Spontaneous Bone Formation in the Maxillary Sinus after Removal of a Cyst: Coincidence or Consequence?

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ABSTRACT

Background: Maxillary sinus floor-augmentation techniques are frequently used to increase the bone volume in the posterior edentulous maxilla to enable placement and integration of titanium implants.

Purpose: The purpose of this report is to document an unexpected healing pattern after maxillary sinus surgery and to discuss the implications for future bone-augmentation techniques.

Materials and Methods: In a patient referred for sinus augmentation, an intrasinus mucosal cyst was removed 3 months prior to the planned augmentation procedure. A replaceable bone window was prepared in the lateral aspect of the sinus wall. The cyst was removed, the ruptured mucosa was sutured, and the bone window was replaced, resulting in a secluded space in the sinus.

Results: After 3 months of healing, the space between the replaced bony window and the lifted sinus membrane was filled with newly formed bone. The surgical technique was repeated in a second patient and resulted in a similar bone reformation pattern.

Conclusion: Surgical trauma and the creation of a secluded space between the bone surfaces and the sinus mucosa result in spontaneous bone formation in the maxillary sinus. The surgical approach described may be used to achieve bone reformation to enable placement of dental implants without the addition of any grafting material.

KEY WORDS: augmentation, bone reformation, dental implants, maxillary sinus

Maxillary sinus floor-augmentation techniques are frequently performed to enable placement and integration of titanium implants in the atrophic posterior maxilla. Acceptable clinical outcomes have been presented when using autogenous bone and various bone substitutes for this purpose.1,2 The healing mechanisms are not fully understood, but the bone induction and conduction properties of the used grafts and filling materials have been suggested to be of importance.

The aim of this case report is to present two patients who experienced spontaneous bone formation in the antrum after maxillary sinus surgery.

CASE REPORTS

Case 1

A 65-year-old female was referred to the Department of Oral and Maxillofacial Surgery, Umeå University, for maxillary sinus floor augmentation. The patient had been edentulous in the right maxilla for several years, and, according to the tomography, the residual bone in the premolar and molar areas was less than 7 mm in the planned implant sites. In the preoperative radiographs (Figures 1 and 2), an intrasinus mucosal cyst approximately 3 cm in diameter was found in the same side as the planned augmentation. A decision was made to remove the cyst in a separate surgical intervention 3 months prior to the bone-grafting procedure.

The surgery was undertaken with local anesthesia and conscious sedation. The preparation of the bone window in the lateral maxillary sinus wall was done with a micro reciprocating saw (Aesculap® Company, Germany), and the cuts were performed in an oblique
way to enable the replacement of the bone window at the end of the surgery (Figure 3). The bone window was dissected free from the underlying sinus mucosa and kept in saline. The sinus membrane was cut with scissors to expose the intrasinus cyst (Figure 4). After removal of the cyst by suction, the sinus membrane was sutured with two sutures (Figure 5). The bone window was replaced, kept in place by the oblique cuts (Figure 6), and secured by the oral mucosa flap.

Three months later the patient was admitted for the bone-grafting augmentation procedure. The surgery was undertaken with local anesthesia and conscious sedation. At reentry the sinus wall was found to be totally healed (Figure 7). During the preparation of the bone window at the previous site, it became obvious that the healing of the bone wall had created new bone in the area behind the sinus wall (Figure 8). The
total compartment created by the cyst-removal surgery was filled with newly built bone. As this was not evident prior to the surgery, the newly built bone was destroyed, and a bone graft was harvested from the mandibular ramus and grafted to the area.

Case 2

The unexpected bone formation in the patient described above raised the question of whether the reformation of bone could be repeated. A 25-year-old female with a congenital aplasia of her right second premolar was referred for a maxillary sinus augmentation with an autogenous bone graft prior to implant surgery. Lateral tomography in the area showed a bone height of 7 mm in the area of the missed tooth (Figure 9). The surgical site was prepared as described in case 1. However, after the lifting of the sinus membrane, a 13 mm Brånemark Mk III implant was inserted in the residual 7 mm of bone in the floor of the maxillary sinus, and the apex of the implant protruded 6 mm into the sinus cavity, below the lifted sinus mucosa. After the insertion of the implant, the bone window was replaced.

Radiographs taken 8 months after the surgical procedure showed clear evidence of new bone reformation in the created space, all along the implant (Figure 10A and B).

DISCUSSION

The findings from these two cases show that bone formation can occur in the maxillary sinus without the use of bone grafts or substitutes. The bone formation observed can be explained by the formation of a blood clot in the secluded space between the sutured mucosa and the bone walls. This serves as a matrix for bone formation following the principle of guided tissue regeneration. Most likely the replacement bone window contributed to the bone formation by preventing ingrowth of soft tissue. The detailed mechanisms behind the observed bone formation
are presently not known, but migration of osteopotent cells from the denuded bone walls and osteotomy as a response to the surgical trauma probably played an important role. It is also possible that the sinus mucosa periosteum contributed to the reaction.

The presented observations show that the maxillary sinus has great potential for bone healing beyond the skeletal contour as a response to a surgical trauma. This may, in part, explain the good results with maxillary sinus floor-augmentation procedures and indicate that the importance of bone grafts and substitutes to obtain bone formation in the maxillary sinus may have been overemphasized. However, more studies are needed to evaluate the predictability of this technique and the newly formed bones’ ability to support implants. A prospective clinical study has been initiated for this purpose.

CONCLUSIONS
It is concluded that surgical trauma and the creation of a secluded space between the bone surfaces and the sinus mucosa result in spontaneous bone formation in the maxillary sinus. The surgical approach described may be used to achieve bone reformation to enable placement of dental implants without the addition of any grafting material.

REFERENCES