

# Pedicated Buccal Fat Pad Flap for Upper Lip Augmentation in Orthognathic Surgery Patients

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**Purpose:** In this article, a new method of upper lip augmentation using a bilateral buccal fat pad flap is reported. This prospective study evaluated the changes in the upper lip that occur after maxillary surgery with concomitant mobilization of the bilateral buccal fat to improve upper lip projection.

**Materials and Methods:** A bilateral pedicled buccal fat pad flap to fill the premaxilla, paranasal, and upper lip areas, in association with a Le Fort I osteotomy for maxillary advancement, was performed in 11 orthognathic surgical patients with a thin upper lip. Minimum follow-up was 12 months. Cone-beam computed tomograms from an i-CAT device (Imaging Sciences International, Hatfield, PA) were taken pre- and postoperatively and loaded into Dolphin software (Dolphin Imaging and Management Solutions, Chatsworth, CA) for analysis. Changes at the right upper incisor tip, upper lip anterior, upper inside, stomion superior, and subnasale were measured in each patient immediately before and 6 months after surgery. Dimensional changes of the upper lip were measured using lip length (from the subnasale to the stomion superior) and lip thickness (from the upper inside to the upper lip anterior).

**Results:** The average maxillary advancement was  $4.81 \pm 2.47$  mm, and the average vertical movement was  $1.00 \pm 1.75$  mm; both were measured at the upper incisor tip. Upper lip movement, measured at the upper lip anterior, was  $5.98 \pm 2.46$  mm (124.32% of maxillary advancement, mean data). Lip thickness increased  $0.9 \pm 0.19$  mm, and lip length increased  $0.77 \pm 0.32$  mm. The new upper lip contour was considered good to excellent in all cases.

**Conclusions:** The technique described was useful to increase the projection, volume, and contour of the premaxilla, paranasal, and upper lip areas in orthognathic surgical patients. Moreover, it appeared to be useful to control the length shortening of the upper lip in all cases.

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Surgical advancement of the maxilla by Le Fort osteotomy produces variable soft tissue changes, thus influencing nasolabial aesthetics. Stella et al<sup>1</sup> reported that the upper lip thinned approximately 2 mm compared with preoperative values after maxillary advancement.

Lip thickness (LT) stabilized at approximately 6 months postoperatively.<sup>1</sup>

In the authors' experience, maxillary advancement can produce unsatisfactory results in individuals with a thin upper lip; the "new" upper lip appears to be extremely straight, without the normal concavity of the anterior part of the upper lip (Fig 1). Conversely, patients with a thick upper lip are less prone to these results.

Although maxillary advancement moves the upper lip area forward, the aesthetic change may appear insufficient owing to dimensional changes in the upper lip. Adjunctive procedures, such as closure of the soft tissue using V-Y advancement, have been found useful to control shortening of the upper lip after maxillary surgery but are not completely effective in controlling upper lip thinning.<sup>2</sup>

The buccal fat pad (BFP) is a structure surrounded by a thin fascial capsule located within the masticatory space. It is bordered medially by the buccinator

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muscle and laterally by the masseter muscle, ramus of the mandible, and zygomatic arch.

The body and buccal extension make up the bulk (50% to 70%) of the fat pad and are situated more superficially, imparting cheek fullness, whereas the temporal, pterygoid, and pterygopalatine extensions tend to be smaller in volume and are located deeper within the masticator and pterygopalatine space. Histologically, the fat pad consists of structural fat rather than accumulated fat and thus is not dependent on nutrition.<sup>3</sup>

The BFP has a rich plexus of blood vessels from branches of the maxillary, superficial temporal, and facial arteries, which allow it to be used as an axial-pattern pedicled flap. This rich blood supply may explain the high success rate with this flap in reconstructing oral defects.<sup>4</sup>

Use of the BFP has increased in popularity in recent years because of its reliability, ease of harvest, and low complication rate. It has been used as a bilateral pedicled flap in cheek augmentation procedures,<sup>5</sup> for the repair of persistent oroantral fistulas<sup>6</sup> or congenital cleft palate,<sup>7</sup> and in the treatment of oral submucous fibrosis.<sup>8</sup> There have been several reports of its successful use as a pedicled graft in reconstructing small- to medium-size maxillary defects after resection of a tumor.<sup>9</sup>

A new clinical application of the BFP in orthognathic surgical patients is reported. In these cases, a bilateral BFP flap was used to provide volumetric enhancement to the upper lip in combination with a Le Fort I maxillary osteotomy approach to correct skeletal malocclusions.

