



CASE STUDY

## Odontogenic Sinusitis, Oro-antral Fistula and Surgical Repair by Bichat's Fat Pad: Literature Review<sup>☆</sup>



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### KEYWORDS

Sinusitis;  
Oroantral fistula;  
Pedicled flap

**Abstract** Odontogenic sinusitis accounts for 10%–12% of maxillary sinusitis. It occurs due to an interruption of the mucoperiosteum in response to a series of conditions, most frequently the extraction of a superior tooth. Its treatment has two bases: treating the infection and managing the oroantral fistula that perpetuates the infection. Communications smaller than 5 mm can resolve spontaneously; bigger ones must be closed by a flap. Bichat's fat pad flap was first used in 1977 to close an oroantral fistula. It is a pedicled flap that has been shown to be successful, with advantages that make it the best option in oroantral fistula treatment. Its location allows easy access, minimum dissection, great versatility, good mobility, good blood supply, low rate of complications, no morbidity in the donor site, low risk of infection, shortened surgical time and fast cover by epithelium, and it leaves no visible scar, amongst other benefits. That is why we encourage the use of this technique and choose it as the best option for management of our patients.

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### PALABRAS CLAVE

Sinusitis;  
Fístula oroantral;  
Colgajo pediculado

**Sinusitis odontogénica, fístula oroantral y su reparación quirúrgica mediante colgajo de bolsa de Bichat: revisión de la literatura**

**Resumen** La sinusitis odontogénica da cuenta del 10 a 12% de los casos de sinusitis maxilar y ocurre por una interrupción del mucoperiostio en respuesta a varias condiciones, siendo la más frecuente la extracción de una pieza dentaria superior. Su manejo consta de dos pilares; tratar la inflamación e infección sinusal y el manejo de la fístula oroantral que perpetúa la infección. Las comunicaciones menores de 5 mm se pueden resolver espontáneamente, pero las mayores se deben cerrar por distintas técnicas de colgajos. El uso de la bolsa de Bichat para cerrar la fístula oroantral se documentó por primera vez en 1977. Es un colgajo pediculado que ha demostrado ser exitoso y tiene varias ventajas que lo hacen el método de elección

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de tratamiento de la fístula oroantral: su ubicación permite su fácil uso, mínima disección, tiene gran versatilidad, buena movilidad, gran aporte sanguíneo, baja tasa de complicaciones, escasa morbilidad del sitio donante, bajo riesgo de infección, rápida técnica quirúrgica, rápida epitelización, sin cicatriz visible, entre otras. Es por esto que promovemos el uso de esta técnica y la presentamos como la mejor opción en la actualidad para nuestros pacientes.

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## Introduction

Maxillary sinusitis is defined as a symptomatic inflammation of the maxillary paranasal sinus; it is classified as chronic when it lasts longer than 12 weeks, sometimes presenting acute exacerbations.<sup>1</sup> Odontogenic sinusitis stems from a dental disease, so it differs in microbiology, physiopathology and its management from sinusitis of other origins.<sup>1,2</sup> It accounts for 10%–12% of all the cases of maxillary sinusitis, and it has even been said that it can cause up to 30% of them; however, the true incidence is difficult to establish.<sup>1,3–5</sup> In spite of the high frequency of dental infections, its incidence is very low. This is explained by the fact that the floor of the maxillary sinus is composed of dense bone tissue that acts as a barrier, without letting odontogenic infections penetrate.<sup>3</sup> Nevertheless, when this barrier is altered, it is relatively easy for the oral flora to pass towards the sinuses. The study by Felisati et al.<sup>1</sup> showed that 20.3% of the cases studied were odontogenic-origin maxillary sinusitis and that all the cases were associated with one or more oroantral communications (OAC).

## Odontogenic Sinusitis

The maxillary sinus begins to develop from the third month of intrauterine life and reaches a volume of 15–20 mL around the age of 12–14 years.<sup>3,5</sup> It extends from the orbital floor to the dentoalveolar segment of the maxillary, over the canine to the third molar.<sup>5</sup> During adult life, the maxillary sinus can continue to expand towards the dental roots of the maxillary, even until these protrude within the sinuses, covered by only periosteum.<sup>3,5</sup> This condition can be even more intense in edentulous patients.<sup>3</sup> The roots of the molars and premolars are found under the floor of the maxillary sinus; the ones closest to the sinus have been described as being the tips of the second molars, with a mean distance of 1.97 mm, followed by the first molars, third molars, second premolar and, finally, the first premolar, with the first premolar having a mean distance of 7.5 mm.<sup>3–5</sup> The described distribution of the teeth involved in the maxillary is: second molar (41%), first molar (33.3%), second premolar and first molar (11.1%), first molar and second molar (7.4%), second premolar (3.7%) and third molar (3.7%).<sup>4</sup>

