JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S9

Comprehensive Review of Oroantral Communication Management: Techniques and Outcomes

Hamad Mohammed Alsolai [1], Mohammed Saeed Ahmed AlAlshahrani [2], Mohammed Abdulhadie Abdulwahab Dajem [3], Saad Omar Saad Al Jelban [4], Hajar Salman Ahmed Kaabi [5], Abdullah Ali Alwabran [6], Abeer Ali Al Enazi [7], Abdul Aziz Hayef Aljash [8], Ebtihal Moosa Almowais [9], Kadom Ibrahim Ahmed Al Madeh [10], Najah Ahmad Almakhamel [11], Hawazen Mohammad Alblehshi [12].

1. *Dentist, Diriyah Hospital, Ministry of health, kingdom of Saudi Arabia. Hamadmoh2@gmail.com*
2. *General Dentist, Ministry of health, kingdom of Saudi Arabia. moh_86866@hotmail.com*
3. *General Dentist, Ministry of health, kingdom of Saudi Arabia. dr_dajam_vip@hotmail.com*
4. *General Dentist, Ministry of health, kingdom of Saudi Arabia. s.jalban@hotmail.com*
5. *Dental Assistant, Dental Center in Tabuk, Ministry of health, kingdom of Saudi Arabia. Hskaabi@moh.gov.sa*
6. *Consultant in Restorative Dentistry, King Khalid Hospital and Prince Sultan Center for Health services in al kharj, kingdom of Saudi Arabia. awabran@moh.gov.sa*
7. *Dentist, -Branch of ministry of health in Riyadh, kingdom of Saudi Arabia. Aalanazi403@moh.gov.sa*
8. *Dentist, Sajer General Hospital, Ministry of health, kingdom of Saudi Arabia. ahaljash@moh.gov.sa*
9. *Dental Assistant Technician, Qatif Central Hospital, Ministry of Health, Kingdom of Saudi Arabia. Ialmowais@moh.gov.sa*
10. *Dental Assistant, Eastern Health Cluster - Supply and Warehouses Department, kalmadeh@moh.gov.sa*
11. *Dental Assistant, Qatif Central Hospital, Ministry of Health, Kingdom of Saudi Arabia. Nalmakhamel@moh.gov.sa*
12. *General Dentist, Al-Ahsa Health Cluster, Ministry of Health, Kingdom of Saudi Arabia. Halblehshi@moh.gov.sa*

Abstract

Oroantral communications (OACs) and oroantral fistulas (OAFs) are common complications encountered in oral and maxillofacial surgery, often resulting from dental extractions, implant procedures, or pathological conditions. Timely and effective management is crucial to prevent further complications such as maxillary sinusitis. This comprehensive review explores various techniques for OAC and OAF closure, discussing their indications, advantages, and limitations. Traditional soft tissue approaches, including buccal advancement flaps, palatal flaps, and buccal fat pad grafts, demonstrate high success rates but may be limited by defect size and anatomical considerations. Advanced techniques such as the use of platelet-rich fibrin, resorbable collagen membranes, and bone grafts offer promising outcomes for complex cases, promoting both soft and hard tissue healing. Alternative methods like tongue flaps, metal foils, hydroxyapatite blocks, and third molar transplantation expand the treatment options for challenging scenarios. Additionally, this review addresses the management of OACs in immunocompromised patients and highlights the potential of low-level laser therapy in enhancing wound healing. The choice of treatment should be individualized based on factors such as defect size, patient health status, and available resources. A multidisciplinary approach and the adoption of innovative materials and techniques can significantly improve patient outcomes and reduce the morbidity associated with OAC and OAF management.

Keywords: Oroantral Communication, OAC, OAF

Introduction

Oroantral communications (OACs) represent one of the most common complications encountered by oral and maxillofacial surgeons. OAC is characterized as an abnormal opening between the maxillary sinus and the oral cavity. These complications frequently arise after odontectomy of maxillary premolars and molars due to the close anatomical proximity of the roots to the maxillary sinus. Additional causes include tuberosity fractures following extractions of maxillary posterior teeth, implant dislodgement, dehiscence secondary to implant failure, pathological lesions within the maxillary sinus, maxillary tumors or cyst enucleation, and complications related to the Caldwell-Luc procedure (Khandelwal & Hajira, 2017). Procedures involving the posterior maxilla, particularly in cases of a pneumatized maxillary sinus, pre-existing acute or chronic sinusitis, or traumatic extractions of teeth with large divergent roots, carry an elevated risk of OAC formation. Literature indicates that OACs are more frequently observed in males than in females, a trend attributed to the higher incidence of traumatic odontectomy in men (Parvini et al., 2018).

