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Review Article

Surgical Management of Oro-Antral Communication (Updated Review)

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Received: March 09, 2020; **Published:** March 26, 2020

Abstract

Background: Oro-antral communication is one of the most common complications during the oral surgical procedure. It can be caused by several conditions like the presence of upper molars with long divergent roots, cyst, periapical infections, also can be caused by maxillary tuberosity fracture. This complication should be managed quickly to prevent the epithelial growth and fistula formation. Factors like site contamination, time of perforation and diameter of defect are critical in treatment plan of this communication. It can be managed by several techniques like the use of platelet rich fibrin, buccal pad of fat, through several types of surgical flaps like buccal advancement flap, palatal rotation flap, transposition flap, or by tongue flap. This review is aimed to give a comprehensive view about the etiologies, diagnosis and the variable surgical management of oro-antral communication.

Methodology: In this review, online researchers will be used to get articles to current subject using scientific databases such as PubMed, google scholar and dental medical books (with English language) about surgical management of oro-antral communication.

Keywords: *Oro-Antral; Fistula; Communication; Oral Surgery; Complications*

Introduction

The oro-antral communication (OAC) is one of the most common complications during the oral surgical procedure and it is considered as unnatural opening between the oral cavity and the maxillary sinus [1]. The OAC mostly induce by extraction of upper molars especially with long diverge roots, cysts, benign or malignant tumor, tuberosity fracture, periapical infection of the upper maxillary posterior teeth, osteoradionecrosis, flap necrosis, dehiscence and dislodgment of implants into the sinus [1]. should be treated within 48h to prevent bacteria, food accumulation and other mouth content from entering the maxillary sinus, if not may lead to Oroantral Fistula or maxillary sinusitis in two weeks [2,3]. OAF is an unnatural epithelized pathological communication. This condition accompanied by many symptoms such as Epistaxis, pain surrounded the injured area, bad odor, whistling during speech and fluid discharge from the nose [4]. In addition of difficulty in drinking with straw. Site contamination, time of perforation and diameter of defect are the most critical factors in treatment plan [4]. OAC is one of the most difficult problems in the field of oral and maxillofacial surgery [5]. This review is aimed to give a comprehensive view about the etiologies, diagnosis and the variable surgical management of oro-antral communication.

Diagnosis of OAC

On clinical inspection Fistula can be easily seen throw the defect. Blowing test can be used as diagnostic test for the OAC, by asking the patient to close his nostrils and blow with an open mouth [2]. Laboratory test advisable if any sign of pus formation or exudate [6]. Immediate treatment after diagnosis of patient with OAC will prevent the formation of oro-antral fistula [7].

Normal anatomical features of maxillary sinus (radiolucent pyramidal cavity surrounded by cortical bone) helpful in detecting any abnormality [1]. All the standard dental radiographs can be used for diagnosis, although, some areas and structures may not be clearly seen mainly in preapical radiographs there is limitation in sinus floor evaluation [1]. Panoramic radiograph gives bilateral view and comparisons between two side [1]. Computed tomography is radiographic technique that used to determine any facial bony defects and maxillary sinuses [1]. CBCT is the best radiograph to assist defect diameter [6]. further information can be gained from the radiograph by means of radiopaque materials e.g. a gutta percha inserted in the socket [3].

Management of OAC

Closure of communication should be done after confirm absent of infection, foreign body or inflammatory change in mucus membrane [6,8]. The surgical intervention is not mandatory if the defect diameter from 1 to 2 mm, it will heal spontaneously [3]. There are surgical and non-surgical procedure used for treating this condition [1].

Hydroxyapatite, bioabsorbable root analogues and transplanted third molar are non-surgical approaches for treating OAC, however it is not suitable techniques when compared to other surgical treatment [3].

Surgical treatment

Platelet rich fibrin (PRF), different flap designs includes (buccal advancement flap, palatal rotation, palatal transposition, tongue flaps and nasolabial flap), Buccal fat pad flap (BFP), grafts material and guided tissue membrane(GTR), gold foils, gold plates and polymethylmethacrylate, Non-porous hydroxyapatite blocks, low doses of laser light, auto-transplantation of upper third molar, Biodegradable polyurethane foam, Bony press-fit technique, Allogenic acellular dermal graft tissue, by using endoscopic surgical equipment, using cartilage for OAC.

Buccal fat pad flap: Has been used for many procedures other than OAC, Because of its superior advantages and results. BFP are easy and quick surgical technique, favorable anatomical site, good blood supply, simple procedure, minimal complication and possibly of harvesting under local anesthesia can be considered as an added advantage [9,10]. Although it requires advance skills to reduce post-operative complications.

Guided tissue regeneration membrane-bone substitute sandwich technique: It's a new procedure on treating OAC. The sandwich technique is quick and simple. it provides good clinical healing and integration into the hard and soft tissues. One of the good advantages of this technique is minimal pain, swelling and alveolar bone is maintained [11].

