



# Functional Endoscopic Sinus Surgery for a Patient with Maxillary Sinusitis Occurring after Implant Placement

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## Abstract

Maxillary sinus membrane elevation and bone graft have been performed routinely in alveolar bone with insufficient residual bone height. There are a number of causes for development of maxillary sinusitis after these procedures. When maxillary sinusitis is caused by sinus membrane elevation, bone graft, and implant placement, various treatment such as medication, incision and drainage (I&D), implant removal, and the Caldwell-Luc procedure can be considered. Removal of an implant or the Caldwell-Luc procedure can be harmful if inflammation is not present in the oral cavity and survival of grafted bone and implant osseointegration can be expected despite the presence of maxillary sinusitis. In this case, functional endoscopic sinus surgery, which was often used in the otorhinolaryngology department, was performed without removal of the implant for a patient with maxillary sinusitis after one month following implant placement. Thus, we report on this case with a review of the literature.

**Key words:** Functional endoscopic sinus surgery, Maxillary sinusitis

## Introduction

Implant placement is becoming a more common treatment for reconstruction of functional defects in edentulous patients. Maxillary sinus membrane elevation and bone graft are often necessary for implant placement in maxillary posterior teeth. When maxillary sinus membrane elevation and bone graft are performed, a window is created in the alveolar bone on the buccal side in order to access the maxillary sinus. The sinus membrane is then carefully elevated and bone graft is performed[1]. These procedures have been recognized as being very reliable; therefore, their use has been widely accepted in dentistry for vertical

augmentation. However, maxillary sinusitis can be caused by undetected preoperative sinus disease, a poor operation, or infection. According to one study, the occurrence of maxillary sinusitis was reported to range from 0% to 20% after maxillary sinus membrane elevation[2].

Patients with maxillary sinusitis visited the hospital with various symptoms, including headache, nasal congestion, and rhinorrhea[3]. In these patients, radiographs should be taken in addition to clinical examination for an accurate diagnosis. Use of computed tomography (CT) scans can provide the precise anatomical location and blockage of maxillary ostium, which can be helpful in determination of whether or not to use a surgical approach[4]. Decongestants

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and antibiotics could be administered to patients with acute maxillary sinusitis after maxillary sinus membrane elevation and bone graft for relief of symptoms. However, surgical interventions, such as the fenestration of maxillary bone and functional endoscopic sinus surgery (FESS) may be required when maxillary ostium is blocked because of maxillary sinus membrane elevation. Compared to the Caldwell-Luc procedure, among these surgical treatments, FESS has the advantage of preservation of the normal mucosal function and ciliary action. Therefore, in the otorhinolaryngology (ENT) department, FESS is the most widely used procedure for chronic maxillary sinusitis that does not respond to medication such as antibiotics[5].

In case of maxillary sinusitis occurring after implant placement with maxillary sinus membrane elevation and bone graft, relief of symptoms was provided by use of FESS without removal of the implant. Therefore, we intend to report on this case with a review of the literature.

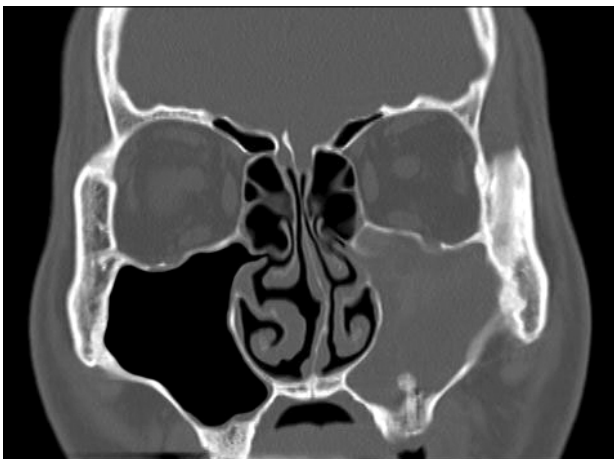
## Case Report

A 34-year-old man visited the ENT department because of headache, nasal congestion, and rhinorrhea. Five weeks before his ENT visit, implant placement with maxillary sinus membrane elevation and bone graft was performed, therefore, he was referred to undergo oral and maxillofacial surgery. Clinical examination did not show facial edema but nasal obstruction and headache. The site of implant placement had healed well and no signs of inflammation,

