Closure of small oroantral communications using heterologous biomaterials: A case series

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Abstract: Purpose: To provide a surgical strategy for small oroantral communication closure and bone regeneration that can meet the needs of an effective, less invasive, and simpler operation by utilizing procedures and biomaterials commonly employed in guided bone regeneration techniques. The primary goal was to close the communication, while the second aim was to achieve bone regeneration. **Methods:** This retrospective and monocentric case series was conducted using data from the medical records of 12 subjects with oroantral communications and bone deficits greater than 3 mm who were treated with a heterologous cortico-cancellous graft covered in resorbable collagen membranes. The primary outcome was communication closure, whereas the secondary outcome was bone augmentation, which was demonstrated radiographically and clinically. **Results:** Twelve individuals were treated consecutively for oroantral communication closure. The subjects consisted of eight men and four women. The mean age was 57.5 years. Closure was effective in all 12 subjects, and radiographic examination after 6 months revealed bone reformation in all cases. This procedure effectively isolated the maxillary sinus from the mouth cavity, resulting in seal and healing, as well as bone regeneration. (*Am J Dent* 2024;37:29A-32A).

Clinical significance: Small oroantral communications are frequent in dentistry, often requiring special expertise and interventions that affect patient morbidity. The use of a heterologous cortico-cancellous graft covered with resorbable collagen membranes can allow effective closure of the small communication, preventing migration of pathological epithelia while increasing the bone ridge.

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Introduction

An oroantral communication (OAC), also known as an oroantral fistula, occurs when abnormal communication forms between the oral cavity and the maxillary sinus.[1,2] This can happen following the extraction of a tooth in the upper jaw, or due to other surgical procedures.[3] Left untreated, OACs can lead to sinusitis, food and fluid passage into the sinus, and even implant failure.[4-6]

The clinical decision to close the OAC depends on several factors such as the size of the communication, time elapsed, the presence of infection at the time of diagnosis, and the presence of current infection.[7] The OAC may close spontaneously if its diameter is less than 3 mm and treatment is not necessary while OACs of over 5 mm in size require immediate closure due to a high risk of possible complications.[7] Surgical closure of OACs is a well-established procedure, traditionally relying on autologous soft tissue grafts and buccal and palatal flaps.[8] However, these techniques can cause additional donor site morbidity and discomfort for patients.[4] OACs of less than 5 mm in size pose an interesting treatment challenge. Traditional flap procedures, while effective for larger OACs, might be overkill for these smaller defects. The additional surgical site required to harvest the flap can lead to unnecessary patient discomfort and potentially prolong healing time.[7]

Biomaterials offer a promising alternative for managing smaller OACs. These biocompatible materials can be strategically placed to bridge the communication, promoting natural healing and tissue regeneration. The selection of the most suitable biomaterial depends on various factors, including the specific OAC characteristics and the desired outcome. Minimally invasive procedures translate to reduced patient discomfort, potentially shorter healing times, and less postoperative swelling.[9,10] This case series describes a closure technique for small oroantral communications with heterologous biomaterials.

Materials and Methods

Data from the medical records of patients who had consecutive treatment from 2015 to 2022 were used to perform this retrospective, observational case study. This study, (Protocol number 0009738/22), was authorized by the Agostino Gemelli University Hospital Foundation IRCCS Ethics Committee.

The 1975 Declaration of Helsinki on Human Experimentation, as amended in 2013 for ethical approval, was followed in conducting the investigations. The signed written consent form for all study data collection was received from subjects who met the inclusion and exclusion criteria.

Subjects with OACs exceeding 3 mm in bone deficit were included if they met the following criteria: age above 18 years; systemically healthy; smokers or non-smokers; able to provide written informed consent. Exclusion criteria included: head and neck radiation history; uncontrolled diabetes; general oral surgery contraindications; pregnancy or breast-feeding; alcohol or drug abuse.

Data collection - Patient demographics (age, sex), OAC dimensions, and etiology were recorded. CBCT scans confirmed OAC presence, and a millimeter-scale probe measured the defect size at the crest.

Study population - Fourteen subjects with oroantral communications from 3-5 mm and bone deficiencies were chosen; two were excluded for lack of follow-up data, resulting in a sample of 12 subjects. Data were gathered on the subject's age, gender, dimensions (mesiodistal × vestibular-palatal in mm), area, and etiology of the OAC. OAC communication was diagnosed using CBCT, then clinically confirmed and assessed at the crestal level using a millimeter-scale probe. OAC closure procedures use a heterologous cortical-cancellous graft covered with resorbable collagen membranes.

Surgical procedures - Before the surgery, each patient took oral amoxicillin 875 mg/clavulanic acid 125 mg (Augmentin[a] 1,000 mg) on the morning of the procedure and twice daily for 5 days. Prior to the surgery, the surgeon administered a local anesthetic (articaine hydrochloride 4% with adrenaline 1:100,000, Septanest[b]).

