

# Endoscopic Surgical Treatment of Chronic Maxillary Sinusitis of Dental Origin

Fabio Costa, MD,\* Enzo Emanuelli, MD,†

Massimo Robiony, MD, FEBOMS,‡ Nicoletta Zerman, MD,§

Francesco Polini, MD,|| and Massimo Politi, MD¶

**Purpose:** Chronic maxillary sinusitis of dental origin (CMSDO) is a common disease that requires treatment of the sinusitis as well as of the odontogenic source. We present our surgical experience performing contemporary treatment of the odontogenic source and endoscopic sinus surgery (ESS) in patients with CMSDO.

**Patients and Methods:** Seventeen patients with CMSDO underwent contemporary treatment of the odontogenic source and ESS. Five patients presented chronic oroantral fistula (OAF); 5 patients presented odontogenic cysts occupying the maxillary sinus; 2 patients had inflammatory cysts of the molars; 2 patients had maxillary sinus infection secondary to peri-implantitis; 3 patients had foreign bodies pushed through the root canal into the sinus. The first surgical step was the treatment of the odontogenic source. The second step was ESS with opening and calibration of the maxillary natural ostium.

**Results:** Foreign bodies were extracted from the sinuses through the endonasal approach. No major complications after ESS were observed. The average time for ESS was  $\pm 25$  minutes. Good distant results without symptoms and complete closure of the fistula were obtained in all patients.

**Conclusion:** When significant sinus disease is found, an endoscopic approach to drainage in all of the involved sinuses can promote predictably successful closure of OAF. The endoscopic approach to chronic maxillary sinusitis of dental origin is a reliable method associated with less morbidity and lower incidence of complications.

© 2007 American Association of Oral and Maxillofacial Surgeons  
*J Oral Maxillofac Surg* 65:223-228, 2007

---

\*Assistant Professor, Department of Maxillofacial Surgery, Azienda Ospedaliero Universitaria, Faculty of Medicine, University of Udine, Udine, Italy.

†Assistant Professor, Otorhinolaryngology Unit, Hospital of Padua, Padua, Italy.

‡Associate Professor, Department of Maxillofacial Surgery, Azienda Ospedaliero Universitaria, Faculty of Medicine, University of Udine, Udine, Italy.

§Associate Professor, Oral Pathology, Faculty of Medicine, University of Ferrara, Ferrara, Italy.

||Assistant Professor, Department of Maxillofacial Surgery, Azienda Ospedaliero Universitaria, Faculty of Medicine, University of Udine, Udine, Italy.

¶Professor and Chairman of Maxillofacial Surgery, Head of Department of Maxillofacial Surgery, Azienda Ospedaliero Universitaria, Faculty of Medicine, University of Udine, Udine, Italy.

Address correspondence and reprint requests to Dr Costa: Clinica di Chirurgia Maxillo-Facciale, Azienda Ospedaliero Universitaria, P.le S. Maria della Misericordia, 33100 Udine, Italy; e-mail: maxil2@med.uniud.it

© 2007 American Association of Oral and Maxillofacial Surgeons

0278-2391/07/6502-0011\$32.00/0

doi:10.1016/j.joms.2005.11.109

Chronic maxillary sinusitis of dental origin (CMSDO) is a common disease and accounts for approximately 10% to 12% of maxillary sinusitis cases.<sup>1</sup> CMSDO may be caused by the following: chronic oral antral fistula (OAF), foreign bodies (dental fillings, teeth roots, parts of broken instruments) pushed through the root canal or OAF into the sinus, periapical granulomas or small inflammatory cysts of the molars and bicuspsids, or large odontogenic cysts occupying total or subtotal space of the maxillary sinus.

Management of CMSDO requires treatment of the sinusitis as well as of the odontogenic source.<sup>2</sup> Despite development of functional endoscopic treatment for chronic rhinosinusitis, external approach and extensive exploration of the diseased sinus are widely used in the treatment of CMSDO.<sup>3</sup> These methods are traumatic and carry a greater risk of postoperative complications despite endoscopic sinus surgery (ESS).<sup>4</sup> Another important consideration regards future bone reconstruction of the maxillary sinus, considering the fact that CMSDO is more often present in the elderly population,<sup>5</sup> who may require prosthetic rehabilitation once CMSDO is resolved. If a

classical Caldwell-Luc, in which the antral lining has been completely removed, is performed it can be detrimental to sinus physiology because the mucociliary lining is replaced with nonfunctional mucosa.<sup>6</sup> We present our surgical experience performing contemporary treatment of the odontogenic source and ESS to open the maxillary natural ostium in patients with CMSDO.

