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A GLANCE ON VARIOUS TREATMENT MODALITIES OF ORO-ANTRAL FISTULA WITH A CASE REPORT IN A 26 YEAR OLD MALE

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ABSTRACT
Oro antral fistula is a pathological communication between the oral cavity and maxillary sinus which has its origin either from iatrogenic complications or from dental infections, osteomyelitis, radiation therapy or trauma. Its closures can be achieved using different flaps which show both advantages and limitations. Therefore all that is needed is careful consideration in order to select the best approach depending on the situation. This article reports a case of oro-antral fistula in 26-years-old male and was treated using flap taken from buccal fat pad. The management was successful with no postoperative complications.

INTRODUCTION

Oroantral fistula (OAF) is an epithelialzed communication between the oral cavity and the maxillary sinus. The fistula is established for migration of the oral epithelium in the communication, event that happens when the perforation lasts from at least 48-72 hours. After some days, the fistula is organized more and more, preventing therefore the spontaneous closing of the perforation. Oroantral communication (OAC) are rare complications in oral surgery, which recognize maxillary molars extraction as the most common etiologic factor, followed by maxillary cysts, tumors, trauma, osteoradionecrosis, flap necrosis and dehiscence following implant failure in atrophied maxilla. Following the creation of an OAC, the patient may experience various symptoms including air and fluids passing into the nose and mouth. The diameter of the communication usually decreases over time but often the 'tract' from the antrum to the oral cavity fails to heal and becomes lined by epithelium. Once this occurs the communication is referred to as a fistula. This fistula acts as a pathway for infection and can result in the development of acute sinusitis which further impedes healing [1]. The likelihood of the development of a communication is increased if there is pre-existing sinus disease, periapical infections, or if the floor of the sinus is in close proximity to the tooth roots (e.g., antrum floor dipping down between the roots of teeth). In addition, attempts to remove apices of teeth that have fractured during extraction may result in the creation of a communication between the maxillary sinus and oral cavity. A purulent discharge may drip through the fistula, which cannot always be seen. Also, when the patient drinks he feels as though part of the liquid enters the nose from that side of the jaw and occasionally runs out of the nostril on the same side. When the nostrils are closed with the fingers and the patient is asked to blow through the nose, air hisses from the fistula into the mouth. A similar occurrence happens when the patient blows out his cheeks, only then the air passes from the mouth into the sinal and

nasal cavity, the so-called Valsalvin test. In some cases the test of blowing through the nose or mouth does not necessarily give a positive answer, e.g. when the fistular canal is filled with inflammatorily changed sinal mucous membrane. However, the test with a blunt probe will confirm the existence of a fistular canal. The fistula must be quickly closed as its persistence intensifies the possibility of inflammation of the sinus by infection from the oral cavity. It is important to establish whether or not infection of the sinus has occurred during the existence of the fistula. The presumption is that the duration and width of the lumen of the fistular canal contributes to infection of the sinus, although infection of the sinus is possible in a short period and with a very narrow fistular canal. There is no agreement about the indication of techniques for the treatment of this kind of surgical complication. Spontaneous healing of 1 to 2 mm openings can occur, while larger defects are managed surgically [2]

Case report

A patient aged 26 years old male reported to department of Oral Medicine & Radiology of Institute of Dental Education & Advance studies dental college with chief complaint of liquid discharge through nasal cavity since 6 days. Patient gave history of slight & intermittent liquid discharge through nasal cavity since 2 years & also of pain in upper right back teeth region because of decayed root stump in relation to 16 since one month for which patient underwent extraction at a private dental clinic 6 days back. Since then patient gives history of complete discharge of liquid through nasal cavity. Patient had brought pre extraction panoramic radiograph taken at a private dental clinic showing periapical abscess with root stumps in relation to 16 (Fig 1). On intraoral examination a communication was visible in relation to extracted 16 (Fig 2).

