Pedicled 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 ± 2.47 mm, and the average vertical movement was 1.00 ± 1.75 mm; both were measured at the upper incisor tip. Upper lip movement, measured at the upper lip anterior, was 5.98 ± 2.46 mm (124.32% of maxillary advancement, mean data). Lip thickness increased 0.9 ± 0.19 mm, and lip length increased 0.77 ± 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.

Surgical advancement of the maxilla by Le Fort osteotomy produces variable soft tissue changes, thus influencing nasolabial aesthetics. Stella et al1 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.1 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 LT. 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.2

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 su-
perficially, imparting cheek fullness, whereas the tem-
poral, pterygoid, and pterygopalatine extensions tend
to be smaller in volume and are located deeper within
the masticator and pterygopalatine space. Histologi-
cally, the fat pad consists of structural fat rather than
accumulated fat and thus is not dependent on
nutrition.3

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 recon-
structing oral defects.4

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 pedi-
cled flap in cheek augmentation procedures,5 for the
repair of persistent oroantral fistulas6 or congenital
cleft palate,7 and in the treatment of oral submucous
fibrosis.8 There have been several reports of its suc-
cessful use as a pedicled graft in reconstructing small-
to medium-size maxillary defects after resection
of a tumor.9

A new clinical application of the BFP in orthog-
nathic surgical patients is reported. In these cases, a bi-
lateral 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 Cemtro in
Madrid, Spain. This study was approved by the Clinica
Cemtro institutional review board. Patient agreement
was obtained before the study.

The patients underwent bimaxillary orthognathic
surgery to correct malocclusion and facial dishar-
mony once the orthodontic preoperative goals were
achieved (Figs 1 through 6). The orthodontic treat-
ment included vestibular braces in all cases. A 3-
dimensional scan captured with an i-CAT machine (Im-
aging 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 anal-
ysis. Patients with a thick upper lip were excluded (LT
\( \geq 16.2 \) mm in male patients, LT \( \geq 14.4 \) mm in fe-
male patients).

A waxbite registration was used to verify that the
joints were seated in the glenoid fossa during the pro-
cedure. Special attention was paid to avoid contact be-
tween 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 super-
vised personally by the same investigator (PR-B.)
pre- and postoperatively.

Surgical treatment planning consisted of bilateral
sagittal split mandibular ramus osteotomy and then
segmental Le Fort I osteotomy. The vestibular inci-
sion to approach the upper jaw was made in the up-
per 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
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, 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).
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 ± 2.47 mm, which was measured at the right upper incisor tip, and the average vertical movement was 1.00 ± 1.75 mm. The upper lip movement forward, measured at upper lip anterior, was 5.98 ± 2.46 mm (124.32% of maxillary advancement, mean data). LT increased 0.9 ± 0.19 mm, and lip length increased 0.77 ± 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. However, Ramirez 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
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. 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 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...
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 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.
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References