## Patients and Methods

Between January 2002 and December 2004, endoscopic surgery of the maxillary sinus was performed in 17 patients diagnosed with CMSDO. Five patients presented with chronic OAF (Fig 1); 5 patients presented with odontogenic cysts occupying the maxillary sinus; 2 patients had inflammatory cysts of the molars; 2 patients had maxillary sinus infection secondary to peri-implantitis; and 3 patients had foreign bodies pushed through the root canal into the sinus.

Orthopantomography, computed tomography (CT) scans of paranasal sinuses in axial and coronal plane (Figs 2, 3), and nasal endoscopy (Fig 4) were used for precise diagnosis of the location and extent of disease. CT showed total or subtotal mucosal thickness of the maxillary sinuses involved in all cases. Facial pain over the maxillary region was present in 10 patients, headache in 6 patients, discharge of pus into the mouth in 5 patients, and nasal discharge in 12 patients.

All the patients were treated under general anesthesia. The first surgical step was the treatment of the odontogenic source. In the 5 patients with chronic OAF, the Rehrmann's buccal advancement flap<sup>7</sup> was performed to close the OAF (Fig 5). In the presence of OAF, meticulous revision of the alveolar recess was



**FIGURE 1.** Preoperative clinical view of a patient of the sample presenting with chronic OAF.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*



**FIGURE 2.** Preoperative CT scan (axial plane) showing complete obliteration of the right maxillary sinus.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*

performed through the OAF canal. Removal of polyps and granulations from the alveolar recess was carried out through the fistula. In the 5 patients with odontogenic cysts, 3 had follicular cysts and 2 odontogenic keratocyst. Removal of the cysts was achieved by buccal flap and extraction of teeth affected by the lesion. In 3 cases the third molar was extracted, in 2 cases the canine. A bone window in the anterior and/or lateral maxillary wall was performed to obtain a better visualization and complete removal of the

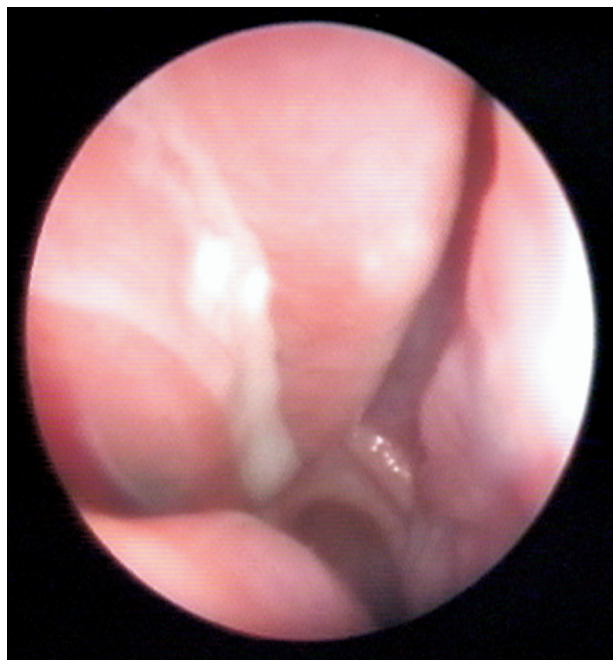


**FIGURE 3.** CT scan (coronal plane) showing complete obliteration of the right maxillary sinus and the anterior ethmoid cells.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*