Maxillary Sinuses and Maxillary Posterior Teeth

The maxillary sinus is shaped as a quadrangular pyramid, with its roof forming the floor of the orbit and its floor contributing to the alveolar process of the posterior maxilla. The sinus volume increases from approximately 6 mL at birth to 15 mL in adulthood, with further sinus pneumatization occurring with age. It receives innervation from the anterior superior, middle, and posterior superior alveolar nerves, which are terminal branches of the maxillary division of the trigeminal nerve. The blood supply is derived from the anterior, middle, and posterior superior alveolar arteries, which branch off the maxillary artery from the external carotid artery (Norton et al., 2017). The sinus is lined by a 0.8 mm-thick pseudostratified ciliated columnar epithelium known as the Schneiderian membrane. Inflammation of this membrane results in acute or chronic sinusitis, a common pathology that can progress from an OAC (Kademani & Tiwana, 2015).

Understanding the spatial relationships between the maxillary posterior teeth apices and the sinus floor is crucial for comprehending OAC etiology. The antral floor is closely associated with the roots of the maxillary first and second molars, with an incidence of 40%. The palatal roots of these teeth are located 50% closer to the sinus floor than to the palate. Specifically, the mesiobuccal root apex of the maxillary second molar is closest to the antral floor, with an average distance of 0.83 mm, whereas the palatal root apex of the maxillary first premolar is the farthest, with an average distance of 7.05 mm. The root apices of maxillary third molars show variable distances to the sinus floor, influenced by diverse patterns of impaction. Hasegawa and colleagues categorized root-to-sinus (RS) relationships into five classifications and reported that extracting a mesioangular maxillary third molar with a type 3 RS classification presents a higher risk of OAC (Hasegawa et al., 2016).

Maxillary Sinusitis

When an OAC persists beyond 48 hours without spontaneous closure, patients face the risk of developing an oroantral fistula (OAF). OAF formation occurs as oral epithelium migrates into the defect, creating a permanent epithelialized tract between the maxillary sinus and the oral cavity. This persistent communication enables allergens and bacteria to inflame the Schneiderian membrane, obstructing the maxillary sinus ostia and preventing fluid drainage into the middle meatus. The resultant stagnation of sinus secretions in a hypoxic environment leads to acute or chronic sinusitis. Iatrogenic factors account for 55.97% of odontogenic maxillary sinusitis (OMS) cases, with other causes including periodontitis (40.38%) and odontogenic cysts (6.66%) (Simuntis et al., 2014). Among iatrogenic factors, extractions are the leading cause of OAF (47.56%), followed by extrusion of endodontic obturation materials (22.27%), foreign bodies or dressings (19.72%), amalgam remnants after apicoectomies

(5.33%), maxillary sinus lift procedures (4.17%), and poorly positioned dental implants (4.17%).

Clinical manifestations of maxillary sinusitis commonly include nasal congestion, nasal discharge, midface pressure, pain, and headache. Acute maxillary sinusitis typically resolves within two weeks and initially presents with fever, malaise, facial swelling, and pain exacerbated by bending forward. Unlike the Streptococcus pneumoniae, Haemophilus influenzae, and Moraxella catarrhalis commonly implicated in nonodontogenic acute sinusitis, odontogenic acute sinusitis predominantly involves aerobic pathogens such as S. pneumoniae and Staphylococcus aureus, as well as anaerobic gram-negative bacilli like Peptostreptococcus spp. and Fusobacterium spp. Chronic maxillary sinusitis persists for more than four weeks and is characterized by postnasal drainage, halitosis, and a diminished sense of taste and smell. The microbial profile in odontogenic chronic maxillary sinusitis often includes a mixture of aerobic and anaerobic bacteria like those found in odontogenic acute sinusitis.

