



Review

Buccal fat pad: anatomy and surgical techniques. A review of the literature

Bola adiposa de Bichat: anatomía y técnicas quirúrgicas. Revisión de la literatura

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ABSTRACT

Introduction: buccal fat pad surgical excision has become a more recently requested procedure. Modifications to this procedure have been made to achieve the least morbidity and complications as well as the best esthetic outcomes.

Objectives: the aim of the present paper is to compile information on the anatomy, the diverse surgical techniques employed up to date, postoperative management, and possible complications. **Material and methods:** a review of the literature was performed in ScienceDirect, PubMed, and Google Scholar on the anatomy, surgical techniques, postoperative management, and complications arising from the surgical excision of the buccal fat pad. **Results:** information on the surgical anatomy and the diverse surgical techniques that several authors have described to prevent complications and conduct postoperative care.

Conclusions: the lack of randomized clinical trials prevents evidence-based clinical decision making to select the best surgical alternative relative to techniques, medications, postoperative care, among other factors. Therefore, the surgeon is encouraged to employ the technique that he/she performs with the most knowledge and skill.

Keywords: Bichat's fat pad, buccal fat pad surgical excision, bichectomy, buccal fat pad removal, facial esthetics, facial contour.

RESUMEN

Introducción: la bichatectomía es un procedimiento quirúrgico que actualmente es muy solicitado, el procedimiento ha tenido modificaciones en su técnica impulsados por la menor morbilidad, mejores resultados estéticos y la limitación de complicaciones. **Objetivos:** el objetivo de este estudio es recabar información acerca de la anatomía, las diferentes técnicas quirúrgicas empleadas hasta hoy, el manejo postoperatorio y las posibles complicaciones. **Material y métodos:** realizamos una revisión de la literatura en ScienceDirect, PubMed y Scholar Google de la anatomía, técnicas quirúrgicas, manejo postoperatorio y complicaciones de la bichatectomía. **Resultados:** recopilamos información sobre la anatomía quirúrgica, las distintas técnicas quirúrgicas utilizadas, recomendaciones que algunos autores nos describen para prevenir complicaciones y cuidados postoperatorios. **Conclusiones:** la falta de ensayos clínicos aleatorizados, impide la toma de decisiones clínicas basadas en evidencia para seleccionar la mejor opción quirúrgica con respecto a técnicas, medicamentos, cuidados postquirúrgicos, entre otros; recomendamos que el cirujano utilice la técnica que más domine.

Palabras clave: bola adiposa de Bichat, escisión quirúrgica de bola adiposa de Bichat, bichatectomía, remoción de bola adiposa de Bichat, estética facial, perfilamiento facial.

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INTRODUCTION

The buccal fat pad (BFP) was first described by Bichat,¹ which is intimately associated with the muscles of mastication. Its physiological importance in the masticatory function is best demonstrated in the infant, where it acts as an aid in sucking.²

Nowadays, the buccal fat pad presents diverse clinical applications, including facial esthetics enhancement, closure of oronasal fistula, correction of intraoral defects, as a treatment of submucous fibrosis, cleft palate defect reconstruction, as an adjunct in reconstruction of the maxilla with bone grafts, reconstruction of defects caused by oral and maxillofacial surgery, among other applications.³

Surgical excision of the BFP, commonly termed as Bichectomy, has reached new heights recently and it is aimed to achieve esthetic outcomes.

To date, there are no exact indications to perform a BFP, but favorable outcomes have been observed in patients with phenotypically rounded faces or in the presence of pseudoherniation of the BFP. The objectives of this procedure are to reduce the facial fullness by diminishing midface volume, and to refine, sculpt, and enhance skeletal features.⁴ The BFP excision may be performed as well as an adjunct procedure with facial feminization surgery.⁵

The aim of the present paper is to compile information to acquire extensive knowledge on the anatomy and related surgical techniques, thereby providing the least morbidity and the best esthetic outcomes to the patients. Although this procedure is performed frequently, the scientific evidence is limited. Therefore, we consider that the present review of the literature is relevant for the Oral and Maxillofacial Surgery field.

