Modified endoscopic medial maxillectomy for zygomatic implant salvage

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ABSTRACT

Objectives: Odontogenic chronic rhinosinusitis (CRS) is an epidemiologically important disease process due, in part, to the increasingly commonplace use of dental restorative procedures such as zygomatic implantation. Traditional management of this clinical entity typically entails extraction of the infected hardware via an open or endoscopic approach. We describe a novel management strategy of odontogenic CRS following bilateral zygomatic implantation for oral rehabilitation that we surgically salvaged via a modified endoscopic medial maxillectomy.

Methods: We describe the presentation and management of a case of metachronous development of bilateral CRS subsequent to zygomatic implantation.

Results: The patient’s postoperative course was characterized by marked endoscopic, radiologic, and symptomatic improvement as measured by the 22-item Sino-Nasal Outcome Test.

Conclusion: We describe a novel treatment strategy for the management of odontogenic sinusitis resulting from erroneous zygomatic implant placement. Modified endoscopic medial maxillectomy in this clinical context facilitates mucosal normalization of the affected sinus, while permitting preservation of oral function through salvage of the displaced implant.

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implantation, the patient noted an increase in the frequency of acute bacterial rhinosinusitis episodes, occurring every other month, with a return to an asymptomatic baseline between episodes. At 8 months after implantation, the patient underwent endoscopic sinus surgery of the left side, by an outside physician, which entailed an uncinectomy, maxillary antrostomy, and partial ethmoidectomy. The patient’s clinical state deteriorated thereafter, with both an intensification and persistence in ipsilateral sinonasal symptoms (left-sided purulent discharge and facial pressure) without relief.

Eight months following the original sinonasal intervention, rigid nasal endoscopy revealed a surgically created left maxillary antrostomy, with significant purulence and polypoid changes of the maxillary sinus mucosa. The right, unoperated nasal fossa was found to be within normal limits. An endoscopically acquired culture of the left maxillary sinus was significant for *Klebsiella oxytoca*. The patient was administered a high-dose 12-day prednisone taper, a 2-week course of levofloxacin, and mupirocin sinonasal irrigation. A post-treatment computed tomography scan at 6 weeks revealed complete left-sided maxillary sinus opacification, frontal sinus, and anterior and posterior ethmoid sinus opacification, with no pathologic mucosal changes noted on the right side (Fig. 1 A). Endoscopic evaluation revealed no change in appearance of the left maxillary sinus following treatment. We proceeded with a left endoscopic total sphenoethmoidectomy, frontal sinusotomy, and MEMM, which revealed exposed zygomatic implant hardware.

The patient did well after surgery but was subsequently lost to follow up. She returned 5 years later with exclusive right-sided sinonasal symptoms (purulence, facial pressure, and nasal obstruction), which persisted over a 3-month period, despite regular twice a day saline solution irrigations. A computed tomography revealed normalization of the left maxillary sinus following MEMM, with complete right maxillary sinus opacification (Fig. 1 B). Endoscopic examination revealed prominent right-sided middle meatal purulence. We subsequently addressed the right side with a MEMM in addition to a complete sphenethmoidectomy and frontal sinusotomy (Fig. 2). Intraoperative findings were significant for exposed zygomatic implant hardware in the affected right maxillary sinus. The patient’s postoperative course, which included a 2-week course of oral antibiotics (Clindamycin and Trimethoprim-sulfamethoxazole [TMP-SMX]), was uneventful, with both symptomatic and endoscopic (Fig. 3) improvement achieved and maintained with twice daily budesonide sinus irrigations.

**Technique**

The surgical technique we use for MEMM in the management of recalcitrant maxillary sinusitis was previously described in detail. This includes creation of a medially based nasal mucosal floor flap that serves to redrape the newly exposed bony ridge that remains after extirpation of the medial maxillary wall. This technique also involves preservation of the lacrimal sac and the nasolacrimal duct.