## Materials and Methods

Eleven patients were treated in the Department of Oral and Maxillofacial Surgery, Clinica Centro in Madrid, Spain. This study was approved by the Clinica Centro institutional review board. Patient agreement was obtained before the study.

The patients underwent bimaxillary orthognathic surgery to correct malocclusion and facial disharmony once the orthodontic preoperative goals were achieved (Figs 1 through 6). The orthodontic treatment included vestibular braces in all cases. A 3-dimensional scan captured with an i-CAT machine (Imaging Sciences International, Hatfield, PA) was taken immediately before surgery (2 to 5 days before), and no orthodontic movement of the upper incisor was made after the scan and until surgery. The scan images were loaded into Dolphin software (Dolphin Imaging and Management Solutions, Chatsworth, CA) for analysis. Patients with a thick upper lip were excluded (LT  $\geq 16.2$  mm in male patients, LT  $\geq 14.4$  mm in female patients).



**FIGURE 1.** Orthognathic surgical patient before surgery, lateral view. The upper lip is extremely thin. Further thinning of the upper lip is a likely and undesirable side effect of maxillary advancement in such patients.

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A waxbite registration was used to verify that the joints were seated in the glenoid fossa during the procedure. Special attention was paid to avoid contact between the bite wax-up and the lips. Excess wax was trimmed if considered necessary. Instructions were given to the patient to avoid any activity of the perioral muscles during the exploration. The position of the head was checked as often as necessary to maintain a natural head posture. All explorations were supervised personally by the same investigator (P.R.-B.) pre- and postoperatively.

Surgical treatment planning consisted of bilateral sagittal split mandibular ramus osteotomy and then segmental Le Fort I osteotomy. The vestibular incision to approach the upper jaw was made in the upper buccal mucosa, 10 mm from the vermilion border (Fig 7). After the upper jaw had been repositioned and stabilized using titanium plates and screws, the BFPs were harvested easily using a curved hemostat by blunt dissection through the posterior



**FIGURE 2.** Frontal view of the same patient shown in Fig 1.

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**FIGURE 3.** Postoperative profile 6 months after maxillary advancement and simultaneous upper lip augmentation using a bilateral buccal fat pad flap, lateral view.

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part of the buccal incision (Fig 8). Then, the flaps were mobilized toward the anterior part of the maxilla using gentle traction to preserve the posterior pedicle. The bilateral flaps were transposed over the already fixed maxilla and sutured together at the midline with resorbable suture (Vicryl 4/0, Ethicon Inc, a Johnson and Johnson Company, Somerville, NJ) to fill the “superior” part of the upper lip, the premaxilla, and the paranasal area (Figs 9, 10). The entire incision appeared to be filled completely by the flaps, which were buried under the buccal mucosa; the incision was sutured using resorbable suture (Vicryl 4/0). An alar base cinch was placed in all cases, but a V-Y closure of the incision was discarded. The increased projection of the upper lip can be visualized intraoperatively, before edema appears (Figs 11, 12).

The surgical result was controlled weekly through an evaluation of the postoperative lip volume and projection after swelling had resolved, clinically and under photographic follow-up during the first 2 months and then once a month until the sixth month. Then,

a new i-CAT scan was taken. The upper LT was measured by cephalometric tracings with Dolphin software immediately before the surgical procedure and 6 months after surgery. Postoperative orthodontic treatment was continued during a variable period no shorter than 6 months.

The tracings were performed on 2-dimensional cephalometric images of the right side, obtained from the 3-dimensional scan, using the following landmarks: labial aspect of the right upper incisor touching the upper lip inside, the A point, subnasale, the most concave point between the subnasale and the upper lip anterior, the so-called soft tissue A point, the most anterior point on the curve of the upper lip, the so-called upper lip anterior, the most inferior point on the curve of the upper lip, and the so-called stomion superior.

Dimensional changes of the upper lip were measured using lip length (from the subnasale to the stomion superior) and LT (from the upper lip inside to the upper lip anterior).



**FIGURE 4.** Frontal view of the same patient shown in Fig 3.

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The tracings were created and measured by the same investigator (P.R.-B.) in each patient immediately before and 6 months after surgery.