HISTORICAL BACKGROUND

The buccal fat pad was first recognized and described in 1732 by Heister, who mistakenly regarded it is a gland and named it the «*glándula molaris*». In 1801, Xavier Bichat was the first to describe it as consisting of fat; it then became known as the «boule de Bichat» or «*corpus adiposum buccae*».¹ In 1977, Egyedi reported the functions of the BFP to close oronasal/oroantral fistula and as a pedicle graft to achieve the closure of postsurgical maxillary defects.⁶

In 1983, Neder described the BFP as a donor source for a free graft to close oral defects.⁷ Tideman et al. in 1986 were the first to describe the anatomy, blood supply, and surgical technique in a detailed fashion.⁸

EMBRYOLOGY

Poissonnet analyzed 805 human embryos and fetuses to study the prenatal development of the BFP using the latter as a model system. Morphogenesis of human fat tissue was evaluated, and the amount and size of the fat lobules were analyzed.⁵ The morphogenic phases are summarized in *Table 1*.⁹

Adipose tissue differentiates during the second trimester, between weeks 14 and 16. After the 23rd week of gestation, the size of these lobules increases until the 29th week. After the 14th week of gestation, the adipose tissue will develop in the cheeks (only loose connective tissue consisting of amorphous ground substance and fibers existed previously to this event), doing so from deep to superficial.⁵

ANATOMY

The buccal fat pad is a mass of specialized fat tissue able to enhance intermuscular motion of the cheek, hence termed «*sys sarcosis*»,¹⁰ and to protect neurovascular bundles from injury. In the newborn, the BFP ligaments counteract the negative pressure during suckling and maximize the necessary negative pressure for effective feeding.¹¹

The BFP is confined in the buccal space. The boundaries of this structure include the buccinator muscle medially, the deep cervical fascia and muscles of facial expression anterolaterally, and the masticator space and parotid gland posteriorly.¹⁰

The average volume of the BFP is approximately 10 mL with a mean thickness of about 6 mm.¹⁰ Loukas et al performed a study where buccal fat pads were analyzed with computerized tomography (CT) scan and magnetic resonance imaging (MRI). The mean volume in male subjects was 10.2 mL with a range of 7.8 to 11.2 mL, whereas the mean volume in female subjects was 8.9 mL with a range of 7.2 to 10.8 mL. Variations between right and left sides showed no significant difference ($p > 0.1$), with a BFP mean thickness of 6 mm with a range between 4.8-7.2 mm, and a mean weight of 9.7 g (range of 7.2-12.3 g).¹² Therefore, according to the aforementioned information, it is concluded that there is no difference in size between the left and right side of the face.

Traditional anatomy describes the BFP as a central body with four processes: buccal, pterygoid, pterygopalatine, and temporal; the latter process splits into a superficial and a deeper portion (*Figure 1*). On the other hand, recent anatomy depicts the BFP with three lobes: anterior, intermediate, and

Table 1: Five morphogenic phases of fat formation.

Stages	Events	Characteristics
1	Undifferentiated fat tissue condensation without	Fat is composed of an amorphous ground substance and fibers are organized into loose connective tissue; mesenchymal cells aggregate
2	Vascular invasion/angiogenesis	Primitive blood vessels proliferate (emergence of the characteristic fat tissue) A rich capillary network develops from each small blood vessel Surrounding mesenchymal cells differentiate into stellate preadipocytes Blood vessels signal areas where fat cells Will organize into groups
3	Development of mesenchymal lobules	These lobules contain stellate mesenchymal cells or pre-adipocytes without lipid droplets
4	Appearance of primitive fat tissue lobules	Fat storage becomes visible
5	Definitive fat tissue lobules	Fat lobules are well separated from each other through connective tissue septa