When sinusitis arises from an OAC or OAF, empiric antibiotic therapy options include Augmentin 875 mg twice daily, Clindamycin 300 mg four times daily, or Moxifloxacin 400 mg once daily for a minimum of 10 days, depending on resistance patterns (Dym & Wolf, 2012). Culture and sensitivity tests should be conducted if purulent discharge is present. Additional treatments include normal saline irrigation, nasal decongestants, antihistamines, and steroids to alleviate symptoms. In cases where medical management fails, surgical interventions such as functional endoscopic sinus surgery or Caldwell-Luc antrostomy may be necessary to ensure proper sinus drainage. Addressing chronic maxillary sinusitis before attempting OAC closure is essential, as neglecting the underlying condition renders closure efforts ineffective.

Diagnosis

The clinical diagnosis of an oroantral communication (OAC) is typically established through both subjective and objective findings. While some patients with OAC or oroantral fistula (OAF) may remain asymptomatic, many present with complaints such as altered nasal resonance, nasal regurgitation of liquids, foul-smelling intraoral odors, a whistling sound during speech, and symptoms indicative of sinusitis. A fistula located in the posterior maxilla is often readily visible. The Valsalva test can aid in diagnosis by instructing the patient to gently expel air against closed nostrils while keeping the mouth open; the passage of air or blood at the surgical site strongly suggests the presence of an OAC or OAF. Additionally, fogging of a mouth mirror placed near the orifice can confirm the diagnosis. Antral polyp formation may be observed through the defect at later stages. Imaging, such as panoramic radiographs and computed tomography scans, can provide detailed information regarding the size and location of the defect as well as the extent of sinus involvement. Based on the defect's location along the maxillary alveolar ridge, OAFs or OACs can be further classified into alveolo-sinusal, palatal-sinusal, and vestibulo-sinusal types (Borgonovo et al., 2012).

Treatment Options for Oroantral Communication/Oroantral Fistula

The choice of treatment for an OAC or OAF depends on several factors, including the defect's size, the timing of diagnosis, the presence of sinus infection, the quality and quantity of tissue available for repair, and the planned restorative treatment for the affected site. Current literature suggests that an OAC should be closed within 24 hours to minimize the risk of odontogenic maxillary sinusitis (OMS). It is essential to treat maxillary sinusitis—either medically or surgically—before addressing the defect to ensure proper drainage. Most OACs with a diameter of less than 2 mm in patients with healthy maxillary sinuses can close spontaneously. For defects measuring between 2 and 5 mm, gel foam can be placed in the defect and secured with figure-of-eight sutures, with regular follow-ups to monitor closure progress. Surgical intervention is required for defects larger than 5 mm, as these do not tend to close spontaneously. Various surgical closure techniques have been described in the literature. Visscher and colleagues classified these techniques into autogenous soft tissue grafts, autogenous bone grafts, allogeneic materials, xenografts, synthetic closure methods, and other approaches (Borgonovo et al., 2012). It is crucial to remove all granulation tissue from the OAC before attempting any definitive closure technique, as emphasized by Dr. Harry Dym, the senior author of this study.

Soft Tissue Flaps

Buccal Advancement Flap

The buccal advancement flap, also referred to as the Rehrmann technique, is among the oldest and most commonly employed methods for closing an OAC (Parvini et al., 2019). This technique is particularly effective for closing small to moderately sized defects. A trapezoidal mucoperiosteal flap with a broad base is developed, beginning with the excision of the epithelialized margins of the defect to facilitate wound healing. Two vertical divergent incisions are made, extending from the defect site to the buccal vestibule. The flap should be at least 50% wider than the defect to allow for proper closure. Scoring the periosteum high in the vestibule is advantageous, as it promotes passive closure of the flap over the defect. The flap's broad base ensures reliable vascular supply. A study by Killey and Kay reported a 93% success rate using this technique in 362 cases. Falci and dos Santos introduced a modified version of the buccal advancement flap, in which the buccal flap is tucked under a raised palatal flap to improve tissue viability (Falci & Dos Santos, 2015).

The primary disadvantage of the buccal advancement flap is the reduction of the buccal vestibule, which can complicate future use of dental prostheses. A prospective study by Von Wowern and colleagues found that this reduction was permanent in 50% of cases. In such situations, implant-retained prostheses may be a viable alternative. Additionally, patients may experience postoperative pain and swelling for several days following the procedure.

Buccal Fat Pad

The use of the buccal fat pad (BFP) for OAC closure was first introduced by Egyedi in 1977. This technique is also applicable for repairing oral-nasal communications. The BFP acts as a pedicle flap, remaining attached to its original site via a tissue band, which ensures an adequate blood supply to the reconstructed area. The BFP has several advantages, including a rich vascular supply, resistance to contraction, and its anatomical proximity to the defect. It is recommended for closing defects up to 5 × 4 cm based on the BFP’s volume.