A gutta percha was inserted in fistula & again panoramic radiograph was taken revealing oro antral communication (Fig 3). Patient was referred to oral surgery department of college for surgical management. The patient was firstly placed on Amoxicillin (500 mg/ 8hrly) and Metronidazole (200mg/ 8hrly) three days before the surgery. Excision of the fistulous tract from the sinus to the oral cavity and freshening of the wound edges done after local anesthesia with 2% Lignocaine (with Adrenaline 1:80.000) was achieved. A right upper vestibular horizontal incision, posterior to the second premolar was made and was then extended to the anterior margin of the fistula to expose the required buccal fat pad. The incision was also closed over the bridge segment of the flap with 3/0 black silk non-resorbable sutures. Patient was instructed against blowing the nose for 2 weeks. Pre-operative antibiotic was continued for the next 7 days. Patient was reviewed at regular one week intervals and sutures were removed 2 weeks after the procedure. At the end of the 4th week, full epithelization of the flap was noticed. No postoperative complications were observed.

DISCUSSION

The largest part of the upper jaw is taken up by the maxillary sinus, which is described as a large, pneumatic space. It is also known as Highmore's Antrum after the English anatomist Nathaniel Highmore from the 17th century, who first described the sinus as a space in the bone and called it the antrum. At birth the maxillary sinus is present as a small cavity, as its growth begins in the third month of foetal life, and ends between the 18th and 20th year of life. The volume of the maxillary sinus is the result of functional development of the maxilla and its pneumatisation, and it therefore increases at the same rate as the growth of the jaws and eruption of permanent teeth. . Because of the smaller volume of the sinus the risk of the occurrence of oroantral communication in children and adolescents is less. In adults the volume of the sinus amounts to 20-25 ml [3].

A clinical study by Guven in 1998 indicated that oroantral fistula most frequently occurs after the third decade of life, which agrees with the results of other authors such as Lin in 1991 and Punwutikorn and co-workers in 1994 [4]. The floor of the sinus is often uneven and deepened, which can be determined by determining the position of the lowest part of the sinus to the floor of the nasal cavity. The floor of the sinus can have three basic positions: beneath the level of the floor of the nasal cavity, on its level or above its level. The relation is particularly important, in which the floor of the maxillary sinus is beneath the level of the floor of the nasal cavity, because its floor can extend to the tops of the dental roots, or go even deeper between them. Such roots are separated from the sinus by a thin bony lamela and its mucous membrane, or very rarely only by the mucous membrane of the sinus. The thickness of the bone wall varies and is on average 0.2 - 16 mm. Because of the anatomic position of the maxillary sinus and its connection with the teeth it is particularly important in the field of oral and maxillofacial surgery [5]. Investigations have also shown that the relation of pneumatisation of the jaw in men and women is identical, although Lin et al. in 1991 reported that the maxillary sinus is more developed in women and that there is therefore greater possibility of the occurrence of oroantral communication and fistula in women [6,7]. Guven concluded that the occurrence of chronic sinusitis and antral polyp is frequently a consequence of oroantral fistula. When a clinical diagnosis of chronic sinusitis is made radiographic follow-up of the sinal inflammation is necessary. Many techniques have been described in order to prevent the consequences of a chronical presence of OAC [8].

The most common surgical treatment of an OAC is the buccal advancement flap procedure designed by Rehrmann. In this procedure a broad-based trapezoid mucoperiosteal flap is created and sutured over the defect. Its broad base assures adequate blood supply. Consequently, high success percentages (93%) have been reported. Disadvantages of the Rehrmann method include

the risk of reduction of the buccal sulcus depth and manifest postoperative pain and swelling [9].

An alternative method for closure of OACs is the Môczáir flap; this method involves a buccal mucoperiosteal flap that is displaced one tooth width distally. The Môczáir flap is recommended for edentulous patients because the large denuded area, which is the result of the distal displacement of the buccal sliding flap, may give rise to periodontal disease in dentate patients. In addition, buccal sulcus depth is minimally influenced by advancement of the Môczáir flap in comparison with the Rehrmann method. Haanaes and Pedersen obtained a success rate of 95.7% in their study using the Môczáir surgical approach [10].

