Maxillary sinus augmentation in the presence of antral pseudocyst: a clinical approach

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Objective. The objective of this study is to present patients with sinus augmentation in the presence of an antral pseudocyst and the surgical procedure, complications, and outcome.

Study design. From 2002 to 2005, 109 patients were scheduled for 1- or 2-stage maxillary sinus floor augmentation (n=129) because of inadequate alveolar bone height for implant placement. Radiographically, a significant antral pseudocyst was shown.

Results. In 8 (7.3%) patients, an antral pseudocyst was diagnosed, and in 2 a history of inactive sinusitis was found preoperatively. A faint dome-shaped radiopacity was found at the lower border of the maxillary sinus. Average lesion size was 5.09 cm². All implants functioned well at follow-up (mean 20 months).

Conclusion. A pseudocyst of the maxillary sinus is not a contraindication for sinus augmentation. The low frequency of sinus membrane perforation and postsurgery sinusitis make the operation safe. In large lesions and in cases with an unclear diagnosis, further evaluation is needed before sinus augmentation. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;103:180-4)

The maxillary sinus augmentation procedure has been routinely performed with predictable results,1 and is an acceptable, safe modality for bone augmentation, providing a base for endosseous implant placement. Careful patient selection, prevention, and effective management of complications lead to successful augmentation. According to Ziccardi and Betts,2 the presence of maxillary (antral) cysts is an absolute contraindication for sinus grafting. However, maxillary sinus cysts are a group of lesions in which the nomenclature and pathogenesis have been somewhat controversial.

Most researchers classify the maxillary sinus cysts into 3 groups, the true sinus mucoceles, the retention cysts, and the antral pseudocysts.3-7 True sinus mucocele refers to an expansive destructive lesion caused by obstruction of the sinus ostia, with accumulation of fluid. Mucus retention cysts are mucoid-filled cysts that develop when seromucous glands of the sinus mucosa become obstructed; they are mostly small and not evident radiographically. The “antral pseudocyst,” a term used to describe a sessile soft tissue elevation on the floor of the maxillary sinus, is caused by the accumulation of inflammatory exudates surrounded by loose connective tissue. Previously, it was believed that the antral pseudocyst results from mucous extravasation, similar to that seen in minor salivary glands. Nevertheless, no mucine can be demonstrated, no histiocytes are present, and there are no associated mucous glands or their ducts present. Thus, it has been concluded that a lesion similar to the oral mucocele apparently either does not occur in the antral mucosa or is very rare.5 In contrast to sinus mucoceles and retention cysts, which are true epithelial lining cysts, the antral pseudocyst is not lined by epithelium.

On a panoramic radiograph, an antral pseudocyst presents as a dome-shaped, faintly radiopaque lesion arising at the floor of the maxillary sinus, and is a relatively common finding with a prevalence of 1.4% to 9.6%8,9 in the population. The pathogenesis of the antral pseudocyst has been a matter of speculation. It could be related to an adjacent odontogenic infection, or as a result of recurrent upper respiratory infections.3,5 In most cases, no treatment is necessary unless a significant expansion is evident radiographically or is associated with symptoms, such as headache.5

This study presents a series of patients who had sinus augmentation in the presence of an antral pseudocyst, the surgical procedure, complications, and outcome.
PATIENT SELECTION AND METHODS

From 2002 to 2005, 109 patients (66 women, 43 men) ranging in age from 24 to 78 years (mean 56 years) were scheduled for 1- or 2-stage maxillary sinus floor augmentation (n = 129). Patients were either completely or partially edentulous in the posterior maxilla and required sinus augmentation because of inadequate alveolar bone height for implant placement. Patients selected had an antral pseudocyst diagnosed radiographically. Two of the researchers (O.M., I.M.) performed all surgical procedures in a private dental surgical practice.

A questionnaire was used for demographic data, medical and dental health history, and smoking habits. A comprehensive periodontal examination determined the periodontal and dental status.