Buccal Fat Pad Anatomy

The buccal fat pad (BFP) is situated between the buccinator and masseter muscles and is encased within a thin fascial envelope. It consists of a central body and four extensions: buccal, pterygoid, pterygomandibular, and temporal. While the pterygoid, pterygomandibular, and temporal extensions are located deeply, the buccal extension is the most anterior and superficial, contributing significantly to cheek fullness. The central body of the BFP and its buccal extension are primarily utilized in the closure of oroantral communications (OACs). The BFP receives its blood supply from branches of the maxillary artery, superficial temporal artery, and facial artery.

Surgical Technique

Reconstruction using the BFP can be performed under local anesthesia, although general anesthesia may be employed if necessary. The procedure begins with an incision in the mucosa posterior to the zygomatic buttress. This is followed by an incision through the periosteum and the fascial envelope enclosing the BFP. Metzenbaum scissors are then used to perform blunt dissection, exposing the yellow-colored fat pad, which is gently mobilized to cover the defect and subsequently sutured to the mucosal margins. The technique emphasizes maintaining a broad base for vascular supply and avoiding mechanical suction during the exposure of the BFP.

Complications

Literature reviews reveal a low failure rate for BFP reconstructions. The most common cause of failure is necrosis, which may lead to the recurrence of an OAC. Additionally, a depression in the cheek has been reported following reconstruction. Tideman and colleagues documented a case in which the BFP was not covered with gingival mucosa and achieved complete epithelialization within two weeks. Their approach included ensuring full coverage of the defect with the BFP, enforcing a liquid diet during the healing phase, and avoiding suturing under tension. Trismus is another commonly reported complication following BFP reconstruction. To address this, Dean and colleagues recommend initiating mouth-opening exercises on the fifth postoperative day.

Palatal Flap

Anatomy

The palatal rotational flap is frequently employed for OAC repair when defects are large or prior repair attempts have failed (Jamali, 2014). This flap offers several advantages, including a robust vascular supply, preservation of the buccal vestibule, and keratinized mucosa that enhances the durability of the reconstruction. The palatal mucosa is thicker than the buccal mucosa, making it less susceptible to tearing or rupture. The primary blood supply to the palatal flap is derived from the greater palatine artery, which has extensive anastomoses with other arteries. Anteriorly, it connects with the nasopalatine artery, while the right and left greater palatine arteries also anastomose. Posteriorly, it is linked to the ascending pharyngeal artery. Even if the greater palatine artery is ligated, the palatal flap retains sufficient vascular supply to ensure viability.

Indications

Palatal flaps are specifically indicated for the repair of large defects, typically those exceeding 10 mm in size. Studies by Lee and colleagues reported a 76% success rate for palatal flaps, emphasizing that an appropriate length-to-width ratio is critical for achieving successful outcomes.

Contraindications and Limitations

Certain conditions contraindicate the use of a palatal flap. These include prior palatoplasty or traumatic injuries to the palate. Additional contraindications may apply to patients who may struggle with adhering to postoperative care instructions. Factors such as the use of continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP), a history of smoking, or coagulopathy may compromise the healing process and thus are considered limitations for this technique.

Tongue Flap

The tongue flap is another option for reconstructing oroantral communications (OACs) (Strauss & Kain, 2014). It is typically utilized in cases where buccal and palatal flaps have failed and the defect exceeds 15 mm in size. This flap offers benefits such as excellent vascularity and flexibility; however, its success can be hindered by the tongue's mobility during speech and swallowing. To address this issue, some researchers suggest the use of maxillomandibular fixation (MMF) during the postoperative period.

Tongue flaps can be classified as anterior-based or posterior-based, depending on the location of the defect. Anterior-based flaps are commonly used for defects in the hard palate and anterior buccal mucosa, while posterior-based flaps are suitable for defects in the soft palate and posterior buccal mucosa (Gupta et al., 2020). Lateral tongue flaps are another alternative for OAC repair. The design and dimensions of the flap are determined by the defect's location and extent, with a typical thickness ranging from 3 to 5 mm. The flap can extend from within 1 cm of the tongue tip anteriorly to within 1 cm of the circumvallate papilla posteriorly. The flap is sutured to the defect margins and left in place for 14 to 21 days to allow for healing, after which the pedicle is severed, and the tongue tissue is repositioned. A third procedure may occasionally be required within three months to reduce the bulk of the recipient site.