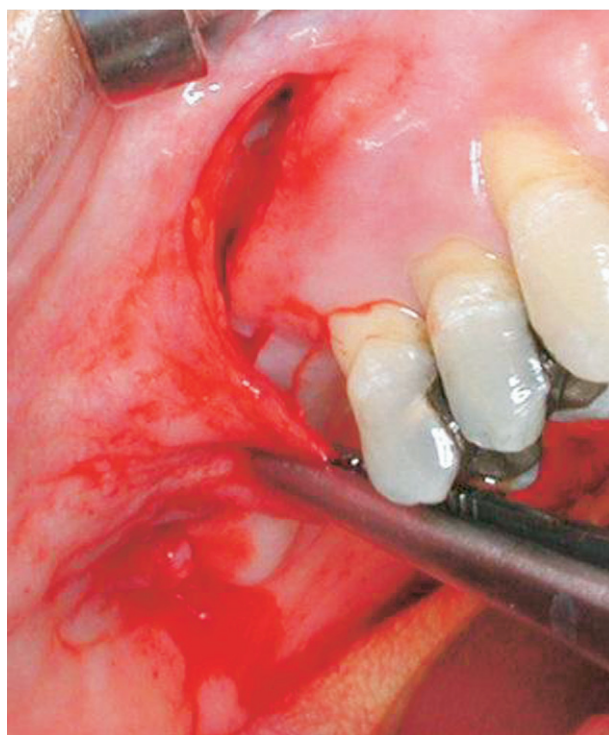
cyst. The 2 patients with inflammatory cysts of the molars had contemporary removal of the cysts and surgical endodontic treatment of the teeth affected by the lesion. Removal of the implants was performed in the 2 patients with maxillary sinus infection secondary to peri-implantitis. In both cases removal of the implants produced an OAF, which was closed with a buccal advancement flap. In the 3 patients with foreign bodies in the sinus, removal of the foreign bodies was achieved during the endoscopic procedure through the natural ostium of the maxillary sinus.

The second surgical step was ESS with opening and calibration of the maxillary natural ostium. The technique of ESS started with decongestion of the nasal mucosa by packs with a vasoconstrictor. Careful medial traction of the middle turbinate and retrograde resection of the posteroinferior part of the uncinate process using back-biting forceps was performed. As usual, multiple small polyps were found in the infundibulum as a result of chronic inflammation. Under control of a rigid 0°, 4-mm endoscope, the polyps were removed and the uncinate cut edges trimmed with a microdebrider. The natural maxillary sinus ostium was identified. If a secondary ostium was identified in the posterior fontanel area, it was connected to the natural ostium by transection of the posterior fontanel in a horizontal plane. To prevent postoperative circular stenosis, we always tried to preserve the anterior half of the ostium edge and to leave it un-



**FIGURE 4.** Preoperative nasal endoscopy showing mucopurulent discharge in the middle meatus.

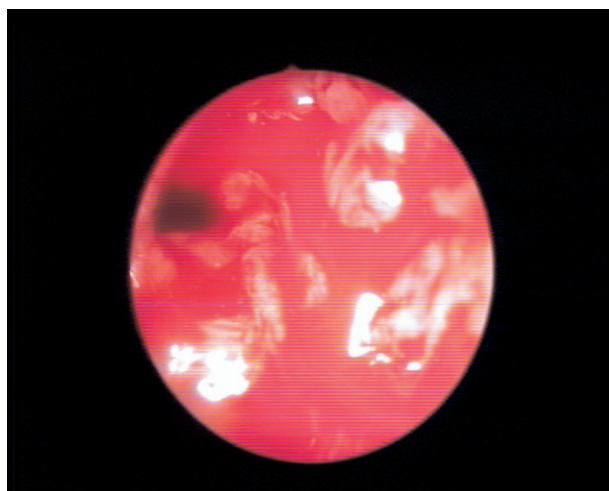
*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*



**FIGURE 5.** Intraoperative first surgical step: the Rehrmann's buccal advancement flap.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*

touched. Foreign bodies were removed with a curved suction tip through the enlarged maxillary ostium using a 70°, 4-mm endoscope. Removal of pathologic content and polyps from the posterior, lateral, and upper parts of the antrum using the microdebrider with 40° curved cutting blades can be easily per-



**FIGURE 6.** ESS: final visualization of the maxillary natural ostium exposed and calibrated.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*



formed. Only true polyps have to be removed. Swollen mucous membrane, even in the case of CMSDO, has a strong tendency to heal after restoration of ventilation and drainage of the diseased sinus. Lavage of the sinus by saline solution was performed and in the cases with OAF it allowed verification of the effective closure of the OAF in the oral cavity. In cases of concomitant purulent inflammation or polyposis in the ethmoid, opening of the diseased anterior and, if necessary, posterior cells was performed. Final visualization of the mucosa in the maxillary sinus and of the maxillary natural ostium exposed and calibrated was achieved (Fig 6).

