four times a day for 7 days), along with anti-inflammatory medication (20 mg tenoxicam one time per day for 3 days) and chemi-

cal control of bacterial plaque (0.12% chlorhexidine; 1-minute mouth rinses three times a day).^{10,18,22,23} Penicillin- or cephalosporin-sensitive patients received clindamycin.

Pediced BFPF Technique

The pediced BFPF provides a large supply of tissue that helps to close oronasal communications. When associated with implants, it allows the coverage of implant threads with the purpose of increasing tissue thickness and reducing the possibility of fenestration of the mucosa and subsequent exposure of the implant. An incision of approximately 1 cm in length is made through the buccinator muscle behind the zygomatic buttress. A blunt dissection is then performed with Metzenbaum scissors to penetrate the BFP capsule. The fatty tissue must be stretched gently and gradually to avoid rupture and maintain its integrity. Then the pedicle must be positioned over the threads of zygomatic implants and sutured with resorbable material (4-0 Vicryl, Johnson & Johnson/Ethicon) over the oroantral communication (Figs 4 to 11).

Prosthetic Rehabilitation

Microunit abutments (Conexão Sistema de Prótese) were placed on the zygomatic and standard implants. For implants submitted to immediate loading, the



Fig 9 Follow-up at 15 months.

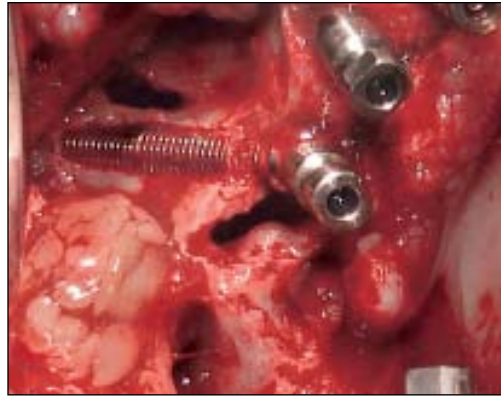


Fig 10 Oroantral communication and implant with buccal approach.

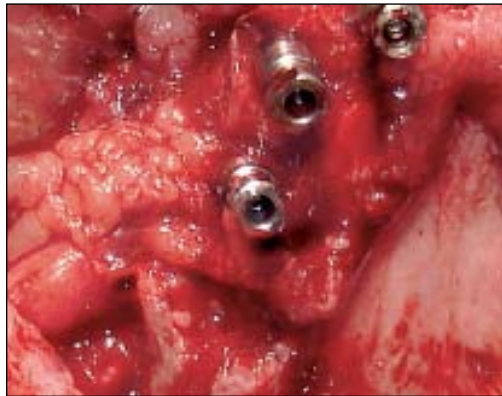


Fig 11 BFP technique with the closure of oroantral communication and covering implant threads.

transfers were placed before the flap was sutured. Otherwise, the prosthetic components were inserted at stage-two surgery after 6 months.

Maxillomandibular records were made with an acrylic resin multifunctional guide based on the patient's conventional complete prosthesis. A cast was fabricated to manufacture the prosthesis and the metallic superstructure. Implants submitted to immediate loading were rehabilitated with a fixed prosthesis, which was inserted between 48 hours and 1 week after implant placement. The patients were followed monthly, and the prostheses were removed after 6 months.²⁵ At this point, osseointegration according to the success criteria of Albretksson et al²⁶ and Buser et al²⁷ was determined, associated with the removal torque test (10 Ncm of pressure applied), which is an indicator of clinical stability, and percussion over the abutment.¹³

RESULTS

Eight men with a mean age of 57 years and severely atrophied maxillae were rehabilitated with zygomatic implants placed using the BFPF technique between May 2005 and November 2007. The mean duration of follow-up was 24.6 months (range, 15 to 42 months).

Twenty-two zygomatic implants (Conexão Sistema de Prótese) were placed in the patients, with lengths ranging from 35 to 50 mm (Table 1). In five patients, two zygomatic implants (one on each side) were placed, and three patients each received four zygomatic implants (two on each side). Sixteen conventional implants were placed in the following sizes: two 3.5 × 10 mm, two 3.5 × 11.5 mm, four 3.5 × 13 mm, two 3.75 × 13 mm, one 4.0 × 11.5 mm, and one 4.0 × 15 mm. In two patients, four long implants (3.75 × 21 mm) were placed with a 30-degree inclination and