Odontogenic sinusitis occurs when there is an interruption of the Schneiderian membrane, or mucoperiosteum.<sup>3–5</sup> This alteration of the natural barrier can be caused by conditions such as dental infections around the root tip, periodontal disease, maxillary trauma, pathology of

the maxillary bone or iatrogenic causes such as dental extractions, maxillary osteotomies, endodontics and dental implants.<sup>1,3,5</sup> Following the loss of mucoperiosteal continuity, there is a higher sinus infection rate by anaerobic microorganisms, given a colonisation by oral cavity microbiota. The greater frequency of anaerobic microorganisms in odontogenic sinusitis can be related to the poor drainage and the increase in intranasal pressure associated with the inflammation and obstruction of the ostium. There is also a reduction in blood flow and depression of the ciliary action, which reduce the oxygen pressure and pH of the inflamed sinus and finally leads to the growth of the anaerobes.<sup>3,5,6</sup>

Odontogenic infections are usually mixed polymicrobial infections.<sup>3</sup> Positive cultures have been described for aerobic bacteria (alpha-haemolytic streptococci, microaerophilic streptococci, *Staphylococcus aureus*) and anaerobic bacteria (gram-negative bacilli, *Peptostreptococcus* spp., *Fusobacterium* spp., *Prevotella*, *Porphyromonas* spp., pigmented *Prevotella*) isolated in cases of acute and chronic odontogenic sinusitis.<sup>3,5,6</sup> The match between the microorganisms found in the sinus cultures and in the mouth suggests that the origin of the infection is dental, with a secondary extension towards the maxillary sinus.<sup>3</sup> No correlation has been described between predisposing dental conditions of the patient and microbiological findings.<sup>3,4,6</sup>

Clinical presentation of odontogenic sinusitis is not specific and does not differ from a sinusitis of other origin. Consequently, it is impossible to diagnose it based on merely the symptoms. The study by Chul Lee and Jin Lee<sup>4</sup> (2010) indicated that the most common symptom in odontogenic sinusitis is unilateral purulent rhinorrhoea (observed in 67% of their patients), followed by maxillary pain (33%), cacosmia (26%), unilateral nasal congestion (18%), posterior discharge (14.8%) and gingival oedema (14%). However, there were no significant differences between odontogenic sinusitis symptoms and those for other types of sinusitis, only a greater frequency of unilateral symptoms.

Diagnosis is mainly based on a thorough dental and medical examination, together with an evaluation of the previous patient history, specifically looking for diagnostic criteria for sinusitis.<sup>4,5</sup> It is important to associate this with an otolaryngological evaluation using rhinoscopy, nasal endoscopy and/or sinus aspiration cultures. As for complementary examinations, a panoramic X-ray will show the relationship between the upper dental pieces and the maxillary sinus, the presence of pneumatization, pseudocysts and displaced roots.<sup>3,5</sup> However, the current gold standard is computed axial tomography (CAT) sinus scan, in axial and coronal views.<sup>3,5</sup> The X-ray criteria of Maillet et al.<sup>2</sup> for odontogenic

sinusitis are as follows: localised thickening of the mucous membrane of the maxillary sinus associated with a dental piece with caries or one that is restored, with a periapical lesion or extraction sites. Longhini et al.<sup>2</sup> observed in their 2012 study that 79% of the paranasal sinuses that showed opacity greater than 2/3 of the cavity were associated with an identifiable dental origin and, the greater the air-fluid level, the larger the odontogenic sinusitis rate. In addition, they reported that 72.5% of the maxillary sinuses altered in the CAT scans were associated with dental pathology, mainly of the upper first and second molars. A new alternative to bear in mind is volumetric Cone Beam computed tomography (CT), which provides a better sinus image, of soft and bony tissue. Its main advantage is that it applies only 10% of the radiation of traditional fine cut CAT scans. The study by Hashimoto et al.<sup>7</sup> (2003) confirmed a considerable reduction in the radiation dosage in dental areas, comparing the average conventional CAT scan dose of 458 mSv with the barely 1.19 mSv of the Cone Beam. Another of its advantages is that it uses a quadrangular isotropic-type voxel, which provides better definition and makes it possible to perform measurements that are closer to the real ones. Other advantages that come with the Cone Beam system is that it uses conical X-ray beams with intermittent bursts of radiation, in contrast to the conventional CAT scan, that uses fan-shaped continuous rays; it also has a lower exposure time (17 s vs 20–30 s), smaller margin of error (0.1 mm vs 0.5 mm) and provides a 3-plane image (axial, coronal and sagittal) with a nominal resolution of 0.4–0.76 mm. Cone Beam imaging is currently the best option for diagnosing odontogenic sinusitis; however, further studies are needed to validate its use.<sup>2</sup>

