A preliminary study of monocortical bone grafts for oroantral fistula closure

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Sinus floor elevation has become a standard procedure in patients affected by severe maxillary atrophy, before implant placement, provided that the maxillary sinus is intact and uninfected. In the case of an oroantral fistula, simple soft tissue closure may interfere with the process of elevating the Schneiderian membrane. Total regeneration of the bony sinus floor is necessary to prevent disruption of the sinus membrane.

In this study, 5 patients with oroantral fistulae of different causes were treated with autogenous monocortical bone blocks harvested from the chin. Press-fit closure for bony repair of the basal maxilla was sufficient in 3 of them. Two patients needed additional internal graft fixation. In the meantime, the 3 aforementioned patients underwent a successful sinus lift procedure.


Communications between the oral cavity and the maxillary sinus commonly occur after extraction of the first and second molars.1-3 If these problems go untreated, approximately 50% of patients will experience sinusitis 48 hours later and 90% of patients will have sinusitis after 2 weeks of no treatment.4 Therefore, management of communications between oral cavity and sinus after tooth extraction are recommended to promote closure within 24 hours.5

Numerous surgical techniques have been described for the closure of oroantral fistulae. Most of them rely on mobilizing the tissue and advancing the resultant flap into the defect.6-9 A Rehrmann flap, which is fashioned by mobilizing the vestibular mucosa,8 is the most widely used technique. An alternative is the use of the buccal fat pad.10 However, soft tissue coverage may fail, especially in large bony defects. Therefore, a method that makes use of autogenous bone grafts harvested from the iliac crest for the closure of the defects has been used.11

Because of the continued need for implant rehabilitation and the necessity of preimplant surgical procedures, such as sinus floor elevation, the routine soft tissue closure of oroantral fistulae has become a major problem. This method causes matting of the mucosae and Schneiderian membrane and makes elevation of the sinus membrane without disruption impossible.

This technical study was designed to show whether chronic oroantral communications can successfully be closed with intraoral bone grafts and whether these would provide the conditions required for subsequent subantral augmentation in terms of conventional sinus lifting before implant surgery.

MATERIAL AND METHODS

Patients enrolled in this preliminary study had to fulfill 1 of the following criteria:

- oroantral fistula and planned sinus floor elevation
- oroantral fistula along a neighboring root surface extending into the maxillary sinus and undesirable tooth extraction
- chronic oroantral fistula with multiple unsuccessful attempts at closure.

Surgery was planned on the basis of a panoramic radiograph and an axial dental computed tomograph (Fig 1). Preoperatively, the affected sinus was irrigated through the fistula with physiological saline solution followed by an iodine-containing solution diluted with physiological saline solution (1:1; betadine; Purdue, Norwalk, Conn) to reduce infection.

Immediately before the surgical procedure, the patients received amoxicillin and clavulanic acid (Augmentin; GlaxoSmithKline, Uxbridge, England), 2 × 1 g/day for at least 5 days and a nasal decongestant.
Surgical procedure

Irregular bony defects of the sinus floor were standardized to the smallest possible rounded shape with a trephine. A monocortical block graft was harvested at the donor site (chin) by using a trephine with an inner diameter matching the size of the round bony defect (Fig 2); the graft was then press-fit into the defect (Fig 3). If the press-fit was unstable, miniplates (Leibinger, Freiburg, Germany) or screws were inserted for internal fixation. Soft tissue closure was established by using a Rehrmann flap. The sutures were drawn 1 week after the surgical procedure. The miniplates were removed at the time of the scheduled sinus lifting (ie, 3 months after the bony closure of the oroantral fistula).

Six to 12 months after the sinus-closure procedure, the defect sites were evaluated on a computed tomograph to ascertain whether the surgical procedure was successful.

RESULTS

A total of 5 patients were treated with monocortical block grafts harvested at intraoral donor sites. The mean age was 40.8 years (range, 32-50 years). The causes of the oroantral fistulae, the defect sizes, and other characteristics are listed in the Table.