## Results

Postoperative healing was uneventful. Patients were kept on an oral liquid diet for 10 days and hard foods were avoided for the next 6 weeks. Epithelization of the incisions was complete after 4 weeks. No dehiscence, infection, or flap necrosis was observed.

The study sample consisted of 7 female and 4 male patients with an age range of 19 to 41 years (mean age, 27.6 years). Seven patients presented an anterior open bite associated with a Class III malocclusion, and 4 patients presented a bimaxillary retrusion associated with a Class I or II malocclusion and a deep bite.

The average maxillary advancement was  $4.81 \pm 2.47$  mm, which was measured at the right upper incisor tip, and the average vertical movement was  $1.00 \pm 1.75$  mm. The upper lip movement forward, measured at upper lip anterior, was  $5.98 \pm 2.46$  mm (124.32% of maxillary advancement, mean data). LT



**FIGURE 5.** Frontal view of the same patient shown in Figs 1 through 4 12 months after surgery and without braces.

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increased  $0.9 \pm 0.19$  mm, and lip length increased  $0.77 \pm 0.32$  mm.

The new upper lip contour was considered good to excellent in all cases.

## Discussion

Partial BFP resection is one of the most common aesthetic procedures when using BFPs; resection of the major parts of this fat results in hollow cheeks and an accentuation of the zygoma.<sup>3</sup> However, Ramirez<sup>5</sup> modified this approach by using a vascularized Bichat fat flap to aid lateral cheek projection.

Le Fort I osteotomy for repositioning the maxilla produces changes in the soft tissue morphology of the nasomaxillary region. Even with a meticulous planning of the case, in some particular cases, the new maxillary position to correct the malocclusion does not produce the desired upper lip result, especially in previously deficient lips.

A bilateral vascularized Bichat fat flap to accentuate the upper lip is recommended in these cases. In this



**FIGURE 6.** Three-quarter view of the same patient shown in Fig 5 12 months after surgery and without braces.

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report, the technique was found useful to increase the upper lip volume, premaxilla, and paranasal area; therefore, the projection of the upper lip area is improved. Moreover, the BFP often is encountered accidentally in most cases during orthognathic surgery involving the upper jaw. Whenever properly dissected and mobilized, the BFP provides a suitable flap with a relatively large range of movement to reach the upper lip, without significantly increasing surgical time.

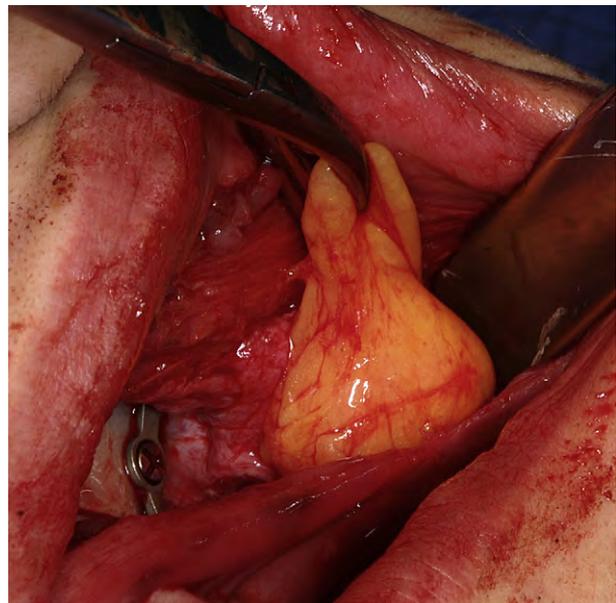
In the authors' preliminary results, there was a positive difference of 0.9 mm of the upper LT at the end of follow-up compared with preoperative values (mean data). Maxillary advancement using Le Fort I produces a considerable thinning of the upper lip in all cases.<sup>1</sup> No technique has been found useful in controlling upper lip thinning after maxillary advancement. In the authors' clinical experience, this upper lip thinning can be dramatic when the maxillary advancement exceeds 10 mm. The authors' preliminary results with this new technique showed a thickening of the upper lip in every case, even



**FIGURE 7.** The incision to approach the upper jaw to perform the Le Fort osteotomy was made in the upper buccal mucosa (lip mucosa), only 10 mm from the vermilion border (black line), far from the buccal sulcus.