Managing an odontogenic sinusitis case has 2 key cornerstones: firstly, managing the inflammation and sinus infections, which perpetuate the OAC; and secondly, necessarily managing the fistula that causes the sinus infections. If the management of either of these cornerstones fails, a vicious circle is formed and the clinical situation will not be resolved. Consequently, the management has to be based on controlling the dental origin of the infection, associated with managing the sinusitis. To do so, medical and surgical management have to be combined.<sup>3,4</sup> Within the medical management, antibiotic treatment, nasal decongestants and saline aerosols are included, similar to the routine management of a maxillary sinusitis.<sup>5</sup> The choice of the antibiotic treatment should be guided by the bacterial cultures and the patterns of local resistance. Antibiotics for oral flora are used for 21–38 days, with amoxicillin–clavulanic acid being the most sensitive (more than 80% of strains) of the most frequent agents, followed by clindamycin; other antibiotics used are cefoxitin, ceftriaxone, azithromycin, doxycycline, metronidazole, moxifloxacin and carbapenems.<sup>1,3,5,6</sup> However, increased resistance to the penicillins has been observed, especially in anaerobic gram negative bacilli, reaching up to 75% beta-lactamase producing bacteria in chronic sinusitis.<sup>5</sup> The patient with OAC should be instructed about daily management, not smoking and avoiding any manoeuvres that exercise positive pressure and open-mouthed sneezing.<sup>5</sup> Surgical management consists of eliminating the focus of infection, conserving the mucosa of the maxillary sinus as much as possible.<sup>5</sup> If the cause is iatrogenic from dental procedures, removing the implant is necessary. As a general

rule, OACs smaller than 5 mm can resolve spontaneously (it is advisable to cover with a resorbable barrier such as gelfoam); however, for those larger than 5 mm, primary closure should be performed through various flap techniques, once the sinus infections have been controlled.<sup>3,5</sup> As for endoscopy management, up to 7% of recurrence of odontogenic sinusitis and 13% of OAC recurrence have been reported in procedures of functional endoscopic surgery.<sup>1</sup>

## Oroantral Communications and Fistulas

An oroantral communication (OAC) is a pathological ostium-mucosal connection between the mouth and the maxillary sinus that appears as a result of various pathologies or procedures. If this communication does not repair itself spontaneously, it becomes chronic and forms an oroantral fistula (OAF).<sup>8–10</sup>

The most frequent cause is the extraction of an upper tooth whose roots has protruded into the maxillary sinus, with its removal leaving a communication, which later becomes epithelialized and forms a fistulous pathway. In contrast to OACs, OAFs are characterised by the presence of tessellated epithelium from oral mucosa and/or pseudostriated ciliated columnar epithelium from sinus mucosa.<sup>9</sup> The incidence of OAF varies, according to different studies, from 0.3% to 5% and increases after the age of 30 years. There are factors that predispose to the formation of these communications, such as advanced age, inflammatory or infectious maxillary processes, maxillary mucous cysts, periodontal disease with bone resorption, chronic infections such as syphilis or tuberculosis, and dental procedures, among others. Age-associated tooth loss is considered to increase the risk of OAF formation.<sup>8,11</sup>

Relatively rare complications, OACs can be the result of diseases, trauma or minor surgery. As has already been mentioned, the most frequent cause is tooth extraction; this is mainly of the upper first and second molars, with an incidence of 0.31%–4.7%, given that their roots are very near the maxillary sinus and they can be displaced into the sinus.<sup>8–16</sup> Other causes are trauma, dental infection, poorly placed implants, cyst excision, the presence of a foreign body, tumours, radiotherapy sequelae, orthognathic surgery and osteomyelitis, among others.<sup>1,5,10,15</sup> Yalçın et al.,<sup>8</sup> in their 2011 study, found that the OAF formed after tooth extraction in 20 out of 23 cases and that the greatest mayor incidence was following the extraction of the first molar, followed by that of the second molar. Radiology reveals a lack of continuity of the floor of the maxillary sinus, sinus opacity, atrofia focal alveolar atrophy and associated periodontal disease.<sup>9</sup>