Taken and adapted from: Poissonnet CM et al.⁹

posterior. According to this description, the four processes arise from the posterior lobe (*Figure 2*).¹¹

DESCRIPTION OF TRADITIONAL ANATOMY

The buccal extension is the most superficial segment of the fat pad and it is well known that it imparts fullness to the cheek. The buccal extension and the main body account for 55-70% of the total weight. The pterygopalatine extension of the adipose tissue extends to the pterygopalatine fossa and the inferior orbital fissure. The pterygoid extension is a posterior extension that generally remains in the pterygomandibular space and packs the mandibular neurovascular bundle and the lingual nerve. This extension is smaller than the buccal extension. The temporal extension is further divided into two parts: superficial and deep. The superficial part of the temporal process of the BFP remains between the deep temporal fascia, temporalis muscle, and tendon. Its anterior end turns around the anterior rim of the temporalis muscle and continues in the deep part. The deep part of the temporal process lies behind the lateral orbital wall and frontal process of the zygoma and turns backward into the infratemporal space. Each process has its own capsule and is anchored to the surrounding structures by ligaments.¹³

DESCRIPTION OF MODERN ANATOMY

According to the modern anatomical depiction of the BFP, it could be divided into three lobes. Each lobe of the buccal fat pad is encapsulated by an independent membrane, fixed by some ligaments, and nourished

by different arteries. The anterior lobe presents a triangular shape, is located below the zygoma, extending to the front of the buccinator, maxilla, and the deep space of the quadratus muscle of the upper lip and major zygomatic muscle. The canine muscle originates from the infraorbital foramen and passes through the anterior part of the anterior lobe,¹⁴ carrying branches from the facial nerve. These branches lie over the capsule that encases the anterior lobe.¹⁰ The intermediate lobe lies in the space around the posterior lobe, lateral maxilla, and anterior lobe. It is a larger mass in children and in adults it is a structure with thin fat tissue. The posterior lobe remains in the masticatory space and in neighboring spaces. It runs up to the infraorbital fissure and the space surrounding the temporalis muscle, down to the upper rim of the mandibular body, and back to the anterior rim of the temporalis tendon and ramus. The latter configuration forms the buccal, pterygopalatine, pterygoid, and temporal processes.¹⁴ The buccal process is located deep to the superficial musculoaponeurotic system at the anterior border of the masseter muscle,¹¹ inferior to the parotid duct.¹⁰ The pterygopalatine process extends through the pterygomaxillary fissure and towards the pterygopalatine fossa, which encapsulates the pterygopalatine vessels. The pterygoid process remains in the pterygoid space and packs the mandibular neurovascular bundle and lingual nerve. The temporal process lies underneath the zygomatic process and can be further divided into two parts: superficial and profound. The superficial part lies between the temporalis muscle and the profound layer of the temporal fascia. The profound part remains between the temporalis muscle fibers¹¹ (*Figure 3*).

LIGAMENTS

The BFP is anchored through ligaments arising from its lobes towards diverse anatomical structures. These ligaments are the entries of nutritional vessels to the buccal fat pad and further divided into maxillary, posterior zygomatic, medial infraorbital fissure, lateral infraorbital fissure, temporalis tendon, and buccinator.¹⁴

PAROTID DUCT AND INNERVATION

The parotid duct courses with the buccal branches of the facial nerve anteriorly (superficial), and on the lateral surface of the BFP, it penetrates the buccinator

muscles, entering the oral cavity at the second molar level.¹³ Hwang et al conducted a study to describe the precise anatomical interrelation among the BFP, buccal branches of the facial nerve, and parotid duct. Their results demonstrated that the branches of the facial nerve and the parotid duct crossed each other within a semicircle with a 30 mm radius. The base (diameter) of the semicircle is parallel to a horizontal line passing the corner of the mouth and 12 mm above. Its center is located 53 mm lateral to the corner of the mouth (*Figure 4*).

