Use of a Non-Resorbable DPTFE Membrane to Close an Oroantral Communication of the Posterior Maxilla after Tooth Extraction: A Case Report

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Abstract

Oroantral communication (OAC) is a common complication following extraction of maxillary premolar and molar teeth. This is due to the close anatomic proximity of the roots of these teeth to the maxillary sinus. The most frequent methods utilized in the office described in the literature to close an oroantral communication involve the use of a buccal or palatal rotational advancement flap or use of the buccal fat pad. These surgical procedures require appropriate surgical skill and training to manage this type of complication and are associated with donor site morbidity, such as avascular flap necrosis that can lead to soft tissue graft failure to close the OAC, infection and extreme postoperative patient discomfort. The goal of this case report is to describe a technique to close the OAC with a non-resorbable high-density polytetrafluoroethylene (dPTFE) membrane (Osteogenics, Lubbock, TX) that leads to predictable soft tissue regeneration and consistent closure of the OAC.

INTRODUCTION

Oroantral communication (OAC) is an iatrogenic complication of the hard and soft tissues of the maxilla due to extraction of the maxillary posterior teeth (premolars and molars) [1-4]. Although the incidence is relatively low (5%) [4, 5], OACs are frequently encountered due to the large number of extractions performed by general dentists and oral and maxillofacial surgeons. Such an iatrogenic complication can occur because of the proximity of the roots of the posterior teeth to the sinus floor and the thinness of the sinus floor [1,2,5]. However, this complication can also occur from implant surgery, enucleation of cyst and tumors from the posterior maxilla, orthognathic surgery, osteomyelitis, trauma, and pathologic entities [1-4].

Most small acute oroantral communications 1 to 2 mm in diameter will usually heal spontaneously after the formation of a blood clot and secondary healing if no infection is present [1-3, 6, 7]. However, larger oroantral communications may not heal leading to formation of an oroantral fistula (OAF) [2, 3, 8-12]. Surgical repair is the treatment of choice to close an OAC and numerous techniques have been developed [1-15]. The most frequently reported technique involves suturing the buccal and palatal gingiva directly over the OAC to obtain primary closure.

However, attempts at primary closure directly over the OAC have resulted in a relatively large number of failures [7-9]. Therefore, mucosal closure using a buccal mucoperiosteal flap or a palatal rotational flap should be considered, especially for larger OACs [9-11] The buccal fat pad has also been harvested for closure of OACs, especially when use of a buccal or palatal flap has failed [12-15].

In implant dentistry, guided bone regeneration (GBR) using barrier membranes with various bone grafting materials has been used to correct anatomical deficiencies, such as inadequate bone volume at the implant site for dental implant placement and to preserve the alveolar ridge for implant placement as a staged second surgery several months after the initial surgery to restore bone volume [16-20]. Barrier membranes are classified as either absorbable membranes and non-resorbable membranes. Absorbable membranes are usually made from collagen or other materials that have the ability to resorb over time when used in the oral cavity [21-23]. In contrast, non-resorbable membranes do not resorb when used in the oral cavity and must be removed by the surgeon several weeks after the bone graft procedure [24,25].

Recently, a new high-density polytetrafluoroethylene
(PTFE) membrane with a titanium frame embedded between the two layers of the PTFE has become commercially available to preserve the alveolar ridge of the jaws in preparation for dental implant treatment [26,27]. To the authors knowledge, there is only one published report in the dental literature that describes the treatment to close an OAC with an autogenous bone graft that uses a non-resorbable membrane to stabilize and protect the bone graft from infection placed directly in the OAC [28]. The purpose of this clinical case report was to describe the successful use of this non-resorbable membrane without any additional material to close an oroantral communication using a titanium-reinforced high-density polytetrafluoroethylene (dPTFE) membrane (Cytoplast Ti-250 Titanium-Reinforced Dense Membrane, Osteogenics Biomedical, Lubbock, TX).