Persistence of the OACs makes sinus inflammation more likely, through contamination from the mouth.<sup>9,11</sup> If an OAC is not treated properly, it can bring about acute sinusitis in 50% of the cases within the first 24–48 h and 90% will do so within the first 2 weeks.<sup>8,9,17</sup> It is important to establish whether there is a coexisting sinus infection, as the maxillary sinus must be free from infection for successful surgical treatment.<sup>9,17</sup> Immediate closure of the defect has a high success rate, up to 95%; however, success in secondary closure has been reported up to only 67%.<sup>8,9</sup> The most common cause of failure is insufficient control of maxillary sinusitis; that is why foreign bodies, infected and

degenerated polypoid mucosa, and the underlying infected bone tissue should be removed.<sup>11</sup>

Most of the smaller OACs (with diameters of from 1 to 2 mm), non-epithelialized, close spontaneously in the absence of infection.<sup>8,9</sup> Defects having a diameter of 5 mm or wider and that have lasted for more than 3 weeks require a secondary surgical intervention to close the defect.<sup>9,14,15</sup> Spontaneous closure is prevented by maxillary infections, epithelialization of the fistulous pathway, apical tooth abscess, osteitis or osteomyelitis in the borders of the communication, dental cysts, foreign bodies or tumours, among others, which make it easier for a chronic fistula to form.<sup>8</sup> Surgical closure is indicated if the defect is larger than 4–5 mm, in the presence of sinus infections and in communications that have lasted more than 3 weeks.<sup>12,16</sup> If treatment is given early, it will only be necessary to close the OAC properly and to instruct the patient to avoid pressure changes in the upper airways during the recovery period; if treatment is delayed, initial management should be to rule out the presence of any OAC-associated sinus pathology.<sup>14</sup>

When choosing the surgical technique, different parameters should be considered, such as the defect location and size, its relationship with adjoining teeth, height of the alveolar border, time of OAC development, paranasal sinus inflammation and patient's general health condition, among others.<sup>9</sup> Some of the methods currently used for OAC repair include buccal advance flaps, palatine rotation or transposition flaps, lingual flaps and temporal muscle flaps.<sup>8,15</sup> The most commonly used surgical technique is the Rehrmann buccal flap; however, recently the Bichat's fat pad, or buccal fat pad, has started to be used in the repair of OAFs and other oral defects.<sup>15,16</sup>

## Buccal Fat Pad or Bichat's Fat Pad

The buccal fat pad (BFP) was first described in 1732 by Heister, but it owes its name to the description by Bichat in 1802. However, it did not become known extensively until the publication of Egyedi in 1977, who presented the BFP as a useful flap in OAC closure.<sup>9,18</sup> It can be used as a pedicle flap in the closure of various oral cavity defects; nowadays, its use is very popular, especially for OAC closure.<sup>19</sup>

The BFP consists of a lobulated mass called central body made up of 3 lobes: anterior, intermediate and posterior; the posterior lobe has 4 finger-like extensions: buccal, pterygoid, pterygopalatine and temporal, which extend from the centre towards the adjacent spaces.<sup>9,10,13,20–22</sup> The central body is found in the masticatory space, between the buccinator muscle and the anterior border of the masseter muscle, covered by a fine fascia capsule; it lies superior to the parotid duct, extending towards the upper jaw posteriorly and anteriorly by the buccal vestibule.<sup>11,13,14,20,22,23</sup> The facial vessels mark the anterior limit of the BFP.<sup>13</sup>