Figure 1:

Traditional description of buccal fat pad with its central body and four processes: buccal, pterygoid, pterygopalatine, superficial, and deep temporal.

Taken from: Arce K.¹¹

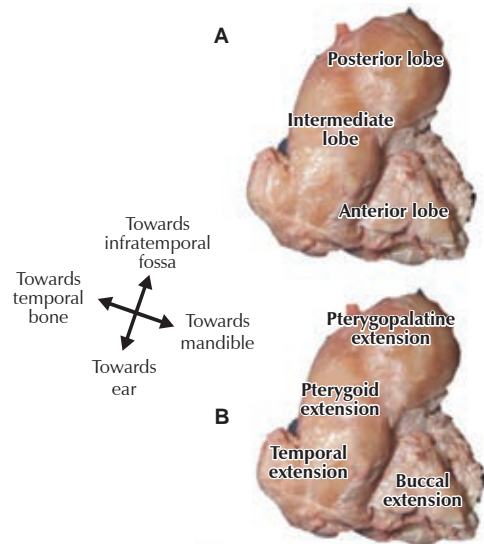


Figure 3: External morphology of the buccal fat pad. **A)** Location of the three lobules: anterior, posterior, and intermediate. **B)** The four extensions of the buccal fat pad are observed: buccal, pterygoid, temporal y pterygopalatine. **Taken and adapted from:** Loukas M et al.¹²

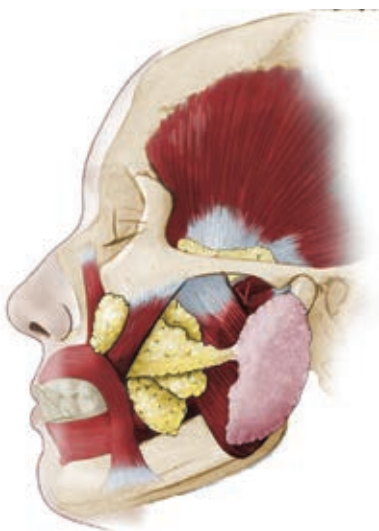


Figure 2:

Recent anatomic description of the buccal fat pad consisting of three lobes: anterior, intermediate, and posterior.

Taken from: Arce K.¹¹

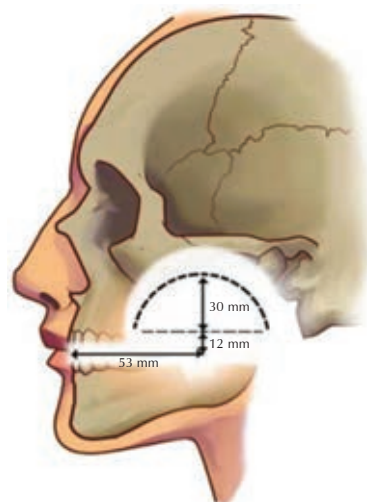


Figure 4:

Crossing point of the facial buccal branches and the parotid duct. **Taken from:** Hwang K et al.¹⁵

Figure 5:

Interrelationship of the facial buccal branch and the buccal fat pad.

A: Type I. **B:** Type II.

