Maxillary sinus floor elevation surgery
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Chapter 4

Maxillary Sinusitis after Maxillary Sinus Floor Elevation Surgery

a Report of 2 Cases

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Abstract

Maxillary sinusitis has been described as major complications of maxillary sinus floor elevation surgery. According to the literature, the incidence of maxillary sinusitis after maxillary sinus floor elevation surgery with iliac crest bone ranges from 0-26%. In our patient material, (n=156), development of chronic maxillary sinusitis was a rare condition. It was observed in two (1.5%) of the treated patients. These two cases are discussed.
Introduction

Sinus floor elevation surgery with an autogenous bone graft is a generally accepted pre-implantology procedure to enable successful placement of endosseous implants in an optimal prosthetic position. As reported in literature, complications of the sinus floor elevation procedure predominantly consists of disturbed wound healing, haematoma, sequestration of bone and (transient) maxillary sinusitis (Raghoebar et al. 1993, 1997). The last complication can occur as a result of contamination of the maxillary sinus with oral or nasal pathogens or because of a lack of asepsis during the surgical procedure (Misch 1992). Other causes are ostial obstruction due to postoperative swelling of the maxillary mucosa (Meyerson 1932; Drettner 1965; Aust and Drettner 1974), and nonvital bony fragments freely floating in the maxillary sinus (Perko 1972).

The incidence of maxillary sinusitis after sinus floor elevation surgery with iliac crest bone grafts ranges from 0-26% (Misch 1987; Chanavaz 1990; Quiney et al. 1990; Tidwell et al. 1992; Ueda and Kaneda 1992; Kent and Block 1993; Jensen et al. 1994; Regev et al. 1995; Kaptein et al. 1998). However, one has to consider that these data are derived from clinical studies in which presence of maxillary sinusitis was not scored according to standard criteria in the field of otolaryngology for the diagnosis of sinusitis (Buiter 1976; Kennedy 1985, 1992; Stammberger 1986; Schaefer et al. 1989; Davis et al. 1991; Lanza and Kennedy 1997; Hartog 1997), and specific preoperative evaluation of sinus drainage was not performed. Timmenga et al. (1997), reported that clearance of the maxillary sinus is rarely compromised after maxillary sinus floor elevation, and that the development of a chronic maxillary sinusitis, with all its therapeutic consequences, still has to be considered as a rare condition.

Between 1988 and 1998, 156 patients have been treated in our clinic; 7 patients (4%) developed a transient (subacute) sinusitis, while 2 patients (1.5%) developed a chronic maxillary sinusitis. In this paper these 2 complicated cases of chronic (purulent) maxillary sinusitis following sinus floor elevation with autogenous bone grafts are discussed and guidelines for specific treatment of both transient and chronic maxillary sinusitis are given.
**Report of Cases**

**Case 1**

A 56-year-old edentulous female was referred to our hospital because of lack of retention of her upper full denture as a result of extreme resorption of the maxilla. She complained of functional chewing problems, and lost 10 kilograms body weight during the last three years. At the time of referral she weighted 54 kg (height 168 cm). Severe resorption of the maxilla (Cawood Class VI) made it impossible to solve her denture-related problems with a conventional upper denture. Psychological screening indicated no contraindications for implant treatment.

The history and clinical and radiographic screening before sinus floor elevation surgery showed neither a history nor actual signs of sinus-related pathology. Therefore, nasendoscopy was not performed. Subsequently, the floor of the maxillary sinus was elevated and the width of the alveolar crest was increased bilaterally with an autogenous bone graft from the right iliac crest. Cephradine (i.v. 1 g, 3 times daily) was administered for 48 hours, starting one hour preoperatively. No complications occurred during the surgical procedure; the mucous lining of the maxillary sinus was not perforated. Wound healing was uneventful, however 3 weeks post-surgery, the patient developed maxillary sinusitis on the left side. The patient had pain in the left paranasal region, mucopurulent rhinorrhea and postnasal drip. Radiographic examination (Waters’ view) showed an opaque left maxillary sinus (Figure 1A). These complaints did not cease on conservative treatment, (amoxycillin-clavulanate 500/125 mg, 3 times daily), continued for two weeks, in combination with nasal decongestants (xylomethazoline 0.1%, 4 times daily), so it was decided to surgically improve sinus drainage.