The buccal fat pad is an encapsulated, rounded, biconvex specialized fatty tissue which is distinct from subcutaneous fatty tissues. It is located between the buccinator muscle medially, the anterior margin of the masseter muscle and the mandibular ramus and zygomatic arch laterally. The size of the buccal fat pad has proved to be constant among individuals, regardless of the fat distribution and body weight. Blood supply to the buccal fat pad depends on branches of the superficial temporal, maxillary, and facial arteries. Its use as a pedicled graft for reconstruction in oral surgery, including the closure of OACs, was first described by Egyedi in 1977. One of the advantages of this flap is its proximity near the recipient area, permitting quick grafting [11].

Clinical findings showed that the buccal flap, after grafting, changed into granulation like tissue over a period of two weeks, followed by complete epithelialization. Furthermore, the buccal sulcus depth is not affected by the buccal fat pad technique. The easy mobilization, its excellent blood supply, and minimal donor-site morbidity are clear advantages.

In contrast, the buccal fat pad requires very careful manipulation, and although success rates in the literature are high (close to 100%), closure of large defects could involve complications such as graft necrosis or new fistulas [12].

Tongue flaps are suitable for reconstruction in various areas, including lip, cheek, and palatal or oroantral fistulas, because they offer rich blood supply and pliability. Tongue flaps can be created from the ventral, dorsal, or lateral part of the tongue. In general, the location of the defect dictates the choice of tongue flap. Especially the lateral tongue is suitable for closure of OAC [13]. Siegel et al [14] used a full-thickness pedicled flap from the lateral border of the tongue to close a large OAC after partial maxillectomy. Healing was uneventful in this patient. The investigators stated that the lateral tongue flap is suitable for large oroantral defects in general, allowing instant repair with rare failure. Kim et al [15] also used a posteriorly based full-thickness lateral tongue flap to close an OAC with success. General disadvantages of the tongue flaps are the requirement for general anesthesia and the requirement for a 2-stage or 3-stage procedure to gain ultimate results.

Autogenous Bone Grafts

Proctor first suggested bone grafts harvested from the iliac crest for closure of large OAC in 1969. Nevertheless, bone grafting for closure of OAC has the disadvantage of requiring a second surgical procedure for bone harvesting. This second procedure elongates surgical time and increases patient morbidity. Despite these disadvantages, bone grafting for closure of OACs has gained attention over recent years, because of the rising demand for implant rehabilitation. Harvesting bone from the iliac crest involves significant donor-site morbidity, such as prolonged postoperative pain and possible sensory disturbance.

Moreover, harvesting bone from intraoral donor areas significantly reduces the demands made on the patients postoperatively and can be performed under local anesthesia. Therefore, alternative donor areas have been investigated, including bone grafts from the retromolar area, zygomatic process, and the chin [16]. Watzak et al [17] harvested retromolar bone for press fitted closure of OACs in 4 patients. After placing the bone graft, soft tissue closure was realized by a Rehrmann buccal flap. No reopening of the sinus was observed. A limiting factor of the retromolar donor area is the confined amount of bone available. However, in most cases only a small amount of bone will be needed for closure of OACs. Further, retromolar bone seems to form a solid base for implant rehabilitation.

Chin bone for oroantral fistula closure was studied in 5 patients by Haas et al. In 3 patients a stable press-fit of the bone graft in the OAC was accomplished. In 2 patients additional plates and screws were used to obtain a rigid fixation of the graft. A Rehrmann flap was used in all patients for soft tissue closure. Wound dehiscence occurred in 1 patient, but the sinus remained unaffected. The use of a monocortical (chin) bone block for closure of an OAC is recommended for patients affected by maxillary atrophy requiring sinus augmentation before implant placement [18]. Peñarrocha-Diago et al [19] used zygomatic bone as a bone graft for closure of an OAC in 1 patient. Subsequently 2 dental implants were placed. This technique offers the advantage of the proximity of the donor area to the recipient area, which minimizes surgical time and patient discomfort. As in retromolar bone grafts, limited bone is obtainable from the zygomatic process. Furthermore, accidental sinus membrane perforation may occur.