Patient tolerance is a significant limitation of this procedure (Visscher et al., 2010). Relative contraindications include smoking and medical conditions such as anxiety disorders, seizures, severe malnutrition, and diabetes. Postoperative complications include tongue edema, which may result in airway obstruction. The use of Decadron can help minimize tongue swelling. If the patient is in MMF, wire cutters must be kept bedside with instructions for emergency wire release. In cases of significant bleeding, MMF may need to be temporarily removed. A liquid diet is recommended until the flap is divided.

Layered Closure for Oroantral Communications

Buccal Fat in a 3-Layered Closure

Conventional techniques primarily focus on soft tissue closure for OACs or oroantral fistulas (OAFs). However, these approaches may have drawbacks. A residual defect can create a dead space, leading to fluid accumulation, increased tension on wound edges, and potential wound breakdown. Accumulated fluid may also become a nidus for infection. Introducing a bone graft before soft tissue closure offers several advantages, including providing a scaffold for healing and preventing sinus pneumatization to the alveolar crest.

Weinstock et al. described a successful three-layered closure of a 1 cm OAC, performed three days after the communication formed. The procedure began with a sulcular incision from the maxillary canine to the second molar, along with vertical releasing incisions. The OAC was curetted, and a Caldwell-Luc window was created in the canine and premolar region above the OAC, taking care to preserve the bony window. The bony window was then repositioned over the defect. A buccal fat pad (BFP) was harvested and sutured in place, followed by a buccal advancement flap. Postoperative follow-up at 10 months revealed no signs of sinusitis or complications.

The Use of Platelet-Rich Fibrin in a 3-Layered Closure

Rosenfeld et al. reported a case of successful layered closure utilizing advanced platelet-rich fibrin (A-PRF), a BFP, and a buccal advancement flap. A-PRF is a novel technique involving the centrifugation of 10 mL of the patient’s blood at 208 gravities for 8 minutes (Ghaznavi et al., 2019). A-PRF is rich in platelets, leukocytes, transforming growth factor-beta-1, vascular endothelial growth factor, and bone morphogenetic protein 2, all of which are crucial for wound healing and have antimicrobial properties.

In this case, two A-PRF membranes were prepared from 20 mL of the patient’s blood using a PRF box to press and stabilize the membranes for an additional 8 minutes. After removing granulation tissue and irregular bony margins, the A-PRF membranes were positioned to cover the defect. The BFP was then advanced to seal the OAC completely. Vertical releasing incisions in the buccal vestibule allowed for the advancement of the buccal periosteum, ensuring complete soft tissue coverage. The patient was discharged with sinus precautions and antibiotics (Augmentin) and showed no signs of sinusitis, wound infection, or dehiscence during follow-ups.

The incorporation of A-PRF provided added stability to the BFP and buccal flap layers and expedited wound healing while offering local antimicrobial protection. This technique is particularly beneficial for patients with poor wound healing or those unable to afford more expensive alternatives like xenografts.

Review of the Literature on Soft Tissue Closure for Oroantral Communications

According to a review by Visscher et al., the buccal advancement flap is the most frequently employed method for managing oroantral communications (OACs). The procedure demonstrates a success rate of 93%. However, a notable drawback is the reduction in vestibular depth, which, as reported by von Wowern, becomes permanent in 50% of cases. Many researchers advocate for the use of buccal flaps in smaller defects due to their limited perfusion and thinner structure compared to palatal flaps, making them less ideal for larger defects or recurrent fistulas.

As previously mentioned, another approach for soft tissue closure of OACs is the use of palatal flaps. This method is especially recommended for defects exceeding 10 mm in size. Lee et al. reported a 76% success rate for palatal flaps in a study involving 21 patients. Salins and Kishore highlighted that the rich blood supply from the greater palatine artery contributes to the flap's success. Additionally, the palatal flap's thickness reduces the risk of rupture. However, the technique does present a disadvantage; the rotation of the flap results in an area of exposed bone that heals through secondary intention, which can cause significant discomfort for patients. Awang noted that surgeons tend to prefer palatal flaps over buccal flaps.