Initially an inferior meatal antrostomy was made, and a silicone drain was left in the left maxillary sinus. Sinus irrigation was performed every second day and continued for two weeks. Pseudomonas species were found by microbiological examination of the maxillary sinus aspirate. Therefore antibiotic treatment was changed into ciprofloxacine 750 mg, 2 times daily, for two weeks. Because recovery did not occur, a computed tomography (CT)-scan was performed. The CT scan showed complete opacity of both the left maxillary and anterior ethmoid sinuses and a sequestrum in the left maxillary sinus (Figure 1B). Therefore, antrostomy in the middle meatus and endonasal ethmoidectomy were performed under general anaesthesia. During the operation the left maxillary sinus mucosa showed edematous hyperaemic polypoid changes with mucopurulent secretions. The sequestrum was removed. In spite of this maxillary sinus empyema, the re-
remaining grafted bone was still fixed and had appeared to be vital. Nasendoscopic treatment was carried out to prevent the development of mucosal adhesions. Successful recovery occurred within four weeks (Figures 1C, 1D).

Three months after bone grafting of the sinus floors, the bone volume seemed to be sufficient for insertion of 6 implants (Figure 1E). Besides minor tenderness of the maxillary wall, the patient had no residual complaints from the maxillary sinuses. Nasendoscopic evaluation showed no evidence of pathology. A CT-scan three months after functional endoscopic sinus surgery showed no evidence of pathology in the left maxillary sinus (Figure 1F). During a follow-up of 12 months no complaints related to the paranasal sinuses were noted, and no implants were lost.

Case 2

A 47-year-old man was referred to our hospital with complaints about his upper denture. Because of an extremely resorbed maxilla, retention and stability of his upper denture were very poor. The available bone volume was insufficient for reliable insertion of endosseous implants. Preoperatively, no signs of clearance-related maxillary sinus problems were noted. Bilaterally grafting to elevate the floor of the maxillary sinus and to increase the width of the alveolar crest was performed with autogenous iliac bone grafts. Cephradine (i.v. 1g, 3 times daily) was started 1 hour preoperatively and continued for 48 hours. Four days post-surgery, a submucosal swelling developed in the osteotomy region in the left maxillary wall (Figure 2A). Conventional radiographic examination revealed an opaque left maxillary sinus (Figure 2B). Examination of the oropharynx showed a postnasal drip.

The patient was referred to the ear, nose and throat (ENT) department for treatment of the maxillary empyema. An inferior meatus antrostomy and sinus lavage were performed, and a silicone drain was left in the maxillary sinus (Figure 2C). Lavages were continued for two weeks, and the patient needed antibiotic treatment (amoxicillin-clavulanate 500/125 mg, 3 times daily), continued for 2 weeks in combination with a mixture of decongestants (xylometazoline 0.1%), and topical corticosteroids (dexamethason 0.01%). After 3 weeks nasendoscopic evaluation showed complete recovery from the maxillary sinus empyema. In spite of adequate ENT intervention, the bone graft at the left side seemed to be insufficient for insertion of implants. A second bone grafting procedure (with bone grafts from the mandibular symphysis) was needed for reliable implantation (Figure 2D). After a follow-up period of 26 months, none of the implants had been lost, and there have been no paranasal sinus complications.
Figure 1
A 56 years old female with upper denture problems related to extreme maxillary resorption.

A Three weeks after maxillary sinus floor elevation surgery, X-Waters examination showed an opaque left maxillary sinus indicative for maxillary sinusitis.

B Six weeks after maxillary sinus floor elevation surgery. Despite of antibiotic treatment, inferior meatal antrostomy and sinus irrigation, the maxillary sinusitis, complaints had persisted. CT-scanning showed mucosal swelling of the left maxillary sinus and a free floating bone sequester in the left maxillary sinus.

C One month after middle meatal antrostomy and endonasal ethmoidectomy endoscopic evaluations showed complete recovery. Endoscopic view (0 degree rigid scope) of left nasal vestibulum. Entrance of the antrostoma in the middle meatus (arrows).
Figure 1 (continued)

D As Figure 1C. Endoscopic view (0 degree rigid scope) inside the left maxillary sinus, via middle meatal (fontanel) antrostoma (arrows). Middle turbinate (♦) and dorso-caudal ridge of the middle meatal (fontanel) antrostoma (f) are clearly visible. Recovery of the mucosal lining of the maxillary sinus (M), after surgical treatment.

E Orthopantomogram showing six implants inserted in the grafted area, and a removable prosthodontic appliance in the lower jaw.