Allogenous Materials

Several investigators have achieved closure of OACs using lyophilized fibrin glue of human origin. Kniha et al [20] and Gattinger [21] used the fibrin glue in combination with a collagen sheet, whereas Stajcic et al [22] solely used fibrin glue. Preparation of the fibrin glue

takes about 15 to 20 minutes. The glue is then applied in the socket with a syringe, together with the collagen sheet. Thereafter, the oral surface is sealed with the rest of the fibrin glue. After 2 hours the glue has reached its maximum strength. The syringe is inserted above the floor of the antrum to protect the clot from airflow. An advantage of this strategy is clearly the fact that no flaps need to be raised. Therefore, intraoral anatomy remains intact. Furthermore, the method is straightforward and gives rise to few postoperative complaints. Kinner and Frenkel[23] used lyophilized dura to treat OACs in 29 patients. The sterilized dura is placed in a saline solution to regain its flexibility. Then it is cut to size to make it cover the bony margins of the defect. Sutures are placed at the corners of the graft after which it is covered with a plastic plate for protection. The dura is exfoliated after 2 weeks. Uncomplicated healing was observed in 28 of 29 patients. This successful and simple technique involves no surgical intervention, which makes it an attractive strategy.

Xenografts

Mitchell and Lamb [24] and Shaker et al [25] used lyophilized porcine dermis (Zenoderm; Ethicon LTD, Edinburgh, Scotland) for closure of oroantral perforations. Mitchell and Lamb left the porcine graft exposed to the oral environment. Conversely, Shaker et al placed buccal and palatal sliding flaps over the porcine collagen. Both groups reported good results. A new surgical management of OACs was described by Ogunsalu. He used Bio-Guide (porcine collagen membrane) and Bio-Oss (bovine bone grafting material) (Geistlich Pharma AG, Wolhusen, Switzerland) to close an OAC in 1 patient. For this purpose the Bio-Oss granules were sutured in a prefabricated Bio-Guide envelope.

A full-thickness mucoperiosteal flap was then raised and the Bio-Oss–Bio-Guide sandwich placed underneath. Then the flap was repositioned, resulting in primary closure. Healing was uneventful in this patient [26].

Synthetic Closure

Various synthetic materials have been described in the literature for closure of OACs. Several studies have reported on the use of gold foil or gold plate for closure of OACs [27,28]. The gold foil is burnished into place with its edges on healthy bone, thus acting as a bridge for overgrowing sinus mucosa. The mucoperiosteal flaps, which were raised to expose the bony margins of the defect, are sutured across the gold foil without attempting to realize primary closure. In general, the gold foil exfoliates after a period of 6 weeks. The value of the gold foil technique seems to lie in the closure of large OAC that failed in previous attempts and in the unaltered intraoral anatomy. A disadvantage of this rather expensive technique is the relatively long period needed for complete closure and healing. Steiner et al [29] proposed 36-gauge pure aluminum plates for closure. In line with the gold technique, an aluminum plate is used as a protective plate to aid in closure. Sutures are placed only for approximation of the buccal and palatal tissues; the aluminum plate is therefore visible at all times. After 6 weeks, the aluminium plate is displaced from its initial position due to the reparative tissue formed underneath. Healing was uneventful in all 8 patients. Advantages of the aluminum are its malleability and softness and its low cost compared with gold. In addition, tantalum foil was used by McClung and Chipps for closure of 4 OACs in edentate patients, using the same method as in the gold technique. No complications were observed. The tantalum foil was exfoliated after 9 weeks, revealing new granulation tissue across the defect [30].

Al Sibahi and Shanoon [31] described a technique for closure of OACs using self-curing polymethylmethacrylate in 10 patients. The polymethylmethacrylate plate is immersed for 24 hours in a sterilizing solution, cut to size, and placed over the defect. Mucoperiosteal flaps are then replaced without attempting to cover the acrylic plate. After 3 to 4 weeks the polymethylmethacrylate plate becomes visible and is removed as soon as the edges become exposed. Results were satisfying for all 10 patients. A disadvantage of this method, compared with the use of gold or aluminum, is the needed preparation in advance, eg, mixing the power and liquid, allowing it to set, and sterilizing it for 24 hours. Dense hydroxylapatite has also been used for closure of OAC.