CASE REPORT

A 54-year-old male presented to the office for surgical removal of the right maxillary second premolar tooth. Informed consent was obtained from the patient. Imaging studies consisting of a panoramic radiograph revealed that the roots of the tooth planned for extraction were in close proximity to the floor of the maxillary sinus. Benefits versus risks of the surgical procedure were discussed with the patient, including the risk of OAC. After local anesthesia was administered to the right posterior maxilla via local buccal and palatal infiltration, the premolar tooth was extracted with a dental forcep. After removal of the tooth, the OAC was immediately observed (Figure 1). The patient was informed of the diagnosis and the surgical site prepared to close the OAC using a dPTFE non-resorbable membrane (Figure 2; Cytoplast Ti-250 Titanium-Reinforced Dense Membrane, Osteogenics Biomedical, Lubbock, TX). Crestal, anterior and posterior vertical releasing incisions on the buccal surface of the maxilla were made with a #15 scalpel and raised to expose the buccal and lingual cortices of the posterior maxilla with a #9 periosteal elevator. The surgical site was debrided and prepared to receive the non-resorbable membrane that would be placed directly over the extraction site. The buccal and palatal ends of the dPTFE membrane were adapted to the maxilla for passive, tension-free closure (Figure 3). The soft tissue flaps were reapproximated and closed using PTFE sutures (Figure 4). Postoperative care consisted of augmentin 750 mg twice per day for seven days and rinsing with chlorhexidine gluconate 0.12% twice per day for 7 days. At 6 weeks post-closure of the OAC the membrane was removed without local anesthesia. It was immediately observed that the OAC was completely closed due to regeneration of the soft tissues directly over the OAC (Figure 5).

DISCUSSION

High-density polytetrafluoroethylene (dPTFE) membranes are made of a synthetic polymer that is non-resorbable, biologically inert and chemically non-reactive. The membrane used for each patient are reinforced with a titanium frame to maintain the rigidity of the membrane. It is an ideal material to close an OAC because of its ability to withstand exposure to the oral cavity due to their microporosity. This property makes the membrane less impenetrable to bacteria and epithelial cells because the intermodal distance is less than 0.2 um, and it is not multiporous. Bartee [26, 27] reported that the use of d-PTFE is particularly useful when primary closure is impossible without tension, such as adding a bone graft in extraction sockets, alveolar ridge preservation, large bone defects, and the placement of implants immediately after extraction. Barber et al. [29] also observed that the use of a d-PTFE membrane, which does not require primary soft tissue coverage can even achieve bone regeneration and soft tissue healing when the membrane is exposed.
The use of barrier membranes for the regeneration of hard and soft tissues in dentistry is an accepted procedure, especially in implant dentistry [16-25]. This case report describes the use of a non-resorbable membrane to effectively treat an OAC. This technique is user friendly for the clinician confronted with this complication as it does not require experience with harvesting and rotating soft tissue flaps in the oral cavity. To the authors knowledge, there are no studies describing this technique in management of an OAC.

This technique offers several advantages over other surgical techniques that require harvesting and rotating soft tissue flaps from either the buccal mucosal of the cheek or hard palate of the maxilla. In addition, the procedure can be completed under local anesthesia, or conscious sedation in the surgeon’s office. When the membrane is removed from the OAC site, the membrane can be removed without local anesthesia if it is exposed to the oral environment. If the membrane is not exposed to the oral cavity, it will have to be removed from the surgical site with local anesthesia.

For the patient, the post-operative recovery is far less painful compared to soft tissue rotational flap surgery, postoperative bleeding is minimal and the patient experiences a shorter recovery time.

CONCLUSION

The goal of closing an oroantral communications is separation of the oral cavity from the maxillary sinus and to prevent infection of the maxillary sinus. Closure of an OAC with the use of a dense PTFE non-resorbable membrane is an alternative treatment option that should be considered instead of a technique that requires harvesting a soft tissue rotational flap from the cheek or palate of the maxilla.

REFERENCES

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