Taken from: Hwang K et al.¹⁵

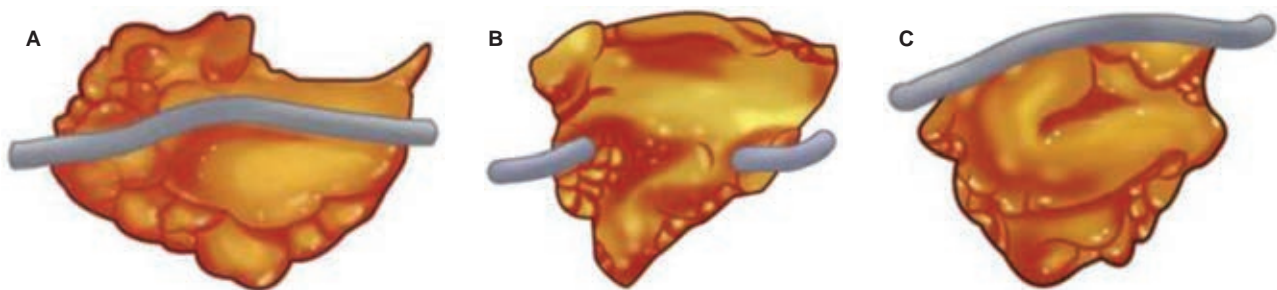
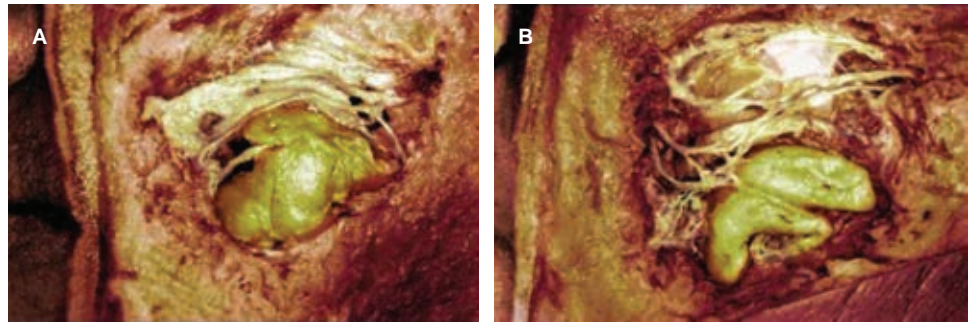


Figure 6: Interrelationship between the parotid duct and the buccal fat pad. Type **A:** the parotid duct crosses the buccal extension of the buccal fat pad superficially (42.1%). Type **B:** the parotid duct traverses deep through the buccal extension of the buccal fat pad (26.3%). Type **C:** the parotid duct crosses along the superior border of the fat pad buccal extension (31.6%). Taken and adapted from: Hwang K et al.¹⁵

The buccal branches of the facial nerve present two locations in the buccal fat pad: type I: branches crossing superficial to the buccal fat pad (73.7%); and type II, two twigs passing through the buccal extension of the buccal fat pad (26.3%) (Figure 5).

The interrelation of the parotid duct and the buccal fat pad may be described as follows: the parotid duct crossing superficial to the buccal extension of the buccal fat pad (42.1%), parotid duct crossing deep to the buccal extension of the buccal fat pad (26.3%); and the parotid duct crossing along the superior border of the buccal extension of the buccal fat pad (31.6%). Therefore, there is a high likelihood (almost 30%) of injuring the parotid duct during the surgical excision of the buccal fat pad. The parotid duct extends deep towards the buccal extension of the buccal fat pad in 26.3% of specimens (Figure 6).¹⁵

In a study conducted by Surek in 2020, eighteen cadaveric dissections were performed and the locations of the facial nerve, parotid duct, and vascular pedicle relative to the BFP were calculated. Measurements were taken from the zygomatic arch, tragus, and gonial angle. The results showed that the buccal extension of the BFP was approximately 7.5 cm (6.2-8 cm) anterior to the tragus, 4.5 cm (4-6 cm) medial the gonial angle,

and 4.1 cm (4-5 cm) inferior to the zygomatic arch. The mean distance of the BFP to the corner of the mouth was 4.3 cm (3.7-6 cm) (Figure 2).¹⁶

VASCULAR SUPPLY

The blood supply for the BFP consists of the facial artery, the transverse facial vessels, the internal maxillary artery, and arterial anastomoses.² Blood vessels from different sources enter through the ligaments and from the lobar subcapsular plexus by anastomosing with each other.¹⁴

The vascular pedicle of the buccal extension of the BFP is a branch from the facial artery and enters the BFP on the posterior surface in the inferior lateral quadrant in 61% and the inferior medial quadrant in 39% of specimens. In all specimens, it was observed that the parotid duct traversed the superior aspect of the BFP capsule and the buccal nerve branches coursed on the superficial surface of the capsule.¹⁶