Following a crestal incision with a scalpel and 15c blade, a periosteal elevator was used to raise a full-thickness mucoperiosteal flap. (As a result, the communication became more evident, and easier to approach the sinus. During this phase, it was beneficial to collect the blood that flowed from the flap incision with a syringe without a needle and set it aside to mix with the heterologous cortico-cancellous bone. Following the detachment of the Schneiderian membrane, a heterologous cortico-cancellous bone graft (OsteoBiol Gen-Os[c]) coated in a resorbable collagen membrane (OsteoBiol Evolution[c]) was placed vestibular and palatally inside the maxillary sinus. Then, a collagen membrane was positioned, which was at least 2 mm larger than the existing defect. (Fig. 1) The membrane was stabilized using a thermoplastic gel (OsteoBiol TSV Gel[c]). The flap was subsequently repositioned, resulting in a primary closure of two horizontal mattress sutures and one continuous crestal suture.

Non-absorbable 4/0 threads in the pseudomonofilament of polyamide[d] sutures were used to achieve primary closure.

Following surgery, the patients continued antibiotic medication and received nasal decongestant and steam inhalation. All subjects were warned not to blow their noses, inflate balloons, play wind instruments, or sip through straws. The sutures were removed 10 days after the surgery.

Post-operative follow-up - Control appointments were scheduled at 1, 10, and 15 days into the intervention, as well as at 1, 3, and 6 months thereafter. All subjects were given specific advice on their dental hygiene. CBCT and X-ray control was conducted 6 months following the procedure.

Results

Twelve subjects were treated in succession for the closure of OACs. (Table). The subjects consisted of eight men and four women. The average age was 57.5 ± 9.65 years (range 41-72). Seven subjects had OACs in quadrant I, and five in quadrant II. OACs were developed to treat difficulties following tooth extraction in eight subjects, implantation complications in one patient, and foreign body issues in four patients.

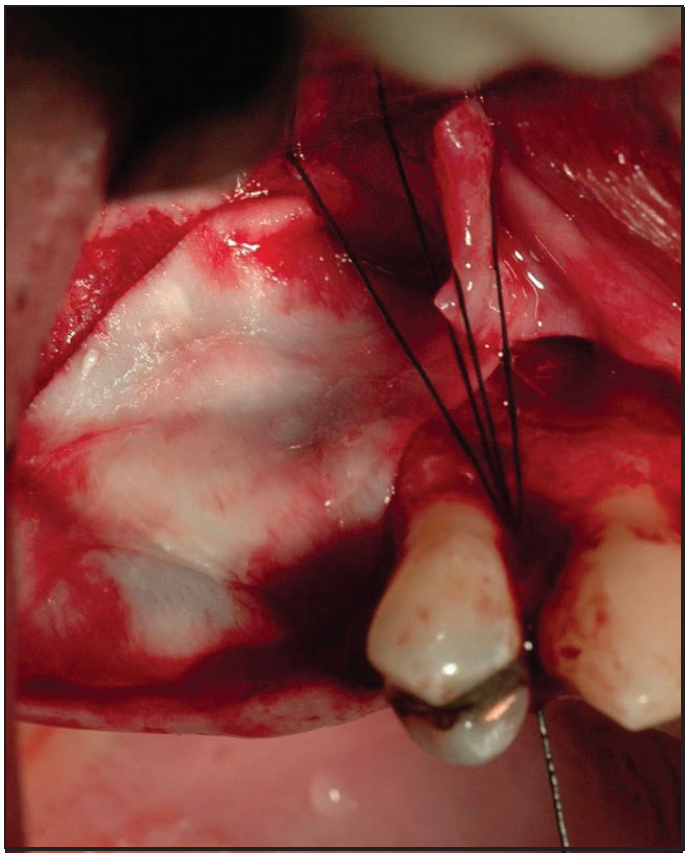

Fig. 1. Intraoral view of the biomaterial and membrane positioning.

The communications had a mean size of 3.67 mm ± 0.78 in the mesio-distal direction, and 3.25 mm ± 0.45 in the vestibular-palatal direction. All perforations were less than 5 mm.

Primary outcome - All interventions were completed without incident, and all 12 cases were successfully closed. Treatments with a cortico-cancellous graft and resorbable collagen membranes were well tolerated by all subjects, and soft tissue recovery occurred within 15 days.

Secondary outcome - Radiographic examination after 6 months showed bone reformation and restoration of the maxillary sinus in all the cases. After 6 months, the mean bone gain was 6.08 mm ± 3.90 over a range of 1-13 mm.

Discussion

The usefulness of a biomaterial-assisted closure method for small OACs with a diameter smaller than 5 mm was considered in this work. All 12 subjects had effective closure and bone regeneration.