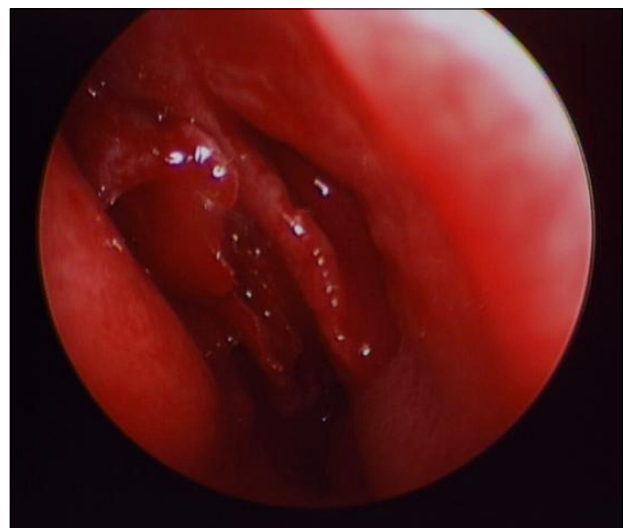
such as redness, swelling, or pus discharge, were observed. Antibiotics and decongestants were administered for 10 days, however, significant progress was not demonstrated, therefore, facial CT was taken. Facial CT revealed complete radiopacification of the left maxillary sinus in which the implant was placed and showed blockage of the ostiomeatal unit (OMU) in the same area. He had chronic maxillary sinusitis (Fig. 1).

It was assumed that the patient had developed chronic maxillary sinusitis even before placement of the implant, because he reported having had mucopurulent rhinorrhea through the left nostril before placement of the implant and he had learned about infection of the left sinus in the ENT department. It was considered that implant placement and maxillary sinus membrane elevation would cause aggravation of the condition, which could be judged from the fact that the symptoms worsened after those procedures. No signs of inflammation were observed in the site of implant placement, and he did not want to remove the implant, therefore, we decided to perform FESS.

First, a cottonoid soaked with 2% lidocaine (with 1:100,000 epinephrine) was left in the left middle turbinate and middle meatus. A polyp in the middle turbinate discovered during endoscopic observation was removed. Then, using a freer elevator, the middle turbinate was placed toward the nasal septum and an incision was made in the uncinata process and it was elevated (Fig. 2). At



**Fig. 1.** Computed tomography image showing radiopacification of the left maxillary sinus and blockage of ostiomeatal unit.



**Fig. 2.** Endoscopic image of the uncinata process, which was incised and elevated.



Fig. 3. Ethmoidal cells after ethmoidectomy was performed.

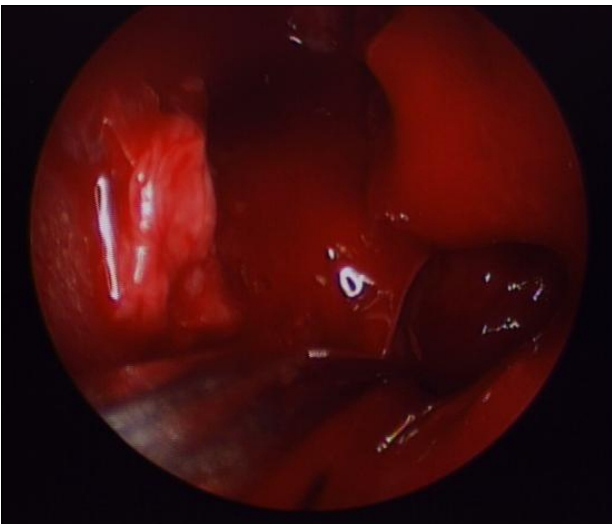


Fig. 4. Endoscopic image of the widened ostium.