Criteria for sinus augmentation were a maxillary vertical dimension of less than 8 mm with at least 1 mm of original bone height. Patients were excluded from the operation if they had a medical history of any systemic disease that could impair wound healing, such as poorly controlled diabetes mellitus, immunosuppressive drugs, drug abuse, and so forth.

Radiographic evaluation included orthopantomogram and coronal and axial computerized tomographic scans (CT). Assessment of the maxillary sinus anatomy, vertical dimension of the sinus floor, and an evaluation of any pathologic findings were carried out on each patient. All patients with a radiographic finding of a dome-shaped radiopacity compatible with an antral pseudocyst were included. Patients with a lesion less than 1 cm × 1 cm and with diffuse mucosal thickening or other irregular opacifications were excluded.

Sinus augmentation was performed following the guidelines stressed by Jensen. Briefly, the space between the maxillary alveolar process and the sinus mucosa was filled with bovine allograft (BIO-OSS Geistlich, Wolhusen, Switzerland). Complete closure was performed without a barrier membrane at the access window. Postoperative management included systemic antibiotics (500 mg amoxicillin 3 times a day for 7 days), application of decongestant nasal spray, chlorhexidine 0.2% mouthwash (twice a day for 10 days), and analgesics. Patients were instructed to avoid use of any removable appliance for the first 2 weeks postoperatively. After the first week, postoperative follow-up visits were once a month.

Patients’ medical files were reviewed for the surgical approach, operative complications such as perforation of the Schneiderian membrane, and difficulties in reflecting the membrane. Postoperative complications were recorded: acute and chronic sinusitis, graft contamination, or any other side effect.

RESULTS

Antral pseudocyst was diagnosed in 8 patients (7.3% and 6.2% of the sinuses). Table I summarizes the demographic and clinical data. All pseudocysts were dome-shaped. A history of inactive sinusitis was recorded in 2 patients.

Radiographs revealed a faint radiopacity at the lower border of the maxillary sinus. Average lesion size was 5.09 cm² (range 1.17 to 10.00 cm²). The antral pseudocyst was first diagnosed on the radiographs with no previous documentation of the lesion’s presence.

The surgical procedure was performed following the
above guidelines. All but 1 patient (No. 4) had a 1-stage implant procedure following augmentation. In the study group, 24 implants were placed.

Complications

Intraoperative complications were rare, and included minor perforation in 2 patients (Nos. 4 and 8). In patient No. 4, the perforation was associated with fluid leakage, and implantation was postponed for 4 months. In patient No. 8, the perforation was in an area where the membrane was thin and not near the antral-cyst.

Postoperative complications were also rare. Acute sinusitis developed 1 month postoperatively in patient No. 4, which was treated successfully with oral antibiotics. There were no further complications during 14 months of follow-up.

Follow-up

Mean follow-up was 20 months (range 12 to 36 months). All patients showed successful healing with well-functioning implants.

Comparison of patients with sinus augmentation without any sinus pathology

Of the 129 sinus floor augmentations, no radiographic signs of any pathologic lesion were found in 121 sinuses. Intraoperative perforations were recorded in 16 patients (13%). Postoperative sinusitis developed in 6 patients (5% of the 121 sinuses).

DISCUSSION

Dome-shaped or cyst-like opacity in the maxillary sinus is a common finding. It is usually asymptomatic and diagnosed on routine radiographic examination taken for other reasons, such as dental rehabilitation, impacted teeth, or to assess the alveolar ridge for implantation. The prevalence of an antral pseudocyst depends on the type of radiograph taken: on the panoramic radiograph the range is reported to be between 1.4% and 9.6%,8 on CT scans, 12.4%11 (Figs. 1 and 2), and on multiple resonance image (MRI) examination, 21%.12 The maxillary sinus can also harbor various abnormalities as shown by Havas et al.13 (25% of asymptomatic subjects) and Beaumont et al.14 (up to 40% of the patients scheduled for sinus augmentation). Therefore, presurgical radiographic evaluation of the maxillary sinus by a trained surgeon is mandatory to avoid unnecessary complications. Most cases of antral pseudocyst are directly related to the severity of periodontal disease and odontogenic infections.14