**RESULTS**

The patient’s postoperative course was characterized by marked symptomatic and endoscopic improvement (Fig. 3). Postoperative imaging 5 years after the initial left-sided MEMM demonstrated normalization of the left maxillary sinus mucosa (Fig. 1 B). A significant symptomatic improvement was likewise noted as measured by the 22-item Sino-Nasal Outcome Test (SNOT-22), a psychometrically validated disease-specific quality-of-life instrument for use in CRS, which was previously used to assess outcomes of surgical intervention in CRS. The patient’s SNOT-22 scores prior to and 2 weeks following the initial left-sided MEMM were 30 and 16, respectively. The patient’s SNOT-22 scores before and 2 weeks and 8 weeks after the sec-

![Figure 1. Pre- (A) and postoperative (B) computed tomography (CT) scans.](image-url)

(A) Preoperative CT demonstrates the presence of bilateral zygomatic implants, with evidence of significant unilateral (left) maxillary and ethmoid sinus opacification. (B) Postoperative CT captured 5 years after the initial left-sided modified endoscopic medial maxillectomy demonstrates mucosal normalization on the left, with development of contralateral disease in the context of the ongoing presence of bilateral zygomatic implants.
ond, right-sided MEMM were 26, 10, and 9, respectively. As per the study by Hopkins et al.,\textsuperscript{10} that psychometrically validated the SNOT 22, a value of 9 corresponds to a score seen in healthy, patients without CRS.

**DISCUSSION**

Our case is a noteworthy example of metachronous development of bilateral odontogenic CRS subsequent to zygomatic implantation. The staggered fashion in which the patient’s mucosal disease was surgically addressed elucidated the effectiveness of MEMM with mucosal normalization of the initially operated side at the time of presentation for the patient’s contralateral symptomatology. Overall, the case highlights a novel management strategy for salvage of exposed zygomatic implants, which enables preservation of oral function while allowing for symptomatic and endoscopic disease control.

The vast majority of chronic maxillary sinusitis can be managed effectively with a standard middle meatal antrostomy, with reported success rates approaching 90%.\textsuperscript{11} A small but significant subset of patients will persistently manifest signs and symptoms of ongoing mucosal inflammation deemed recalcitrant to standard medical and surgical therapies. Risk factors for recalcitrant maxillary sinusitis are well established in the literature and include innate or acquired mucociliary dysfunction, immunologic impairments, biofilm colonization, and odontogenic disease.\textsuperscript{12} MEMM has been
shown to be a safe and effective surgical approach for refractory chronic maxillary sinusitis with multiple case series reporting disease resolution in up to 80% of patients with previously recalcitrant disease.\textsuperscript{12–15} Long-term follow-up of this patient cohort has confirmed lasting clinical benefit from surgery, with sustained symptomatic improvement for up to 7 years postoperatively.\textsuperscript{15} Although the exact mechanism of improvement after MEMM has yet to be elucidated, proposed theories include improved distribution of topical therapy, improved mechanical debridement of mucus and biofilms, and facilitation of gravity-dependent sinus drainage.\textsuperscript{12}

Chronic maxillary sinusitis in the setting of previous oral restorative procedures represents a subset of recalcitrant maxillary sinusitis that deserves special attention. It is estimated that, up to 40% of chronic maxillary sinusitis is odontogenic in origin,\textsuperscript{16} with dental implants accounting for a small portion of these cases given their limited associated complication rate. Nonetheless, there seems to be an increasing incidence of dental implant–related maxillary sinusitis due, in part, to the increasingly commonplace use of these procedures. An infectious process ensues in these instances after penetration of the Schneiderian lining of the sinus, with the resultant exposed hardware generating a foreign body reaction.\textsuperscript{4} A number of cases series of implant-induced sinusitis described surgical protocols that addressed this clinical entity, all of which stress the necessity of implant removal either through an open or an endoscopic approach.\textsuperscript{4,7,17} The investigators argue in favor of implant removal due to potential perimplant osteitis with concerns that sinusitis might persist without accounting for the infectious nidus.\textsuperscript{4}

Our case suggests that sinus-exposed implants may be salvaged in view of preserving oral function by exteriorizing the sinus \textit{via} a MEMM. The exact mechanism for mucosal normalization in this context was unclear. We suspect that a low-grade inflammatory process likely persists postoperatively due to hardware exposure, potentially inducing a state of mucociliary dysfunction. By rendering the sinus gravity dependent and facilitating distribution of topical anti-inflammatory agents, budesonide, the underlying mucosal inflammation and impaired mucociliary drainage can be adequately managed, allowing for symptomatic relief. This observation parallels the favorable outcomes seen in cystic fibrosis–related CRS following MEMM. Although MEMM does not correct the underlying mucociliary dysfunction in these patients, a prospective postoperative evaluation of this patient cohort has uniformly demonstrated a marked improvement in sinonasal disease outcomes.\textsuperscript{9}

**CONCLUSION**

Our case demonstrates a novel treatment strategy for the management of odontogenic sinusitis resulting from erroneous zygomatic implant placement. MEMM in this clinical context facilitates mucosal normalization of the affected sinus while permitting preservation of oral function through salvage of the displaced implant.

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