Zide and Karas [32] used hydroxylapatite blocks that were carved to fit the defect and encircled with a wire for stability when needed. The investigators observed natural extrusion of the blocks without recurrence of a fistula in all 6 patients. Becker et al [33] used hydroxylapatite implants in 5 different sizes for closing oroantral defects. Hydroxylapatite granules were used to fill any remaining space in the socket. Oral mucosa was approximated without complete closure. Healing was uneventful in all 20 patients. In contrast, these researchers observed no extrusion of the hydroxylapatite implants. Due to this, dental implants could not be placed at a later stage. Disadvantages of hydroxylapatite for closure of OAC are the expense of the material and the need for a variety of implant sizes to allow for size selection. A root analog made of tricalcium phosphate was used by Thoma et al [34] in 20 patients with OACs. The root replicas were fabricated chair side, using a mold of the extracted tooth.

Replicas could be placed in only 14 of 20 patients due to the necessity of a proper recipient socket to ensure tight fitting of the root replica. No complications were observed. This technique proved to be fast and simple, but cannot be performed in all patients due to technical limitations.

Other Techniques

Third molar transplantation for closure of OACs has been described by Kitagawa et al [35].

The investigators successfully used a transplanted upper and lower third molar for closure of OACs in 2 patients. Donor teeth were placed in slight infraocclusion and fixed by firm finger pressure and light tapping, without the need for additional stabilization. Endodontic therapy of the donor teeth was performed after 3 weeks. The researchers concluded that third molar transplantation is a successful but challenging procedure, depending on a proper recipient socket and perfect fitting of the donor tooth.

In addition to the obvious need for a donor tooth, the method is noz recommended when there are space limitations for the donor tooth in the recipient area and when mucoperiosteal tissue is damaged. Hori et al [36] described the successful application of interseptal alveolotomy for closure of small OACs in 8 patients. This technique is derived from the Dean preprosthetic technique and originally designed for smoothing the alveolar ridge. In the extended Dean technique the interseptal bone is removed, followed by fracturing of the buccal cortex in the direction of the palate. Sutures are used for soft tissue closure. According to the investigators the advantages of the extended Dean technique are that a bony base is created for closure with less postoperative swelling compared with a flap procedure. Furthermore, the buccal sulcus depth is not influenced. Nevertheless, this method is restricted to cases with at least 1 cm of space across the fistula. In addition, the required breaking of the buccal bone carries the risk of inflammation due to formation of bone sequesters and possible deficient closure of the soft tissue in case the fracture is incomplete.

A technique for the closure of OACs using guided tissue regeneration was described by Waldrop and Semba [37]. The technique involves an absorbable gelatin membrane, allogenic bone graft material, and a nonresorbable polytetrafluoroethylene (ePTFE) membrane. A flap is reflected and an absorbable gelatine membrane is placed over the OAC with its edges on the bony margins of the perforation, to act as a barrier for the bone graft material. A layer of allogenic bone graft material is put on the membrane. The nonresorbable ePTFE membrane is used to cover the bone graft material, and the soft tissue flap is placed over the membrane. Eight weeks after placement, the ePTFE membrane is removed, after removal of the inner aspect of the flap adjacent to the ePTFE membrane, and the mucoperiosteal flap replaced. Two patients were successfully treated with this technique. Clinically bone formation was seen by the investigators after removal of the ePTFE, although this was not confirmed histologically. Disadvantages of the method are the need for a full-thickness flap and a second procedure to remove the nonresorbable ePTFE membrane.

Prolamin occlusion gel is an alkaline alcoholic solution based on corn protein. The prolamin gel has been used by Götzfried and Kaduk [38] and Kinner and Frenkel [39] for closure of OACs. The solution is injected in the perforation and hardens within a few minutes. After a week, granulation tissue is formed and the prolamin gel completely dissolves after 2 to 3 weeks. According to the investigators, the procedure was well tolerated by patients. This simple treatment strategy results in fewer postoperative complaints compared with the standard flap procedure. In addition, it does not influence buccal sulcus depth. Disadvantages of this technique are high material costs and the fact that the technique is less suitable for OACs larger than 3 mm or shallow OACs.