SURGICAL TECHNIQUES

The surgical removal of the BFP is also known as Bichectomy. The Bichat fat pad can be extracted

intraorally and extraorally. For the intraoral approach, an initial incision may be performed in three regions: in the vestibule at the level of the maxillary molars (above the parotid duct); in the lining mucosa of the cheek at the occlusal level (inferior to the parotid duct); and behind the parotid duct. Intraoral techniques may be performed under local anesthesia (most frequently performed), sedation or general anesthesia.¹⁷ The extraoral technique is conducted through a facial approach associated with a face-lift procedure (rhytidectomy), which is performed under general anesthesia.¹⁶

Intraoral techniques for buccal fat pad excision:

1. Approach above the parotid duct

Local anesthesia is secured with 3 mL of Lidocaine HCl 2% and Epinephrine 1:200,000, approximately between the first and second maxillary molars. The cheek is retracted laterally, and a 2.5-cm mucosal incision is made¹⁸ (although some surgeons prefer a smaller incision of approximately 5 mm), preserving a cuff of mucosa for closure. The incision is carried through the mucosa and muscle while applying external pressure on the skin in the region of the BFP. Then the BFP is exposed, and the fascia is pierced with scissors or a scalpel blade. Due to fascia perforation, blunt dissection with a hemostat is performed anterior and medial to the coronoid process.¹³ Because of the external (extraoral) pressure performed, the buccal fat pad herniates. The surgeon continues to place pressure on the cheek and without excess traction, the portion of the fat pad that protrudes is grasped and clamped at its base. The fat pad may be removed with tissue scissors or through electrocoagulation. The wound is then packed with gauze soaked in lidocaine and epinephrine solution, while the opposite side is operated. The wound is closed with an absorbable suture.¹⁴ It is of utmost importance to remove only the fat that protrudes from the mucosal incision and to do so without excessive pulling or traction. With these guidelines, complications including facial nerve and parotid gland injuries can be avoided.

2. Approach inferior to the parotid duct

A small incision, no more than 2 cm long, is made above the parotid duct, into the soft tissue located in the lower portion of the zygomatic process. This

is done taking care to properly see the orifice of the parotid gland. After doing this incision, dissection of the fat pad is achieved with a thin or hemostatic scissors, which is located under the zygomatic arch. It is very important to preserve the fascial lining of the fat pad, which will allow the removal of the whole fat pad at once.¹⁸

A technique has been described to perform the approach inferior to the parotid duct, namely, the trident technique. This approach seeks to recognize diverse anatomical boundaries, including the caruncle of the Stensen's duct and the linea alba on the buccal mucosa. These landmarks may be marked with methylene blue stain, 2 cm from the caruncle to the posterior region, in a horizontal plane. Parallel at the linea alba, the same marking is performed with the aforementioned dimensions. Both lines are connected in their most internal portion with a vertical line. Afterwards, a third line of 1 cm long is traced at the center of the vertical line and parallel to the last two marks. Such mark will be the incision site, which is recommended to be performed with a radiofrequency electrode colored tip (Ellman). Thickness is deepened and dissection continues towards the temporomandibular joint. Finger pressure is performed on the cheek externally to protrude the BFP. The pedicle is located and clamped, followed by electrocauterization. As a final step, simple interrupted sutures are placed in the wound. The authors report that this procedure has been conducted in more than 2,000 patients for the last 15 years, having encountered minor complications.¹⁹

3. Approach posterior to the parotid duct

An incision is placed beginning above the second molar and extending posteriorly for 2 cm. The incision is made 5 mm above the attached gingiva of the second molar and extends through mucosa and the fibers of the buccinator muscle to expose the maxillary periosteum. The fascia covering the BFP must be incised. This layer is opened with a hemostat and the fascia is spread to the extent where the fat protrudes into the oral cavity.²