The buccal fat pad (BFP) technique has also demonstrated high success rates. Hanazawa et al. achieved success in 13 out of 14 patients using this approach. Neder emphasized the proximity of the BFP to the surgical site as a key factor in its effectiveness. The BFP benefits from a robust blood supply, though it is a technique-sensitive procedure. It may not yield as high a success rate for larger defects, as attempting to close large defects with this method can result in graft necrosis. Therefore, it is recommended for medium-sized defects, approximately 5 × 4 cm in size.

Tongue flaps are another option for addressing OACs. The success of this approach is largely attributed to the tongue's rich vascularity. Siegel et al. utilized a full-thickness pedicled flap from the lateral tongue border to successfully close a large OAC following partial maxillectomy, with uneventful healing in the patient. Similarly, Kim et al. employed a posteriorly based full-thickness lateral tongue flap to manage OAC closure, with positive outcomes. Despite these advantages, patient discomfort and the necessity for multiple surgical procedures are potential limitations of this technique.

Bone Grafts

Bone grafting is an additional method for closing OACs and oroantral fistulas (OAFs). This approach is generally recommended for larger defects or for cases where soft tissue closure has failed. Using bone grafts may also reduce the need for future sinus augmentation. Bone graft material can be harvested from several sites, including the anterior ramus, symphysis, maxillary tuberosity, and anterior iliac crest. Although harvesting from the anterior iliac crest provides access to a substantial volume of bone, it is associated with greater morbidity.

Hass et al. described a standardized technique for using bone grafts, which involved creating a uniform defect in the sinus floor with a trephine bur. A bone graft of matching size was inserted into the defect and secured with miniplates. Soft tissue closure was then achieved using a buccal flap. Additionally, several researchers have recommended performing a sinus lift procedure concurrently with OAC closure and the placement of bone graft material.

Xenografts

Resorbable Collagen Membrane

Markovic et al. detailed the use of a resorbable Bio-Gide collagen membrane for OAC closure (Markovic et al., 2009). This membrane supports blood clot stabilization, promotes cell organization and reepithelialization, and facilitates bone replacement. The dense, porous structure of the porcine collagen permits osteoblast infiltration while preventing the formation of fibrous tissue. After curetting the granulation tissue at the fistula site, the Bio-Gide membrane was positioned and secured with resorbable pins over the bony defect, without the need for repositioning the buccal flap. The membrane was intentionally left exposed postoperatively, with complete soft tissue closure achieved within two weeks. The collagen membrane naturally resolves within 24 weeks. This technique is particularly advantageous for managing moderately large defects, cases with missing neighboring teeth, and situations where insufficient soft tissue is available for local grafts.

Sandwich Technique Using Collagen Membrane and Bone Substitutes

Ogunsalu reported a technique combining Bio-Gide collagen membranes with Bio-Oss bone graft material. The procedure involved encasing bovine cancellous bone particles between two layers of resorbable collagen membranes. Three edges of the membranes were sutured together using resorbable sutures to prevent leakage of the bone particles. The Bio-Oss particles were then inserted into the "sandwich," which was subsequently closed entirely with resorbable sutures and positioned into the communication. Buccal and palatal flaps were then repositioned for primary closure. Follow-up evaluations confirmed the formation of a bony floor with sufficient bone height to support dental implants. This technique provides simultaneous soft and hard tissue closure without the need for donor site surgery and offers promising outcomes for achieving optimal bone height for endosseous implants.

Metal Foils and Plates

The use of metal foils and plates for closing oroantral communications (OACs) has been documented. Commonly used metals in these techniques include tantalum, vitalium, gold, and aluminum. The procedure involves the elevation of a split-thickness mucoperiosteal flap, ensuring that the inner periosteal layer remains attached to the bone. Retaining the inner layer of periosteum facilitates more efficient healing, while a metal foil placed over this layer acts as a scaffold for mucosal overgrowth. Buccal and palatal tissues are sutured without tension, and the healing process typically spans 4 to 6 weeks. The reparative tissue often displaces the metal from its original position, enabling easier removal. This method is advantageous due to its simplicity, minimal scarring, and preservation of intraoral anatomy. However, the time required for soft tissue healing over the defect can be a drawback. Aluminum foil offers a cost-effective alternative to gold foil, with favorable outcomes reported by Steiner et al., who observed no residual sinusitis or infection in eight cases.