that time, a discharge of pus and exudates was observed. When the discharge disappeared, using a shaver and a suction tip, inferior ethmoidal bulla was opened and ethmoidectomy was performed (Fig. 3). Then, the ostium of the left maxillary sinus was identified, and, using a cutting forcep and a shaver, this ostium was widened (Fig. 4). In the area where surgery was performed, Meroce<sup>®</sup> (Medtronic Xomed, Jacksonville, FL, USA) packing was performed to prevent bleeding and closure of the ostium. The packing was removed after approximately five days, and daily dressing was performed for approximately two weeks. He was discharged two weeks after surgery. One



Fig. 5. Computed tomography image showing significantly reduced radiopacification after the ostium was widened.

month later, no signs of inflammation were observed in the oral cavity, and symptoms such as headache, nasal congestion, and rhinorrhea were not observed (Fig. 5).

## Discussion

Chronic maxillary sinusitis is a chronic disease caused by odontogenic infection, systemic factors, and extrinsic sources such as implant placement. The most common cause is an infection, which is related to the ciliary movement of the maxillary sinus. In general, maxillary mucociliary transport releases mucus and foreign bodies to the nasal cavity depending on the physiological condition. However, persistent infection causes impairment of sinus ventilation, which creates an acidic anaerobic condition[6]. Eventually, ciliary damage and ineffective mucus clearance create a vicious circle[6]. Infection from extrinsic sources such as maxillary sinus membrane elevation, bone graft, and implant placement could be caused by a lack of aseptic treatment and operation skill. However, recently, as a result of development of aseptic treatment, infection is frequently caused by already having had problems in the maxillary sinus before surgery or growth of bacteria due to occlusion of maxillary ostium after maxillary sinus membrane elevation. In addition, allergy or bleeding can stimulate the mucous membranes and mucosal thickness increases in spite of minimizing damage to the mucous membranes during surgery, therefore, maxillary sinusitis may occur due to reduction in size of maxillary sinus ostium. Efforts are

needed to minimize these exogenous causes after maxillary sinus membrane elevation, bone graft, and implant placement.

However, despite efforts, maxillary sinusitis can occur after maxillary sinus membrane elevation or implant placement. If symptoms of maxillary sinusitis occur, rapid treatment is needed. First, dose of antibiotics and decongestants is important. With passage of time, if swelling and pus are observed on the surgical area, incision and drainage (I&D) will be required through the surgery site. In 2010, Hong *et al.*[7] immediately placed the implants in the left maxillary molar area after maxillary sinus membrane elevation using the lateral approach technique and bone graft using autograft and xenograft. Perforation of maxillary sinus membrane did not occur at the time of surgery, but 10 days later, when the patient showed swelling and pain of the facial region and symptoms of maxillary sinusitis such as pus and an odor, therefore, I&D was performed. After that, the symptoms did not disappear; therefore, the window opening technique was performed between orbital nerve and the window which was previous performed, and then drainage and administration was performed through the window newly performed. As a result, 6 months later, the implant placement had a good result. It is thought that a fast initial treatment helped not to remove the implant. However, if the symptoms of maxillary sinusitis worsened over time after implant placement, intraoral symptoms didn't be caused in the area of implant placement or bone graft and alveolar bone problems did not be shown in radiographs as in our case, it would be difficult to decide what to perform any approach.