3.1 Buccal fat pad excision with hydrodissection technique

A novel technique has been described by Valencia to perform the BFP excision with hydrodissection technique. The same protocol is followed for intraoral techniques. A 15 ml solution composed of 250 mL

of saline 0.9% + 1 mg of epinephrine + 20 mL of 2% lidocaine (within a safe dose equivalent to 0.0555 mg of epinephrine and 22.2 mg of lidocaine per side prior to incision). The solution was distributed as follows: a first infiltration of 1 mL using a 22G needle is conducted in the oral mucosa where a 1 cm incision will be made posterior to the opening of the Stensen's duct. Afterwards, 14 mL were injected into the virtual space where the BFP is located.

A 0.5 cm horizontal mucosal incision is made 1 cm posterior to the ampulla of the Stensen's duct. A Kelly clamp is then introduced into the incision and passed in the direction of the earlobe to penetrate the buccinator fascia. The buccinator muscle is then bluntly dissected using the Kelly clamp in a parallel orientation to its muscle fibers until the BFP is identified. This exposure allows for easy resection of the fat pad.²⁰

EXTRAORAL EXCISION TECHNIQUE

Intraoperatively during rhytidectomy, following extended SMAS flap elevation and repositioning, the visible and palpable bulge of buccal fat is identified. The capsule is incised, and the fat is exposed using a gentle teasing motion through the opening in the capsule. The fat was placed over the end of a cotton tip applicator and excised using bipolar electrocautery. Once adequate excision has been performed, hemostasis is obtained, and the capsule is re-approximated with simple interrupted absorbable sutures.¹⁶ Postoperatively, patients may appreciate changes in facial contour over the course of several weeks.⁴

POSTOPERATIVE CARE

Postoperative care measures are as important as the surgical procedure itself. Esthetic outcomes may be compromised in the case of infection or hematoma formation. Postoperative care is divided into local and general measurements, as well as pharmacological management.

General measures encompass relative rest, which consists in avoiding strenuous activities and exposure to heat sources that may exacerbate the inflammatory response unnecessarily. Local measures include continuous compression in the cheek area at the surgical site for the longest time possible. The latter should be done at least during the acute inflammation period (within the first 2-3 days) and if possible, during the subsequent 30 nights. This type of care

is regarded as one of the most important measures, since it avoids edema, hematoma, and fibrosis formation. To achieve this, the use of a face mask/wrap or compression bandages are recommended. Local measures also include thermotherapy with damp-cold packs for 15 minutes, 3 times a day for 3 days. After the 4th day, damp-warm packs may be used instead. Oral surgery postoperative general instructions are provided, including thorough oral hygiene with soft toothbrush and chlorhexidine antiseptic mouthrinse, soft diet without irritants, avoid carrying heavy loads and restrain from using a straw or spitting. Pharmacological management includes antibiotic therapy with amoxicillin as the first choice. For pain control, NSAIDs such as ibuprofen and the additional use of sublingual ketorolac within the first 24 hours may be employed. After analyzing the risk-benefit ratio, the use of steroids may be considered even prior to the procedure and 2-3 days postoperative.

POSTSURGICAL COMPLICATIONS

The most potential complications for BFP excision are hematomas and infections, although these are unlikely.⁴ Other possible, less frequent complications are over resection, injury to the facial nerve and/or parotid gland, and hemorrhages (which have not been reported as massive).¹⁵

CONCLUSION

Buccal fat pad excision has become a more recently requested procedure by patients who seek to improve their esthetics, the procedure has the objective of providing a less painful and brief postoperative period that allows patients to resume their daily activities in the shortest time possible. Up to date, diverse surgical techniques have been proposed in the literature. However, the lack of randomized clinical trials prevents evidence-based clinical decision making to select the best surgical alternative relative to techniques, medications, postoperative care, among other factors. Therefore, the surgeon is encouraged to employ the technique that he/she performs with the most knowledge and skill and that can offer the best results to the patient, thus limiting the incidence of complications.

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