Table 1 Clinical Data of the Patients

Patient no.	Age (y)	Zygomatic implants			OAC	Loss of sinus wall	Follow-up (mo)	Antagonist	Complications
		No. placed	Lengths (mm)	IL					
1	46	2	35/40	0	1	1	42	FP-I	
2	69	2	40/42	2	1	2	30	ND/RP	
3	54	4	42/45/50/50	4		2	27	FP-I	
4	54	4	40/42/45/50	4		2	25	ND	
5	54	2	40/42	2		2	25	ND	
6	65	2	42/45	2		1	18	FP-I	
7	51	4	42/42/50/50	4		2	15	ND	
8	65	2	35/40	0		2	15	ND	Zygomatic implants: soft tissue (2)
Totals		22		18	2	13			

IL = immediate loading; OAC = oroantral communication; FP-I = fixed implant-supported prosthesis, ND = natural dentition; RP = removable prostheses.

anchored onto the cortical of the nasal fossae, one on each side, according to the "All on Four" technique²⁸ and were splinted to standard and zygomatic implants in the prosthetic rehabilitation. In six patients, the implants were anchored with 45 Ncm of torque and were submitted to immediate loading.

All patients were rehabilitated with fixed prostheses and were examined monthly for a minimum follow-up period of 15 months (Fig 9). There were no failures of any implants, resulting in a success rate of 100%. One patient presented soft tissue complications (perimplantitis) in the region of two zygomatic implants because of their positions in the palatine region. In all cases, the sinus membrane was perforated, but no patients presented any symptoms of postoperative sinusitis. In two patients, the BFPF technique was used to close an oroantral communication close to the site of a zygomatic implant. In the remaining patients, the technique was used to increase the amount of tissue over the implants to prevent fenestration of the buccal mucosa and implant exposure. All patients presented with loss of at least one sinus wall with buccal contact of zygomatic implants (Table 1).

DISCUSSION

It is important to emphasize that the BFPF technique is frequently used with success in oral and maxillofacial surgery. The literature confirms its use as a pedicled graft for closure of oral defects^{1,6} and demonstrates that the BFPF offers sufficient blood supply for protection of bone grafts in the maxilla and maxillary sinuses.³ Some authors have stated that the procedure

can be accomplished with a single incision without generating changes in the patient's appearance and function.² Other authors have successfully used the BFPF technique for sinus augmentation^{3,4} and for the treatment of an oroantral communication associated with zygomatic implant surgery.⁵

Tissue engineering studies²⁹⁻³¹ have concluded that adipose-derived adult stem cells are multipotent, differentiating along the adipocyte, chondrocyte, myocyte, neuronal, and osteoblast lineages, and can serve in other capacities, such as providing hematopoietic support and gene transfer. Adipose-derived adult stem cells have potential applications for the repair and regeneration of acute and chronically damaged tissues. In a recent study, Farré-Guasch et al³⁰ affirmed that the adipose stem cells that are present in adipose tissue can differentiate into several lineages and express multiple growth factors, which makes them suitable for clinical application. Studies have demonstrated that BFP, an adipose-encapsulated mass found in the oral cavity, could represent an easy source of adipose stem cells for dentists and oral surgeons.^{29,30}

Although classical zygomatic implant surgery and the different approaches proposed by Stella and Warner and Aparicio et al are associated with high success rates,^{14,16,18} some aspects must be discussed. Oroantral communications and soft tissue complications^{16,17,20} are cited as potential problems in the post-operative period. Becktor et al²¹ observed oroantral communications more frequently than exposed implant threads. Aparicio et al¹⁶ expressed concern regarding the extrasinus technique in that the placement exposes the implant to the overlying buccal mucosa, which may be a potential risk for the development of

soft tissue problems. Lekholm and coworkers³² did not observe any increase in marginal bone loss or failure rates for machined implants with exposed threads at implant surgery compared with fully submerged implants. At present, zygomatic implants with a roughened oxidized surface are commercially available and the change from a machined surface to a roughened oxidized surface must be considered as a major modification.¹⁶ Therefore, new studies on the long-term performance of implants with this surface are necessary to analyze the potential risks of soft tissue complications.¹⁶

CONCLUSION

In the present study, the buccal fat pad flap technique presented a high success rate and served as a valid surgical option to prevent complications following zygomatic implant placement. However, this technique is indicated only in complex cases (eg, loss of the lateral sinus wall, oroantral communications) and should not be employed as a routine approach to zygomatic implant surgery. Some authors consider that the adipose-derived adult stem cells present in the buccal fat pad have potential applications for the repair and regeneration of acute and chronically damaged tissues. However, more studies are necessary to confirm this proposal clinically.

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