After surgery, packs were placed in the middle meatus for 2 days and after removal of the packs all patients received saline nasal irrigation and topical steroids over 4 weeks. Follow-up ranged from 6 months to 2 years after surgery (Figs 7, 8). Patients were all closely followed postoperatively with serial endoscopic examinations to verify the maintenance of opening of the maxillary natural ostium and the absence of mucosal degeneration around the ostium (Fig 9).

## Results

At the time of surgery, dental fillings were found in 3 patients. All these foreign bodies were extracted from the sinuses through the endonasal approach. No case of postoperative trigeminal neuralgia occurred. No major complications such as orbital hematoma, visual disturbance, and cerebrospinal fluid leak during



**FIGURE 8.** Six months postoperative CT scan (coronal plane) showing complete aeration of the right maxillary sinus.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*

or after ESS were observed. A minor complication, a nasal synechia requiring revision under local anesthesia, was seen in 1 case (5%). The average time for ESS was  $25 \pm 12$  minutes. We considered distant results as “good” if the patient was free of symptoms such as nasal discharge and facial pain or headache and if the fistula healed completely. In terms of follow-up from 6 months to 2 years, good long-term results were obtained in all patients.



**FIGURE 7.** Six months postoperative CT scan (assial plane) showing complete aeration of the right maxillary sinus.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*



**FIGURE 9.** Postoperative nasal endoscopy 1 year after surgery showing maintenance of opening of the maxillary natural ostium and the absence of mucosal degeneration around the ostium.

*Costa et al. Endoscopic Surgery for Maxillary Sinusitis. J Oral Maxillofac Surg 2007.*

## Discussion

A general opinion is that CMSDO, especially associated with OAF, requires an external approach with extensive exploration of the diseased sinus and closure of the OAF itself.<sup>3</sup> For this reason, classic Caldwell-Luc surgery with removal of all sinus mucosa is performed. Disadvantages of this approach have been discussed in literature and include higher complication rates, more blood loss and operation time, and more hospitalization of the patients.<sup>4,8</sup>

An alternative approach could be curettage of the antrum through the existing OAF or through the bone window created for removal of odontogenic cysts, inflammatory cysts, or implants. In most cases, however, the existing OAF or the bone windows should be sufficiently enlarged to facilitate adequate exposure and moreover curettage does not allow an approach to the maxillary ostium and the key area of the osteomeatal complex.

Only a few studies have been published concerning an endoscopic approach to CMSDO.<sup>9,10</sup>

Lopatin et al<sup>9</sup> reported on 70 patients with CMSDO who had surgery using the endoscopic technique. Thirty-nine patients presented with OAF. Foreign bodies were found in 21 sinuses. Odontogenic cysts were found in 10 cases. Good results were obtained in all but 4 patients in terms up to 3 years. No complications occurred. Overall recovery rate after primary surgery was 94.7%. The endoscopic surgical technique was similar to that performed in our sample of patients. They reported extraction of all foreign bodies and all odontogenic cysts but 1 through the endonasal approach. In our sample we also performed an endonasal approach in all the patients and it was useful for removal of all foreign bodies. It is our opinion that for patients with odontogenic cysts, especially with odontogenic keratocyst, removal of the cysts cannot be achieved without performing a buccal flap and a bone window in the anterior wall of the maxillary sinus. This is on account of 2 reasons: first because odontogenic cysts often require extraction of teeth affected by the lesion and this may be performed only through an oral approach, second because there is no consensus on adequate treatment for odontogenic keratocyst in relation to the potential for recurrence.<sup>11</sup> Treatments of keratocyst are generally classified as conservative or aggressive, but in both cases at least complete enucleation of the cyst has to be achieved during surgery. We do not believe that complete enucleation may be assured through the endonasal approach alone. In our experience, an intraoral approach to CMSDO is often necessary to perform a correct treatment of the odontogenic source. The role of ESS in those cases is to restore the

normal patency of the natural ostium and to facilitate more rapid recovery of the sinus clearance.