Within 15 days, the OACs were closed with a 100% success rate. This is especially encouraging considering the difficulties that fewer flaws may present. Historically, it has been possible for mild OACs to continue because of challenges in creating a tight seal.[1] This obstacle seems to be solved by the biomaterial-assisted approach, possibly as a result of the following factors working together: by limiting epithelial down growth and fostering healing, the biomaterials most likely function as a physical barrier separating the maxillary sinus from the oral cavity,[1] by fostering an environment that is conducive to normal tissue growth, the biomaterials may help to close the communication gap.[1,9]

Table. Results and clinical data.

Subject	Age	Zone	Mesiodistal	Vestibulo-palatal	Etiology	Complications	Healing time (days)	Bone gain after 6 months (mm)
1	58	2.3	3	3	Implant complication	No	15	11
2	40	2.6	4	3	Foreign body	No	15	5
3	52	1.6	3	3	Classic	No	15	3
4	64	1.7	4	3	Classic	No	15	3
5	63	1.6	3	3	Classic	No	15	8
6	68	2.3	3	3	Foreign body	No	15	2
7	60	1.6	4	4	Classic	No	15	10
8	46	1.4	5	4	Classic	No	15	13
9	42	2.5-2.6	5	4	Classic	No	15	9
10	71	1.6	3	3	Classic	No	15	3
11	57	2.7	4	3	Classic	No	15	4
12	58	1.5	3	3	Foreign body	No	15	2

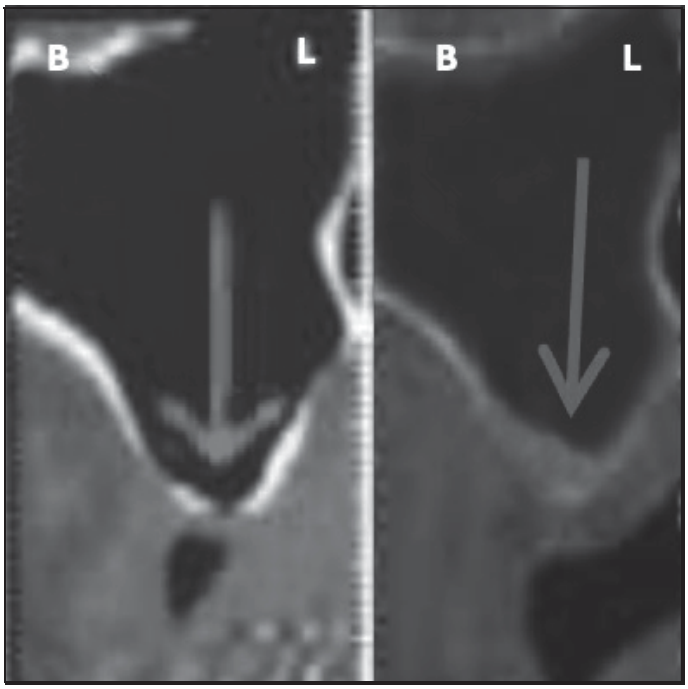

Fig. 2. 3D X-ray examination in coronal section before and after closure of oroantral communication.

Potential for bone regeneration - At 6 months, radiographic assessment showed that all subjects had gained bone, with an average increase of 6.08 mm (Fig. 2). This implies that the method not only successfully seals the OAC but also encourages bone regrowth inside the defect. This is an important point to note because future dental implant placement frequently requires sufficient bone volume.[11]

Benefits of treatment - This biomaterial-assisted technique's minimal invasiveness presents several potential benefits over conventional flap procedures as it lessens patient discomfort because this method may reduce postoperative discomfort and swelling and does not require a second surgical site for flap harvesting.[9,12] Moreover healing times are shorter when compared to flap surgeries; the observed 15-day healing period points to a possibly quicker recovery. Another possible advantage should be a simplified surgical technique compared to flap surgery, as the biomaterial-assisted technique may require less technical expertise, thus saving surgical time and simplifying the procedure.[9,12-14]

Restrictions and limitations - Even if the results are encouraging, there are things to consider such as the short-term follow-up because the data in this study are limited to 6 months.[15,16] A long-term follow-up is required to evaluate bone healing and the longevity of the closure. The sample size of 12 participants was small.[17] More extensive research is required to validate the applicability of these results to a wider demographic. The type of biomaterial could be a variable to consider, so it may be possible to investigate further the effectiveness of various biomaterials for OAC closure.[16]

This study showed that biomaterial-assisted closure is a potentially effective minimally invasive method for treating minor OACs. The method produced a good closure, encouraged bone regrowth making possible the alternative of inserting dental implants, and may have advantages in terms of patient discomfort, recovery time, and surgical complexity. Larger studies, long-term follow-up, and investigation of other biomaterials are all required to fully determine the use of this approach in the clinical therapy of minor OACs.

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