Sinus augmentation is associated with several complications, with postoperative sinusitis and bone graft infection as the most serious. The development of sinusitis following sinus augmentation can be directly related to drainage disturbances, mainly as a result of septal deviation and allergy, combined with oversized inferior and middle turbinates. The presence of an
antral pseudocyst reduces the size of the maxillary antrum. Therefore, it can be speculated that lifting the maxillary mucosal lining in this case would further reduce the sinus size and postoperative edema of the Schneiderian membrane. The ostium opening may be blocked causing stasis of fluids, which when contaminated, could lead to sinusitis. Nevertheless, because of the high position of the ostium relative to the sinus floor, especially in a large antrum, the reported prevalence of sinusitis following sinus augmentation in the absence of any pathology is about 3% to 20% of the cases reported in the literature. In these cases, the ostium is probably blocked because of mucosal edema. Therefore, the sinusitis that develops is transient and symptoms cease following appropriate treatment. In the present study, only 1 patient developed sinusitis in the presence of a pseudocyst, 1 month postoperatively.

Differential diagnosis of an antral pseudocyst from other sinus lesions is crucial for treatment planning. As the maxillary sinus may become involved with several types of diseases, including chronic rhinosinusitis, benign and malignant neoplasms, or even dental disorders, appropriate diagnosis is mandatory prior to any intervention. Most pathologic processes in the maxillary antrum are asymptomatic and often found incidentally. When symptoms exist, the lesion is probably large or secondarily infected; these cases need prompt diagnosis and sinus augmentation should be postponed. The differential diagnosis of radiopacities in the maxillary sinus is large and includes, among others, odontogenic lesions, and various soft tissue tumors. Although rare, malignant tumors of the maxillary sinus should be considered in the differential diagnosis. In most cases, sinus carcinoma presents as sinus opacity associated with antral wall destruction and adjacent bony involvement. Initially, panoramic radiographs are useful. However, a definite diagnosis requires more sophisticated modalities, such as CT and MR imaging.

On plain films, inflammatory polyps in the maxillary sinus floor, when small, cannot be differentiated from antral cysts, although inflammatory polyps are often multiple while antral pseudocysts are solitary. Retention cysts can also be found in the floor of the maxillary sinus, however they seldom become large enough to be visible radiographically.

The indications for sinus augmentation in patients with sinus cysts are not clearly defined in the literature. Ziccardi and Betts define mucocele of the maxillary sinus as a relative contraindication for sinus augmentation. However, the term mucocele was used for what they defined as an antral pseudocyst. They suggest that the cyst should be removed or aspirated prior to sinus augmentation. It should be remembered that most pseudocysts and retention cysts of the maxillary sinus are asymptomatic and probably not related to obstructive sinus phenomena. It is generally accepted to consider these patients as poor candidates for surgery. According to the present study, antral pseudocyst should not be regarded as a contraindication for sinus augmentation. The risk of perforation of the Schneiderian membrane in the presence of a pseudocyst is rare because of the typically thick mucosal lining.

Of the maxillary cysts, the mucocele is the most serious lesion that can distend the sinus walls and erode through the bone. Therefore, sinus augmentation should be avoided. Risk for developing sinusitis may be increased in patients with large symptomatic lesions when most of the maxillary sinus volume is occupied. In these patients and where an accurate diagnosis is unclear, further evaluation of the patient should be made and a diagnosis of the sinus pathology should be reached before augmentation is scheduled.

CONCLUSION

A pseudocyst of the maxillary sinus is not a contraindication for sinus augmentation. The low frequency of sinus membrane perforation and postsurgery sinusitis makes the operation safe. Nevertheless, in patients with large lesions and where the diagnosis is not clear, further evaluation should be made before sinus augmentation is scheduled. It is mandatory for the surgeon to be familiar with the anatomy and pathology of the maxillary sinus to avoid any unnecessary complications.

REFERENCES


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