The buccal extension of the BFP lies superficially in the cheek, over the fascia buccopharyngeal fascia that outlines the external surface of the buccinator muscle, helping to form the facial contour.<sup>13,18</sup> The buccal extension and the central body constitute 55%–70% of the entire BFP weight.<sup>13,24</sup> The buccal extension is the one most commonly used for OAC closures because of its anatomical characteristics.<sup>10,18</sup> The temporal extension is extended

under the zygomatic arch towards the temporal plane, where it divides into 2 sections: a larger, superficial one, which extends superiorly between the temporal fascia and the surface of the temporal muscle; and a deep section, which is thinner and passes between the superficial and deep fibres of the temporal muscle up to the temporal space.<sup>13,18,24</sup> The temporal extension is the only process that cannot be separated easily from its adjacent tissues.<sup>18</sup> Deep under the temporal muscle tendons is found the pterygopalatine extension of the BFP, which extends towards the pterygopalatine fossa and the inferior orbital fissure.<sup>13,24</sup> The pterygoid is a posterior prolongation that is generally found in the pterygomandibular space, circling neurovascular bundles and the lingual nerve.<sup>13,24</sup> Each process has its own capsule and is anchored to nearby structures by ligaments. The size of the pterygoid and temporal extensions are inconsistent, but they are generally smaller than the central body and the buccal extension.<sup>13,24</sup>

Histologically, the BFP is different from subcutaneous adipose tissue; it is composed of the same type of fat as the orbital fat.<sup>10,21</sup> Its size is constant, regardless of the weight and body fat distribution of the individual.<sup>10,20,22</sup> The BFP has an average volume of 9.6–10 mL, being 6 mm thick and weighing 9.3 g on average; it is consequently capable of covering small and medium-sized defects, of about 4 cm.<sup>13,14,21,23,24</sup> Its volume can vary between men and women and between the right and left sides of the same patient, although the variations are minimal.<sup>20</sup> Its anatomical relationships have also been reported to be constant in the masticatory space and in relationship to the surrounding facial structures.<sup>20</sup>

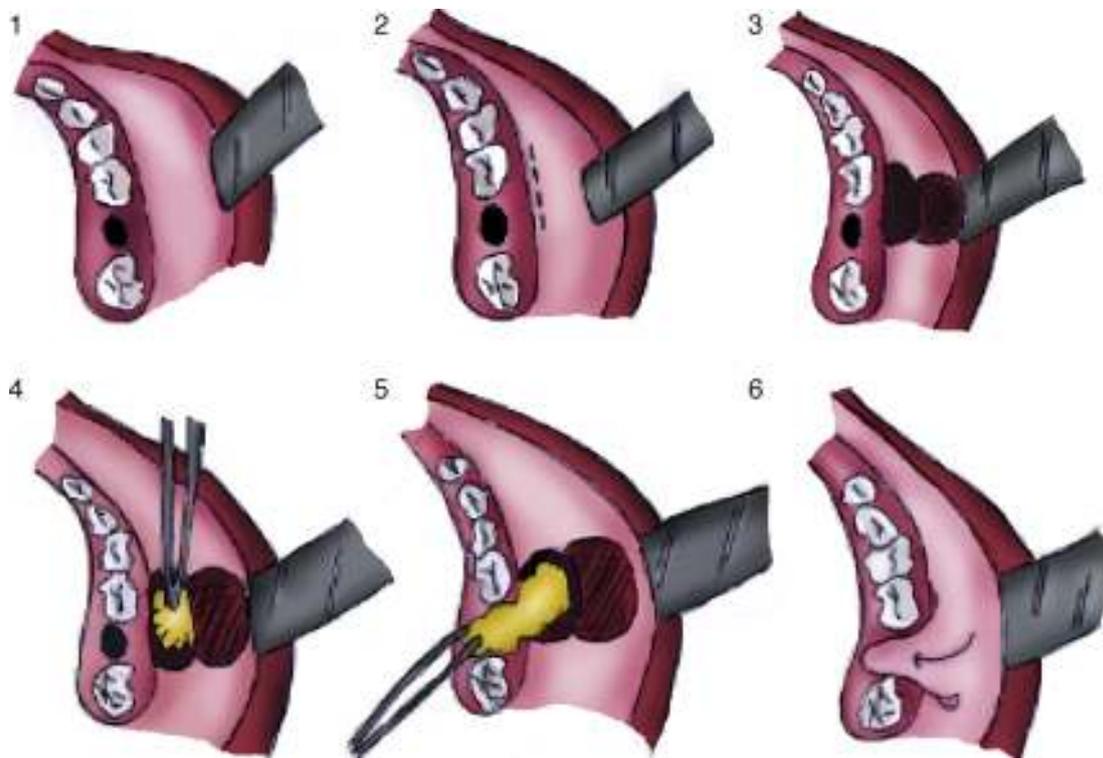
The BFP has rich blood irrigation, consisting of a subcapsular plexus of free anastomosis formed by arteries from each lobe. The main arteries that nourish this fat cushion derive from branches of the maxillary artery (buccal and deep temporal branch), of the superficial temporal artery (facial transverse facial branch) and of some branches of the facial artery.<sup>10,11,13,14,18,21,22,24</sup>