Hydroxyapatite Block

OAC closure using nonporous hydroxyapatite (HA) blocks has been reported with positive outcomes. This technique involves carving the HA block to match the bony margins of the defect. For larger defects, bur holes are drilled in the bony margins, and a 26-gauge wire is used to stabilize the block, preventing dislodgment into the maxillary sinus. Primary closure is achieved while preserving vestibular height. The HA block provides a scaffold for tissue growth over the defect and eventually loosens and exfoliates once the sinus is sealed. This approach is advantageous as it transforms a large defect into a smaller, sealed area, promoting spontaneous healing without donor site morbidity. However, trimming the HA block to fit the defect is time-consuming, and prefabricated blocks are available in limited sizes.

Alternative Approaches to Oroantral Communication Closure

Third Molar Transplantation

Kitagawa et al. described a novel method for OAC closure involving the transplantation of third molars with closed apices into the defect site immediately after extractions. In this study, two patients in their 30s were undergoing implant planning following the removal of non-viable maxillary teeth with periapical infections extending into the maxillary sinus. Anticipated OACs were addressed by transplanting third molars into the defects. Mucoperiosteal flaps were not raised to maintain sufficient blood supply, and the donor molars were extracted with minimal damage to the root surfaces. Recipient sockets were reshaped to accommodate the transplanted teeth, which underwent endodontic treatment three weeks later, followed by prosthetic restoration. Both patients experienced no complications two years post-procedure. The success of this technique relies on factors such as recipient site soft tissue viability, alveolar bone height exceeding 5 mm, root integrity of the donor tooth, and the compatibility of the recipient socket size with the defect.

Laser Therapy

Low-level laser therapy has gained acceptance in oral and maxillofacial surgery due to its ability to enhance wound healing by stimulating angiogenesis and collagen synthesis in a dose-dependent manner (Ustaoglu et al., 2017). Grzesiak-Janas and Janas applied a biostimulative laser with 30-mW power and 830-nm wavelength to treat 56 patients with OACs larger than 8 mm. Irradiation was administered for 3.5 minutes at a dosage of 4 J, targeting the infraorbital region extraorally and the alveolar process intraorally. Complete closure of OACs was achieved in all cases within four days of consecutive treatment, with patients reporting no postoperative pain or discomfort. This method effectively mitigates postoperative symptoms such as nasal discharge, rhinitis, headache, and localized pain. However, its disadvantages include high costs and the need for multiple patient visits.

Oroantral Communication Closure in Immunocompromised Patients

Delayed wound healing is a common complication in immunocompromised individuals following tooth extractions. OAC cases have been reported in patients with human immunodeficiency virus (HIV). For such patients, surgical approaches may prolong the healing process. Logan and Coates described the use of an acrylic splint as a scaffold after debridement of epithelial tissue from the OAC. The patient was instructed to rinse the splint with 0.02% chlorhexidine gel after meals. Complete closure of the OAC was observed after eight weeks, allowing for the removal of the splint. However, for OACs larger than 5 mm in immunocompromised patients, surgical intervention remains indicated.

Conclusion

Oroantral communications (OACs) and fistulas (OAFs) remain significant challenges in oral and maxillofacial surgery. Timely and effective closure techniques are essential to prevent complications such as maxillary sinusitis. This review highlights a variety of methods, ranging from traditional soft tissue closures, such as buccal advancement and palatal flaps, to more advanced techniques like the use of platelet-rich fibrin, bone grafts, and xenografts. Alternative methods, including tongue flaps, metal foils, and hydroxyapatite blocks, expand the options for addressing complex cases.

Each technique has distinct advantages and limitations, often dictated by the size of the defect, patient health, and surgical goals. Novel approaches, such as low-level laser therapy and third molar transplantation, demonstrate promising outcomes in specific scenarios. For immunocompromised patients, non-surgical options, such as acrylic splints, offer viable alternatives.

Ultimately, the choice of treatment must be individualized, taking into account defect size, patient comorbidities, and the availability of resources. A multidisciplinary approach and adherence to advancements in materials and techniques can significantly enhance patient outcomes and reduce morbidity associated with OAC and OAF management.