Figure 1. Pre extraction panoramic radiograph taken at private clinic showing periapical abscess in relation to 16

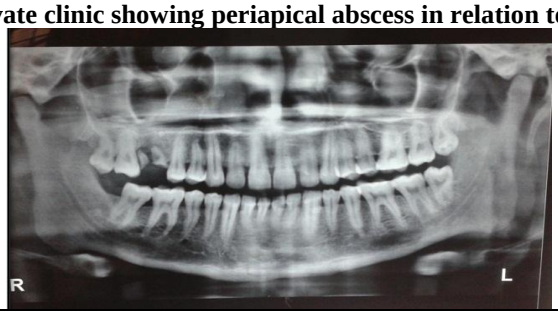


Figure 2. Clinical photograph of oro antal fistula after extraction of root stump irt 16

Figure 3. Post extraction panoramic radiograph showing communication between oral and antral cavity through radioapaque gutta percha after extraction irt 16

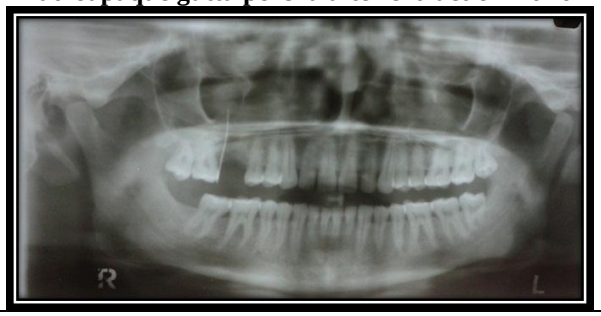
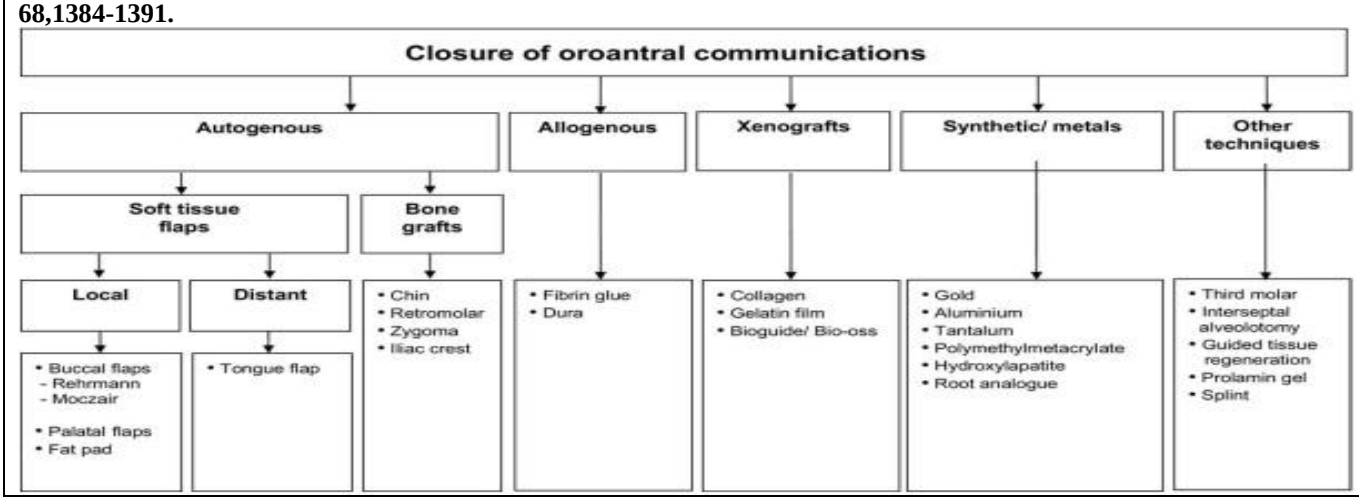


Figure 4. Visscher, van Minnen, and Bos. (2010).Closure of Oroantral Communications. *J Oral Maxillofac Surg*, 68,1384-1391.



CONCLUSION

Pedicled buccal fat pad is a reliable flap for the repair of oro-antral fistula. The easy mobilization of the buccal fat pad, its excellent blood supply, and minimal donor site morbidity make it an ideal flap in such cases.

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