In the past, Caldwell-Luc procedure was chosen as the treatment of chronic maxillary sinusitis. But this procedure is an aggressive procedure to; use of this technique has a major disadvantage which is that the normal mucosal function and ciliary action cannot be restored. Using this procedure, other paranasal sinuses cannot be treated and many complications can occur[8]. Therefore, a modified Caldwell-Luc procedure with minimal removal of maxillary mucosa was proposed, however, these procedures also had disadvantages and complications[9]. Using these procedures, an opening at the inferior meatus was created to prevent obstruction between nasal cavity and maxillary sinus, however, it did not appear to be useful because

ciliary movement of the remaining mucous after these procedures continued to act toward maxillary ostium at the middle meatus. Al-Belasy[9] reported that it was not useful to create the opening at the inferior meatus if the patient had a normal maxillary sinus ostium and no anatomic abnormalities. In addition, many references have emphasized that antrostomies were closed naturally at a high rate even though inferior meatal antrostomy was performed[10]. Realizing that drainage of the maxillary sinus through the middle meatus was important, Lavelle and Harrison[11] reported that middle meatal antrostomy was more effective than inferior meatal antrostomy. Repeating the studies through the nasal cavity, maxillary surgery was developed by using an endoscope through the nasal cavity. Stammberger and Posawetz[12] performed FESS, in which the osteomeatal complex was removed under guidance of an endoscope in order to restore sinus ventilation and drainage through normal mucosal movement. With understanding of the physiology of the mucous membrane of the maxillary sinus, FESS has recently been used for treatment of maxillary sinusitis instead of the Caldwell-Luc procedure in the ENT department[5]. Penttilä[13] reported the results of comparison of FESS with the Caldwell-Luc procedure. FESS showed better results in improvement of symptoms and FESS with middle meatal antrostomy maintained the opening well at a high rate. Lopatin *et al.*[14] performed FESS in 70 patients with chronic maxillary sinusitis, and 39 patients with an oro-antral fistula. Additional FESS was performed in these patients, and, after surgery, there were three patients with recurrence of a fistula and one patient with blockage of maxillary sinus ostium. However, the reported overall recovery rate was 94.7%. Costa *et al.*[15] performed FESS in 17 patients with chronic maxillary sinusitis of dental origin, including five patients with an oro-antral fistula. As a result, they reported that the oro-antral fistula was completely recovered, and that the symptoms of maxillary sinusitis showed improvement. In addition, they emphasized that the surgery time for FESS was approximately 25 minutes; therefore, FESS was not time-consuming. Andric *et al.*[16], who also performed FESS in patients with chronic maxillary sinusitis with an oro-antral fistula, reported that the fistula had healed well and no complications occurred. This result indicated that if sinus ventilation and drainage through maxillary sinus

ostium was facilitated, normal mucosal ciliary movement would be possible and the symptoms of maxillary sinusitis would be reduced. It also showed that if a previously-existing cyst of the maxillary sinus or bone graft materials blocked the maxillary sinus ostium in patients who underwent maxillary sinus membrane elevation or bone graft, adequate treatment of maxillary sinusitis through administration or intraoral I&D would be difficult without approach to the maxillary sinus ostium using FESS.

In this case, maxillary sinusitis occurred after placement of an implant with maxillary sinus membrane elevation and bone graft. Although the symptoms worsened due to implant placement, judging from the history of frequent visits to the ENT department and patient's recognition of chronic sinusitis it could be inferred that he had already developed maxillary sinusitis. It was thought that maxillary sinus membrane elevation, bone graft, and implant placement had a bad influence on OMU and that maxillary sinusitis had worsened, so that the symptoms the patient felt increased. Preoperative facial CT would have been helpful for accurate diagnosis. Performance of a CT scan is important in order to check the condition of the maxillary sinus when dental treatments such as maxillary sinus membrane elevation and bone graft are performed, due to the difficulty of making accurate judgments using panoramic radiographs. Despite accurate diagnosis, maxillary sinusitis can occur after sinus maxillary membrane elevation or implant placement. If maxillary sinusitis occurs, rapid early treatment is needed. Rapid early treatment can increase the survival rate of grafted bone and implant. In this case, we decided to restore sinus ventilation and drainage through clearance of OMU using FESS for survival of grafted bone and implant. If inflammatory findings such as pus or redness were observed in the oral area of bone graft or implant placement, we would administer treatment through an intraoral approach. However, the fact that the intraoral approach may also cause side effects such as leakage of grafted bone and interference of implant osseointegration should be kept in mind. In this case, FESS was considered first because the oral treatment area had healed well and there had not been any oral symptoms. During FESS and the following month, symptoms such as headache, nasal congestion, and rhinorrhea were not demonstrated and radiopacification had disappeared on CT scan.