Flaps: Are the most popular technique with high successful rate for manage oral defect and OAC with minimum post-operative complication, the main disadvantage it decreases sulcus depth with sever bone loss that affect prosthetic and implant treatment later on [4,8]. In recent study they advise to use autogenous bone graft to solve this disadvantage by increase vertical and horizontal dimensions of alveolar bone, but it considers as invasive procedure with high donor site morbidity [8].

Platelet rich fibrin (PRF): It's a simple biocompatible technique has been used for treating the OAC. Growth factor accelerate healing process without any complain or relapse, has minimal tissue destruction with anti-inflammatory effect [2,7,8].

Alloplastic material to close OACs: Several studies have reported on the advantage of alloplastic materials such as resorbable collagen membranes and gold foil [12]. Gold foil, aluminum plates and tantalum foil have been described for closure of OAC. In general, the gold foil technique used in large defect of OAC after the failure of all previous technique. Although, this technique has disadvantage of long period time of complete healing and expensive technique. In addition, aluminum plates were used with the gold technique to aid in closure as protective plates [12].

Alternative techniques: In recent study third molar transplantation has been reported for OAC closure. The donor teeth do not need any additional stabilization method only firm finger pressure, light tapping and slight infra-occlusion. Limitations of this technique depends on a proper fitting and the recipient socket [12].

Methodology

In this review, online researchers will be used to get articles to current subject using scientific databases such as PubMed, google scholar and dental medical books (with English language) about surgical management of oro-antral communication.

Discussion

According to many studies, Immediate closure of OAC in 24h to 48h shows high success rate 95% [13]. if Oro-antral communication last more than two weeks should be treated surgically in order to avoid any medical problems. Size and location of the defect help in picking up the appropriate treatment [14].

Multiple surgical flaps treatment options are available for management of OAC/OAF. All those flaps have advantages and disadvantages. Proposed treatment is different from patient to another. Sliding buccal flap is the most common technique to manage the OAC. It has mild postoperative complication when compared to others flaps. The main problem for flap techniques is decrease in sulcus depth with time [4,15].

Whereas, in large extended defects, lingual flap can be used in patients who have had multiple surgeries. it has no risk at the donor site, simple, reliable and effective technique. But, Th only drawback of this technique is that it needs two surgical procedure and nasogastric intubation between the visits to achieve closure. Speech problems, depressed lingual mobility, pain lasting for three weeks approximately seen in this technique [16].

Palatal flap technique has advantages of good vascularization, the best for tissue quality and adequate thickness [17]. However, it's only preformed for OAF in premolar area due to the excessive rotation of the palatal flap when closing the OAF in molar area, which could cause palatal artery occlusion and necrosis and that lead to ischemia of the flap [17,18].

In addition, disadvantages of bone exposure palatally, which requires more time for re-epithelization from 2 to 3 months, pain and surface irregularities due to secondary healing [17,19].

Furthermore, the palatal flap considers as more complicated procedure in comparison with buccal flap [19].

Buccal flap is easier technique but it's not the optimal flap technique in a large or recurrent OAF with less vascularization, and it's affecting the depth of buccal vestibule [18,19].

Modified double layered flap technique it's better than the old technique, the flap is must be longer and wider than the fistula, Which's make the suturing technique easier and minimize trauma to both buccal and palatal side, so the healing process is faster with a decreased risk of ischemic complications and relapse [20].

However, PRF and collagen membrane shows superior advantages and results. Low cost, low risk and shorter healing time have been reported in this method [15].

Umut., *et al.* are used PRF for treatment of OAC with a diameter from 3 to 5 mm. the technique was biocompatible, simple, immediate and not affect the sulcus depth. Complete epithelization and healing are done within 3 to 5 weeks. All patients tolerated this procedure without any complain or relapse [2]. This technique will make the treatment less traumatic, easier and will eliminate the need for special surgical expertise [13].

In a previous case report, they have been used PRF with autogenous bone graft in the defect site to minimize the risk of sulcus reduction, but it considered as an invasive technique [8].

According to G Sandhya., *et al.* Guided tissue regeneration membrane-bone substitute sandwich technique is a new approach that provides good clinical healing and integration into the hard and soft tissues. minimal pain, swelling and alveolar bone is maintained [11].

BFP is a good approach that can results in successful epithelization, low failure rate, short surgical duration and it can be used with large defects [21]. Mild reduction in the height of the vestibule, limited mouth opening has been seen in this technique. it has a mild rate of recurrence that requires a second surgery to perform closure and skillful operator [2,4,14,22,23].

In recent studies they report using cartilage to provide ideal healing between the sinus membrane and oral mucosa.

Cartilage has minimal vascularity and resistant to infection, this characteristic decreases the failure incidence of the graft.

It can be easily trimmed and bent so can be used in a compound and large defect. Also, scar or defect formation do not occur on the donor site [24,25].