References

Borgonovo, A. E., Berardinelli, F. V., Favale, M., & Maiorana, C. (2012). Surgical Options In Oroantral Fistula Treatment. *The Open Dentistry Journal*, *6*(1), 94–98. https://doi.org/10.2174/1874210601206010094

Dym, H., & Wolf, J. C. (2012). Oroantral Communication. *Oral and Maxillofacial Surgery Clinics of North America*, *24*(2), 239–247. Scopus. https://doi.org/10.1016/j.coms.2012.01.015

Falci, S. G. M., & Dos Santos, C. R. R. (2015). Modification of the vestibular mucoperiosteal flap technique for closure of oroantral fistula. *Journal of Craniofacial Surgery*, *26*(7), e659. Scopus. https://doi.org/10.1097/SCS.0000000000002069

Ghaznavi, D., Babaloo, A., Shirmohammadi, A., Zamani, A. R. N., Azizi, M., Rahbarghazi, R., & Ghaznavi, A. (2019). Advanced platelet-rich fibrin plus gold nanoparticles enhanced the osteogenic capacity of human mesenchymal stem cells. *BMC Research Notes*, *12*(1). Scopus. https://doi.org/10.1186/s13104-019-4750-x

Gupta, N., Shetty, S., & Degala, S. (2020). Tongue flap: A “workhorse flap” in repair of recurrent palatal fistulae. *Oral and Maxillofacial Surgery*, *24*(1), 93–101. https://doi.org/10.1007/s10006-019-00823-9

Hasegawa, T., Tachibana, A., Takeda, D., Iwata, E., Arimoto, S., Sakakibara, A., Akashi, M., & Komori, T. (2016). Risk factors associated with oroantral perforation during surgical removal of maxillary third molar teeth. *Oral and Maxillofacial Surgery*, *20*(4), 369–375. https://doi.org/10.1007/s10006-016-0574-1

Jamali, J. A. (2014). Palatal Flap. *Oral and Maxillofacial Surgery Clinics of North America*, *26*(3), 305–311. https://doi.org/10.1016/j.coms.2014.05.012

Kademani, D., & Tiwana, P. (2015). *Atlas of Oral and Maxillofacial Surgery*. Elsevier Health Sciences.

Khandelwal, P., & Hajira, N. (2017). Management of Oro-antral Communication and Fistula: Various Surgical Options. *World Journal of Plastic Surgery*, *6*(1), 3–8.

Markovic, A., Colic, S., Drazic, R., Stojcev, L., & Gacic, B. (2009). Closure of large oroantral fistula with resorbable collagen membrane: Case report. *Stomatoloski Glasnik Srbije*, *56*(4), 201–206. https://doi.org/10.2298/SGS0904201M

Norton, N. S., Netter, F. H., & Machado, C. A. G. (2017). The paranasal sinuses. *Netter’s Head and Neck Anatomy for Dentistry*, 318–336. Scopus.

Parvini, P., Obreja, K., Begic, A., Schwarz, F., Becker, J., Sader, R., & Salti, L. (2019). Decision-making in closure of oroantral communication and fistula. *International Journal of Implant Dentistry*, *5*(1), 13. https://doi.org/10.1186/s40729-019-0165-7

Parvini, P., Obreja, K., Sader, R., Becker, J., Schwarz, F., & Salti, L. (2018). Surgical options in oroantral fistula management: A narrative review. *International Journal of Implant Dentistry*, *4*(1), 40. https://doi.org/10.1186/s40729-018-0152-4

Simuntis, R., Kubilius, R., & Vaitkus, S. (2014). Odontogenic maxillary sinusitis: A review. *Stomatologija / Issued by Public Institution “Odontologijos Studija” ... [et Al.]*, *16*(2), 39–43. Scopus.

Strauss, R. A., & Kain, N. J. (2014). Tongue Flaps. *Oral and Maxillofacial Surgery Clinics of North America*, *26*(3), 313–325. https://doi.org/10.1016/j.coms.2014.05.002

Ustaoglu, G., Ercan, E., & Tunali, M. (2017). Low-Level Laser Therapy in Enhancing Wound Healing and Preserving Tissue Thickness at Free Gingival Graft Donor Sites: A Randomized, Controlled Clinical Study. *Photomedicine and Laser Surgery*, *35*(4), 223–230. https://doi.org/10.1089/pho.2016.4163

Visscher, S. H., van Minnen, B., & Bos, R. R. M. (2010). Closure of Oroantral Communications: A Review of the Literature. *Journal of Oral and Maxillofacial Surgery*, *68*(6), 1384–1391. https://doi.org/10.1016/j.joms.2009.07.044