This anatomical structure is necessary because it fulfils various functions, such as separating the masticatory muscles to improve their mobility, filling facial and masticatory spaces, counteracting the negative pressure generated by suction in newborns, protecting neurovascular complexes, and acting as a venous net associated with the pterygoid plexus, among others.<sup>9,10,19,21,24</sup>

It is important to point out that one of its characteristics is rapid fat epithelialization because of being uncovered. It is coated by stratified tessellated epithelium, as confirmed by histological studies.<sup>9,13</sup>

## Description of the Technique

The use of the BFP flap for OAF closure was documented for the first time in 1977 by Egyedi, but it was Tidemann who published a detailed anatomical description of this adipose body and the results from 12 reconstruction cases in 1986.<sup>12,16,22</sup> Various surgical techniques for closing orofacial defects have been described, which vary depending on lesion size, its location and other factors; the method that best suits the patient's needs should be chosen. The BFP is used as a pedicle flap in the closure of small and medium



**Figure 1** Surgical technique for the closure of an oroantral fistula using the buccal fat flap.

OAF and in the reconstruction of bone defects in the oral cavity.<sup>13,14,20,21,24</sup> This flap has shown itself to be consistently successful for OAF closure; it preserves the normal architecture of the oral mucosa, it has easy access, it is richly vascularised and has complete epithelialization at 1 month postoperatively, which makes it a perfect, reliable method for the closure of these defects.<sup>11,24</sup> Other uses for this BFP are in the reconstruction of postoperative defects in oncological pathology, primary repair of cleft lip, reconstruction of the temporomandibular joint posterior to its ankylosis, injection into vocal folds and palatine reconstruction in open hypernasal speech, among others.<sup>24</sup>

Given its anatomical placement, the most plausible defects to cover are the maxillary OAF, preferably located between the premolar area up to the posterior tuberosity; they can even include a larger territory from the amygdaline fossa to the area of the canines and the palate midline, even in the reconstruction temporomandibular joint.<sup>19,24</sup> The key factor for the success of the flap is its size. In the literature, it has been described as achieving coverage of defects of up to 7.0×5.0×2.0 cm; however, it is recommended that it be smaller than this, about 5.0×4.0 cm, to avoid excessive flap tension and ensure good blood supply.<sup>24</sup> Toshihiro et al.<sup>20</sup> recommend performing a preoperative CAT scan or nuclear magnetic resonance to establish the total volume of the BFP and avoid complications in surgery. Jain et al.<sup>13</sup> recommend that defects larger than 5.0×1.0 cm should be covered by 2 flaps, a BFP flap and an advance buccal flap, given that this technique provides greater stability and closure with less tension.

There are 2 main stages in the surgical technique. In the first stage, the fistulous sinus tract has to be identified and that tissue removed, sending it for biopsy; next, the flat

insertion site has to be prepared, cleaning the borders of the wound. In the second stage, the BFP flap is prepared, as either single or bipedicle. To do so, an incision is made in the upper vestibular mucosa, forming a mucoperiosteal flap. A horizontal, 2-cm incision is then made over the periosteum and fascial covering; this extends in a backwards direction over the upper second molar. A simple anterior and medial dissection is performed to the coronoid process. The dissection should be through the buccinator and its surrounding fascia, removing the first layer of fatty tissue, which is seen with small lobules; this is not the BFP. Of a lighter-coloured fat, the BFP is found more deeply; it should protrude towards the mouth. The central body and the buccal extension are mobilised through dissection, taking care not to injure the capsule or the vascular plexus, preserving a wide base. Next, the flap is advanced and expanded over the defect (Fig. 1). Its borders are sewn to the mucosa with 3-0 or 4-0 Vicryl sutures, not too tightly. The mucoperiosteal flap can be returned to its place or not. The sutures are removed at 15 days postoperatively without complications.<sup>9,10,13,14,19,22,24</sup>