In 13 patients (76%) from our sample, a blocked maxillary ostium and/or anatomical abnormalities (concha bullosa, deviated uncinate process, large ethmoidal bulla) were revealed. We think that restoration of the ostium patency and of the natural sinus clearance mechanism increases faster healing of the CMSDO. Functional endoscopic sinus surgery and the use of the middle meatal antrostomy has been a central component, because it is safe, effective, and physiologic.<sup>12</sup> Comparisons in the human model established long-term patency of the middle meatal antrostomy performed during ESS.<sup>13</sup> Inferior meatal antrostomy, as performed during Caldwell-Luc operation, seems to be useless because analysis of ciliary flow patterns in rabbits showed that the nasal antral window did not cause redirection of the mucociliary clearance pattern,<sup>14</sup> and the cilia in the sinus continue to clear mucus toward the natural ostium, despite surgical alteration.<sup>12</sup>

Even when the Caldwell-Luc operation is performed for CMSDO, it does not seem necessary to perform antrostomy at the inferior meatus, provided the patient has a patent osteomeatal complex and no anatomic abnormalities.<sup>3</sup> In our experience, ESS was not time-consuming (with a mean operating time of 25 minutes) and did not present any major complications. Only a mucosal synechia, which resolved under local anesthesia without functional consequences, was observed.

Considering the little additional time and the low incidence of complications, in our sample, ESS with middle meatal antrostomy, obtaining a more rapid and effective recovery of the sinus involved by the lesion, appears to be useful even in patients with apparent patent osteomeatal complex. The ESS approach to CMSDO in our experience is a reliable method associated with less morbidity and lower incidence of complications than the Caldwell-Luc technique.

## References

1. Maloney PL, Doku HC: Maxillary sinusitis of odontogenic origin. *J Can Dent Assoc* 34:591, 1968
2. Sandler HJ: Clinical update—The teeth and the maxillary sinus: The mutual impact of clinical procedures, disease conditions and their treatment implications. Part 2. Odontogenic sinus disease and elective clinical procedures involving the maxillary antrum: Diagnosis and management. *Aust Endod J* 25:32, 1999
3. Al-Belasy FA: Inferior meatal antrostomy: Is it necessary after radical sinus surgery through the Caldwell-Luc approach? *J Oral Maxillofac Surg* 62:559, 2004
4. Ikeda K, Hirano K, Oshima T, et al: Comparison of complications between endoscopic sinus surgery and Caldwell-Luc operation. *Tohoku J Exp Med* 180:27, 1996

5. Guven O: A clinical study on oroantral fistulae. *Cranio-maxillo-fac Surg* 26:267, 1998
6. Regev E, Smith RA, Perrott DH, et al: Maxillary sinus complications related to endosseous implants. *Int J Oral Maxillofac Implants* 10:451, 1995
7. Rehrmann A: Eine methode zur Schliessung von Kieferhöhlen-perforationen. *Dtsch Zahnarzt Z* 39:1136, 1936
8. Narkio-Makela M, Qvarnberg Y: Endoscopic sinus surgery or Caldwell-Luc operation in the treatment of chronic and recurrent maxillary sinusitis. *Acta Otolaryngol* 529:177, 1997
9. Lopatin AS, Sysolyatin SP, Sysolyatin PG, et al: Chronic maxillary sinusitis of dental origin: Is external surgical approach mandatory? *Laryngoscope* 112:1056, 2002
10. Kraut RA, Smith RV: Team approach for closure of oroantral and oronasal fistulae. *Atlas Oral Maxillofac Surg Clin North Am* 8:55, 2000
11. Morgan TA, Burton CC, Qian F: A retrospective review of treatment of the odontogenic keratocyst. *J Oral Maxillofac Surg* 63:635, 2005
12. Coleman JR Jr, Duncavage JA: Extended middle meatal antrostomy: The treatment of circular flow. *Laryngoscope* 106:1214, 1996
13. Davis WE, Templer JW, Lamear WR: Patency rate of endoscopic middle meatus antrostomy. *Laryngoscope* 101:416, 1991
14. Kennedy DW, Shaalan H: Reevaluation of maxillary sinus surgery: Experimental study in rabbits. *Ann Otol Rhinol Laryngol* 98:901, 1989