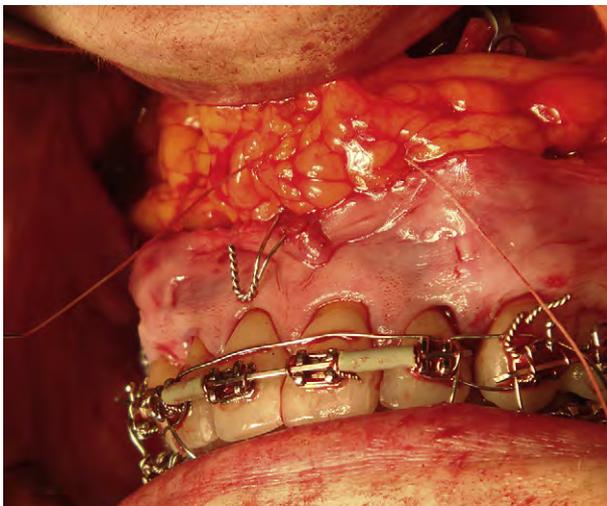
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when the maxilla moved forward 8 mm. If the LT enhancement were 0.9 mm in the present series (mean data), and a thinning of 2 mm should be expected without this technique, then the entire gain could



**FIGURE 8.** Once the maxilla has been fixed in proper occlusion, the buccal fat is dissected.

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**FIGURE 9.** The 2 flaps are sutured at the midline to fill the “superior” part of the upper lip, the premaxilla, and paranasal aspect of the anterior maxilla.

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be almost 3 mm of thickening of the upper lip. Considering previous reports, in which a 2-mm loss of the upper LT has been reported in all cases after maxillary advancement, the effectiveness of this technique is evident.

This flap is supplied by the small vessels in its base. Therefore, it must be handled with great care while preserving a wide base; otherwise, a free fat graft will result. To benefit its maximum gain, the BFP must be dissected properly.

In conclusion, the bilateral BFP transposition flap is a useful pedicled flap to provide volumetric enhancement to the upper lip in orthognathic surgical patients. The bilateral BFP transposition flap is readily accessible by the Le Fort osteotomy approach, and



**FIGURE 10.** Part of the buccal fat pad flap fills the “superior” part of the upper lip (black lines).

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**FIGURE 11.** After completion of the bimaxillary orthognathic surgical procedure, including an important advancement of the upper jaw. The occlusion has been corrected, but an unacceptable retrusion of the upper lip remains.

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the technique for harvesting is simple and rapid without the addition of significant donor site morbidity. The rich blood supply of this vascularized flap probably helps to maintain its volume indefinitely.

Because of its utility, availability, and ease of use, the bilateral BFP transposition flap should be considered in some cases of orthognathic surgical procedures and secondary cleft lip repair and in aesthetic surgical patients.



**FIGURE 12.** The same patient shown in Fig 5. In this image, bilateral buccal fat pad flaps have been dissected and sutured at the midline to augment the projection of the upper lip.

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### **References**

1. Stella JP, Streater MR, Epker BN, et al: Predictability of upper lip soft tissue changes with maxillary advancement. *J Oral Maxillofac Surg* 47:697, 1989
2. Peled M, Ardekian L, Krausz AA, et al: Comparing the effects of V-Y advancement versus simple closure on upper lip aesthetics after Le Fort I advancement. *J Oral Maxillofac Surg* 62:315, 2004
3. Hasse FM, Lemperle G: Resection and augmentation of Bichat's fat pad in facial contouring. *Eur J Plast Surg* 17:239, 1994
4. De Riu G, Meloni SM, Bozzo C, et al: A double buccal fat pad flap for middle palate defect closure-a new technique for palate closure. *Int J Oral Maxillofac Surg* 35:1057, 2006
5. Ramirez OM: Buccal fat pad pedicle flap for midface augmentation. *Ann Plast Surg* 43:109, 1999
6. Scott P, Fabbioni G, Mitchell DA: The buccal fat pad in the closure of oro-antral communications: An illustrated guide. *Dent Update* 31:363, 2004
7. Pappachan B, Vasant R: Application of bilateral pedicled buccal fat pad in wide primary cleft palate. *Br J Oral Maxillofac Surg* 46:310, 2008
8. Yeh CJ: Application of the buccal fat pad to the surgical treatment of oral submucous fibrosis. *Int J Oral Maxillofac Surg* 25:130, 1996
9. Dean A, Alamillos F, García López A, et al: The buccal fat pad flap in oral reconstruction. *Head Neck* 23:383, 2001