When the fatty tissue is exposed at the mouth, it is epithelialized and is gradually replaced by fibrous connective tissue.<sup>14</sup> Epithelialization takes place from the first postoperative week and has been seen to end between the next 4–5 weeks.<sup>19</sup> The flap surface changes to yellow on the third day and then becomes gradually red by the end of the week (mainly due to granulation tissue); it changes to mature granulation tissue during the second week and becomes completely epithelialized, with slight wound contraction, at 3 weeks postoperatively, as confirmed by histology.<sup>10,13,24</sup> The great blood supply is what contributes to its epithelialization, so there is no fatty tissue found

at 4 weeks, only fibrous tissue coated with parakeratotic stratified tessellated epithelium.<sup>20</sup> The fat acts as a base for the growth of the epithelium, which migrates from the gingival margin.<sup>12</sup> In the 10-year follow-up carried out by Toshihiro et al.,<sup>20</sup> they did not find contraction of soft tissues, facial paralysis, aesthetic deformities or limitations of buccal opening after the use of this technique.

Follow-up time was from 1 to 6 months in most studies, for complete epithelialization of the flap.<sup>24</sup> During postoperative management, patients should not perform Valsalva manoeuvres for at least 2 weeks and should be under medical treatment with antibiotics (amoxicillin 500 mg) with decongestants, antihistamines and analgesics for 5–7 days.<sup>12,13,22</sup>

The use of the BFP has various advantages that make it be the method of choice over other techniques that were previously the pillar of OAF treatment. In the first place, its location lets it be used easily and with minimal dissection; other advantages are its great versatility, good mobility, blood supply, low complication rate, low donor site morbidity, low risk of infection, fast surgical technique, easy epithelialization, allowance of replacing the mucoperiosteal flap without loss of vestibular height and lack of visible scar, among others.<sup>10,13–15</sup> Among its disadvantages are found the fact that it can only be used once, the possibility of postoperative trismus, limited use of small and medium-sized defects, lack of rigid support and a small increase in oedema compared to the buccal advance flap.<sup>10,12,22</sup> The complications of this flap in OAF closure have been described in the literature as being around 3.1%–6.9%. These complications include partial necrosis of the flap, infections, excessive scarring and aesthetic deformity of the cheek, facial nerve lesions, haematoma, haemorrhage, temporal paresthesias of the buccal nerve, temporary weakness of the buccinator muscle, OAF recurrence and vestibular obliteration; these are all complications that can be repaired in a second operation.<sup>9,13,16,17,19,24</sup> To avoid postoperative complications, it is suggested that the BFP should cover the surgical defect appropriately and that it should not be tightly sutured.<sup>18</sup>

There is some disagreement as to whether the BFP is sufficient for covering oroantral defects alone. For that reason, various studies have been carried out comparing the results between closing OAF by BFP and by others. The study by Nezafati et al.<sup>16</sup> observed patients operated on within the first 7 days of OAF formation, with preoperative antibiotic management. They compared the results between patients in whom BFP and buccal flaps were used. Although both methods were observed to be similar, patients in the BFP group presented slight pain, trismus that was resolved on the seventh day, and oedema. However, this did not affect the quality of life of the patients, so it was concluded that the BFP is a simple, trustworthy procedure for OAF closure. Another study, carried out by Candamourty et al.<sup>15</sup> in 2012, compared the use of the BFP alone against its use together with the buccal flap. The study did not demonstrate any greater benefit from covering the BFP with the buccal flap in a combined technique. They described that it could be beneficial only if the BFP was excessively stretched or if it was perforated during the procedure. That is why this should be studied case by case before operating to establish the best alternative to fit the requirements of each individual patient.

## Conclusions

Knowing odontogenic pathology of the paranasal sinuses is important for being able to suspect its existence and to identify it as an etiological alternative in a patient that does not respond to first-line treatment in infectious sinusitis. The incidence of sinusitis associated with odontogenic infections is low, despite the high incidence of dental infections. It is possible that this pathology is less detected due to the diagnostic methods currently available; that is why we propose the use of volumetric Cone Beam CT imaging as the best diagnostic approach. Concomitant management of the dental site and sinus infections ensures the resolution of the clinical condition and helps to prevent recurrences and complications.

The BFP is one of the safest methods for closing OAFs. How easy it is to mobilise the flap, its rich blood supply, its characteristics and the low morbidity of the donor site make it the flap of choice. That is why the technique should be known, along with its advantages and complications; it is the best option available at the moment for managing odontogenic sinusitis.

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## Conflict of Interests

The authors have no conflicts of interest to declare.

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