However, since then, he has not visited, therefore, long term evaluation was impossible. In conclusion, FESS can be an effective treatment for patients with maxillary sinus membrane elevation and implant placement in suspected cases of blockage of OMU. In addition, we would be able to obtain excellent results if the surgery was performed under close cooperation with the ENT department.

## References

1. Raghoobar GM, Brouwer TJ, Reintsema H, Van Oort RP. Augmentation of the maxillary sinus floor with autogenous bone for the placement of endosseous implants: a preliminary report. *J Oral Maxillofac Surg* 1993;51:1198-203.
2. Timmenga NM, Raghoobar GM, Boering G, van Weissenbruch R. Maxillary sinus function after sinus lifts for the insertion of dental implants. *J Oral Maxillofac Surg* 1997;55:936-9.
3. Kang MJ, Lee DK, Yim CJ. Clinical study of odontogenic maxillary sinusitis. *J Korean Assoc Oral Maxillofac Surg* 1990;16:123-9.
4. Maillet M, Bowles WR, McClanahan SL, John MT, Ahmad M. Cone-beam computed tomography evaluation of maxillary sinusitis. *J Endod* 2011;37:753-7.
5. Busaba NY, Kieff D. Endoscopic sinus surgery for inflammatory maxillary sinus disease. *Laryngoscope* 2002;112:1378-83.
6. Aust R, Drettner B. Oxygen tension in the human maxillary sinus under normal and pathological conditions. *Acta Otolaryngol* 1974;78:264-9.
7. Hong SR, Lee YW, Yoon KS, *et al*. Sinusitis management associated with maxillary sinus augmentation: case report. *J Korean Assoc Maxillofac Plast Reconstr Surg* 2010;32:558-62.
8. Murray JP. Complications after treatment of chronic maxillary sinus disease with Caldwell-Luc procedure. *Laryngoscope* 1983;93:282-4.
9. Al-Belasy FA. Inferior meatal antrostomy: is it necessary after radical sinus surgery through the Caldwell-Luc approach? *J Oral Maxillofac Surg* 2004;62:559-62.
10. Lund VJ. Fundamental considerations of the design and function of intranasal antrostomies. *Rhinology* 1985;23:231-6.
11. Lavelle RJ, Harrison MS. Infection of the maxillary sinus: the case for the middle meatal antrostomy. *Laryngoscope* 1971;81:90-106.
12. Stammberger H, Posawetz W. Functional endoscopic sinus surgery. Concept, indications and results of the Messerklinger technique. *Eur Arch Otorhinolaryngol* 1990;247:63-76.
13. Penttilä MA. Endoscopic findings after functional and radical sinus surgery: a prospective randomized study. *Am J Rhinol* 1994;8:71-6.
14. Lopatin AS, Sysolyatin SP, Sysolyatin PG, Melnikov MN. Chronic maxillary sinusitis of dental origin: is external surgical approach mandatory? *Laryngoscope* 2002;112:1056-9.
15. Costa F, Emanuelli E, Robiony M, Zerman N, Polini F, Polini M. Endoscopic surgical treatment of chronic maxillary sinusitis of dental origin. *J Oral Maxillofac Surg* 2007;65:223-8.

16. Andric M, Saranovic V, Drazic R, Brkovic B, Todorovic L. Functional endoscopic sinus surgery as an adjunctive treatment for closure of oroantral fistulae: a retrospective analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2010;109:510-6.