In case of future scheduled for implant rehabilitation, some experimental studies they emphasized that using of autogenous bone graft material will give better results in osteo-integration on the receiving site, which would help in closure of OAF, rather than using of xenogenous bone graft. Moreover, this technique indicated for treating moderate to large OAF [26].

Previously the gold foils, gold plates and polymethylmethacrylate have been performed for treatment of OAF, but it had disadvantages of high cost, higher risk for infections and increased time in preparing such as the polymethylmethacrylate [18].

Non-porous hydroxyapatite blocks have been used by Zide and Karas to close OAF. It considered a simple method with many different sizes, shapes and sizes of defects. Also, advantages of less disruption of the soft tissues, increased patient compliance and it's not indicated optimal soft tissue closure to cover the blocks. Although it has disadvantages of high cost and more time consuming for carving the blocks [18].

The auto-transplantation of upper third molar can be done to closing OAF and replacement of the missing tooth without need for fixed or removable denture, moreover has advantages in accelerate the healing time and preservation of vestibular depth. However, This technique not applicable in case of large fistula and advance bone resorption. It's performed only on OAF caused by extraction of the molars. Also, it's requires special surgical expertise and third molars with appropriate size and shape. in case of failure, complication is managed by removal of the transplanted teeth and administration of antibiotic with anti-congestion drugs [19].

Cameron YS described a new technique by using High density polytetrafluoroethylene (dPTFE), This is a non-irritant synthetic polymer that has a biological inert. It's mainly used in small OAC defect. This non-resorbable membrane is strengthened with titanium frame to preserve its rigidity. it minimizes the bacterial invade as it can withstand exposure in the oral cavity. This method doesn't require experience. minimal bleeding and pain was observed in this technique.

The technique was successful with less complications, and when compared to others surgical methods it has the superior advantages [27].

Julia Noel et al, have been used the pedicled naso-septal flap for closure of OAF and facilitate vascularized tissue. They used this method with a large defect size (20 mm) in the first premolar region, complete healing is done after 3 months with mild nasal obstruction due to rotation of the flap across the nasal cavity [28].

Hori., *et al.* preformed a new technique for OAC closure named as Dean's technique. It was applied in 8 patients and all of them succeed. This technique was for small defects and done by removal of the interseptal bone and both the buccal and palate cortex are repositioned. Unlike other flap techniques, the main advantages of Dean's technique are minimal postoperative swelling and the buccal sulcus depth is not affected [12].

Grazesiak-Janas and Janas reported a new technique by low doses of laser light. The laser light used for 10,5 minutes for 4 sequential days for sixty-one patients. Surgical intervention is not necessary to achieve closure. Which is considered as an obvious advantage of this technique. technique. Even though, high costs and multiple visits are needed for healing process [12].

Biodegradable polyurethane foam its resorbable material that's effective in OACs treatment by inserting cylindrically shaped foam inside the defect, in this study they used this method and it was successful treatment and not required skillful clinician, its simple and quick procedure. However, it had some disadvantages like displacement of the material into the sinus and causing maxillary sinusitis. One case only reported recurrent OAC [29].

Allogenic acellular dermal graft tissue it's used in a treatment of a persistent oro-Antral fistula. the main advantages over the old technique are, easy technique and optimal results, revascularization occur due to presence of hydrophilic dermal surface and epithelialization [30].

Ibrahim., *et al.* described a new approach by using endoscopic surgical equipment, this technique was applied for some patient by removing the chronic inflammation (fistula) endoscopically throw the natural ostium and graft the defect with autogenous bone. The technique was easy and eliminate the need for surgical flap and pre-operative antibiotic, infections was controlled with irrigation only. The most important problem in this approach was the sensory loss in the area innervated by inferior orbital nerve in 16.6 as well it needs experienced operator and endoscopic surgical equipment [31].

Bony press-fit technique it's a bone graft for the closure of an OAC its intraoral bone harvested from chin, buccal exostosis or ramus. its placed into the perforation area. The graft acts as supportive plug between the sinus cavity and the flap [32].

The advantages of this technique are minimizing the formation of secondary fistula, less of a health risk, easy and short technique.

The main drawbacks are closure of OAC may fail in cases with large communication and bone healing is compromised [32].

Mandibular bone grafts for Combined bony closure of oroantral fistula and sinus lift, this method for large deficits treatment by using bone from chin and retromolar regions. The technique was successful and has advantages of reducing the total treatment time and number of procedures. However, it may also present some disadvantages, such as the need for a bone donor site, vestibuloplasty, shorting of vestibular depth and second alveolar augmentation [33].

Conclusion

OAC/OAF is the most common complication occur during maxillary teeth extraction. Treatment of this condition should be as early as possible to minimizes further problems. Treatment choice is based on the size and location of the defect. Buccal flap PRF are used for smaller defect. Whereas, in large defects BFP, lingual flap, Flaps with autograft can be the treatment of choice. Management of OAC/OAF is different from patient to another.

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Volume 19 Issue 4 March 2020