F CT-scan three months after functional endoscopic sinus surgery showed no evidence for pathology in the left maxillary sinus.
Discussion

The risk of developing maxillary sinusitis can be reduced by preoperative radiographic examination (Waters’ view). These radiographs may reveal mucosal pathology in sinus clearance-compromised patients. However, the diagnostic value of the radiographs is rather low (73%) (Buiter 1976; Kennedy 1992). Nasendoscopic evaluation is indicated for patients with a history of frequent sinusitis to rule out the presence of an obstructive phenomenon as a risk factor before undergoing a sinus lift procedure. Because sinus clearance compromising factors were not evident, preoperative endoscopic evaluation was not performed. Although the
occurrence of iatrogenic sinus membrane perforations during surgery does not seem to be related to the development of postoperative sinusitis in healthy patients (Timmenga et al. 1997), large perforations of the maxillary sinus membranous lining might result in a discharge of the bony fragments into the maxillary sinus and thus cause maxillary sinusitis. The influence of postoperative pressure of the upper denture on the buccal wall of the maxilla should be kept in mind as a possible factor in displacement of bony fragments into the maxillary sinus. In case 2, despite standard perioperative antibiotic treatment, contamination of haematoma in the osteotomy region probably caused maxillary empyema 4 days postoperatively. An extensive preoperative history and plain radiographic examination did not indicate any maxillary pathology. Sinus lavages solved this complication.

**Figure 2 (continued)**

A 47-year-old male with upper denture problems related to extreme maxillary resorption.

C One week after maxillary sinus floor elevation surgery. A silicon drain for sinus irrigation was left in the maxillary sinus via an inferior meatal antrostomy.

D Six months post-implantation, Waters’ view showed no signs of sinus pathology.
Endoscopic examination after this intervention showed complete recovery of the maxillary sinus, and no ostial pathology was observed. Contamination of the operative site by secondary infection of the maxillary sinus is therefore not very likely. Hypothetically, infection of the bone graft could have been attributable to oral contamination of the site as a result of a mucosal dehiscence. This could be the cause of complete loss of the bone graft in case 2.

If patients develop chronic maxillary disease after maxillary sinus floor elevation procedures special care is needed to prevent loss of bone grafts. Intervention is necessary to establish adequate drainage of the maxillary sinus and to remove sequestra that may be responsible for maintaining this undesirable condition. In Tables 1 and 2, guidelines for the treatment and prevention of transient and chronic sinusitis are given. These guidelines are based on the facts that:

1. Diminished maxillary sinus drainage is closely related to structural and mucosal factors responsible for the size of the maxillary ostium. Therefore all factors that disturb sinus drainage such as septal deviation, nasal polyposis, allergy, obstructive lung disease and infundibular pathology, have to be evaluated at preoperative screening and treated accordingly before elevation surgery.

2. The risk on development of maxillary sinusitis is increased in patients with a disturbed clearance of the sinus.

3. In case of large perforations of the sinus membrane a considerable proportion of the grafted bone is exposed to the sinus environment. Because surgical treatment affecting the maxillary sinus will result in at least a transient sinusitis, the larger the exposed area, the greater the potential risk of infection and loss of the bone graft.

### Table 1  General guidelines for the treatment of transient and chronic maxillary sinusitis after elevation of the maxillary sinus floor.

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<tr>
<th><strong>Transient sinusitis</strong></th>
<th><strong>Chronic sinusitis</strong></th>
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<tr>
<td>1. Use of decongestants and antibiotics</td>
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<td>2. Follow-up after 2 weeks</td>
<td>2. CT-scanning and functional endoscopic sinus surgery</td>
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<td>3. If no recovery, transient sinusitis has possibly evolved into subacute sinusitis needing further treatment:</td>
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<td>a. continuation of decongestants and antibiotics</td>
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<td>b. maxillary drains for sinus irrigation</td>
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<td>c. CT-scanning and consideration of functional endoscopic sinus surgery, if no recovery within 3 weeks</td>
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Table 2  General guidelines for the prevention of transient and chronic maxillary sinusitis after elevation of the maxillary sinus floor.

1. Preoperative evaluation of sinus clearance-related factors
2. Post-surgery: nasal decongestants (xylometazoline 0.1%), and topical corticosteroids (dexamethasone 0.01%), to prevent post-surgery obstruction of the ostium
3. Perioperative antibiotic prophylaxis (cephradine i.v. 1 gram 3 times daily, starting 1 hour before surgery and continued 48 hours after surgery)

References