Each patient with extraction-related fistulae (patients 2, 4, and 5) underwent 2 unsuccessful attempts of sinus closure with a buccal sliding flap. Three patients were candidates for 2-stage subantral sinus augmentation and implant placement after sinus closure. In 3 patients, a stable press-fit of the grafts in the bony maxillary defect was achieved. The remaining 2 patients needed additional internal fixation with miniplates or screws. The bony skeleton of the maxilla was completely restored throughout.

In 1 patient, mucosal dehiscence developed 4 weeks after the surgical procedure. This necessitated superfi-
sical decortication of the graft and daily disinfection with 3% hydrogen and Peruvian balm application. The soft tissue defect healed by secondary intention within 14 days. The sinus itself was unaffected. The postoperative course was uneventful in all other patients.

Radiologically, the bony union was verified 8 months after the surgical procedure, on average, by computed tomographic evidence.

In 3 patients with planned implant rehabilitation, a sinus lift procedure was performed through a lateral window 3 months after bony sinus closure. At the time of the sinus lifting, the sinus membrane overlying the original bony defect was found to be intact and neither elevation nor augmentation caused any problems.

**DISCUSSION**

For internal grafting of the maxilla, the sinus membrane should be intact without any signs of inflammation. Chronic oroantral fistulae usually cause severe chronic inflammatory thickening of the sinus membrane and thus dictate that sinus lifting not be used. Solitary soft tissue closure of oroantral fistulae before implant surgery carries a high risk of mucosal injury during augmentation because of the adhesion of the oral mucosa to the Schneiderian membrane. Sinus closure with bone grafts harvested from the iliac crest, as reported in 1969 by Proctor,11 is an attractive option, but its use should be reserved for large defects because of the known morbidity inherent with this procedure.

A congruous fit of the graft in the defect is the key to bony healing.12 This can be ensured with burs of matching sizes. In 3 of our 5 patients, the perfect press-fit obviated additional internal graft fixation. In the remaining 2 patients, press-fit fixation was inadequate, so a miniplate (patient 1) or a bone screw (patient 3) was necessary. In patient 2, closure of the communication along an adjacent root preserved the neighboring tooth.

Bone graft harvesting at intraoral donor sites substantially reduced the demands made on the patients postoperatively.13-16 Nonetheless, 1 of the patients in this study developed wound dehiscence at the recipient site postoperatively. This complication rate is in keeping with those reported for other procedures17 and did not result in reopening of the sinus, but the wound healed by secondary intention.

Therefore, this novel surgical technique is useful for

- closing chronic oroantral fistulae in patients with known fistulae between the maxillary sinus and the nasal cavity
- closing oroantral fistulae to pave the way for subsequent conventional sinus lifting
- closing oroantral communications extending along exposed root surfaces.

**REFERENCES**


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Erratum


Following is a revised version of Table VI from “Magnetic resonance evaluation of the disk before and after arthroscopic surgery for temporomandibular joint disorders” (Ohnuki T, Fukuda M, Iino M, Takahashi T, 2003;96:141-8).

<table>
<thead>
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<th>Successful group*</th>
<th>Preoperative disk morphology†</th>
<th>Postoperative disk morphology†</th>
<th>total no. of TMJs</th>
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</thead>
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<tr>
<td>Enlargement</td>
<td>Even thickness Biconvex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enlargement of posterior band</td>
<td>1 0 9</td>
<td>(31.3%)</td>
<td></td>
</tr>
<tr>
<td>Even thickness</td>
<td>0 1 0 1 (3.1%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biconvex</td>
<td>0 0 21 21 (100%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1 (3.1%) 1 (3.1%) 30 (93.8%) 32 (100%)</td>
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</table>

<table>
<thead>
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<th>Unsuccessful group*</th>
<th>Preoperative disk morphology†</th>
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<td>Enlargement</td>
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<td></td>
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<tr>
<td>Enlargement of posterior band</td>
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</tr>
<tr>
<td>Biconvex</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1 (9.1%) 1 (9.1%) 9 (81.7%) 11 (100%)</td>
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<td></td>
</tr>
</tbody>
</table>

On preoperative MRI, the disk morphology of the successful group showed more progressive deformity than that of the unsuccessful group.

*Wilcoxon single rank test $P < .01$.
†$P < .01$ (Mann-Whitney U test).