
Use of third molar transplantation for closure of the oroantral communication after tooth extraction: A report of 2 cases

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Objective. This clinical report introduces a promising and unique method for the immediate closure of the oroantral communication (OAC) after tooth extraction: the use of the transplanted third molar with closed apices.

Study design. In 2 adult patients, OAC caused by the extraction of an upper molar was immediately closed by using a transplanted third molar with complete root formation. After tooth extraction at the recipient site, OAC with perforated mucosa of the sinus floor was confirmed and the donor third molar was transferred to the prepared recipient socket. Endodontic therapy of the transplanted third molar began at 3 weeks after surgery, and prosthetic treatment was completed at 5 months after the operation. These 2 patients were carefully observed both clinically and radiographically.

Results. Closure of the OAC was successfully performed, and the transplanted teeth became fixed with the passage of time in these 2 patients. Root resorption did not occur, and good functional results were obtained without any complications.

Conclusions. Tooth transplantation of a mature third molar for closure of the OAC is a simple and excellent method because the transplanted tooth not only closes the communication to the maxillary sinus, but it also satisfactorily functions at the recipient site during mastication, even in adult patients.

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Oroantral communication (OAC) with subsequent formation of an oroantral fistula is a clinical complication commonly encountered by oral and maxillofacial surgeons. Punwutikorn et al¹ reported 87 OACs (incidence, 0.31%) after the simple extraction of 27,984 maxillary teeth (canine to third molar). Furthermore, in a study in Japan,² a much higher incidence (3.8%) was reported (77 OACs after 2038 extractions). When it occurs, OAC typically follows the extraction of the maxillary molars because of the anatomically intimate relationship among these teeth and the maxillary sinus. Various techniques have been proposed for the closure of the OAC, including buccal sliding flaps, palatal flaps, and related modifications.³⁻¹⁰ However, these procedures require subsequent prosthodontic treatment for the missing teeth, even after successful closure of the OAC. This clinical report describes a promising and unique method for the immediate closure of the OAC after tooth extraction by means of a transplanted third

molar with closed apices. To our knowledge, this technique has not previously been reported in the English language literature.

CASE REPORTS

Patient 1

A 31-year-old woman presented with left odontogenic maxillary sinusitis attributable to a periapical granuloma of the left upper first molar (Fig 1). Her symptoms, which disappeared after a small gingival incision was made for the drainage and administration of antibiotics, included swelling and pain on the left side of her face. After 1 month, computed tomography (CT) imaging revealed that the inflammation in the maxillary sinus was gone (Fig 2). Then the left upper first molar and 3 roots were extracted, and periapical granulation was enucleated after scraping, when communication from each of the 3 roots to the maxillary sinus, including perforation of the sinus floor mucosa, was confirmed. The interradicular septum of the recipient socket was carefully removed to adjust the transplant, because the donor tooth of the left upper third molar had a single conical root. The donor tooth was carefully extracted with dental forceps and was immediately transplanted to the prepared recipient bed (Fig 3, A). Firm finger pressure and light tapping with a mallet provided good immobilization of the tooth on the recipient bed and produced a complete simultaneous closure of the OAC. Further stabilization, such as an adhesion with resin, was not needed. The patient underwent endodontic therapy at 3 weeks and final prosthetic treatment at 5 months after the operation. She progressed well without any postoperative complications (Fig 3, B). CT imaging 2 years after the operation revealed a clear sinus with no sign of pathosis and new bone formation

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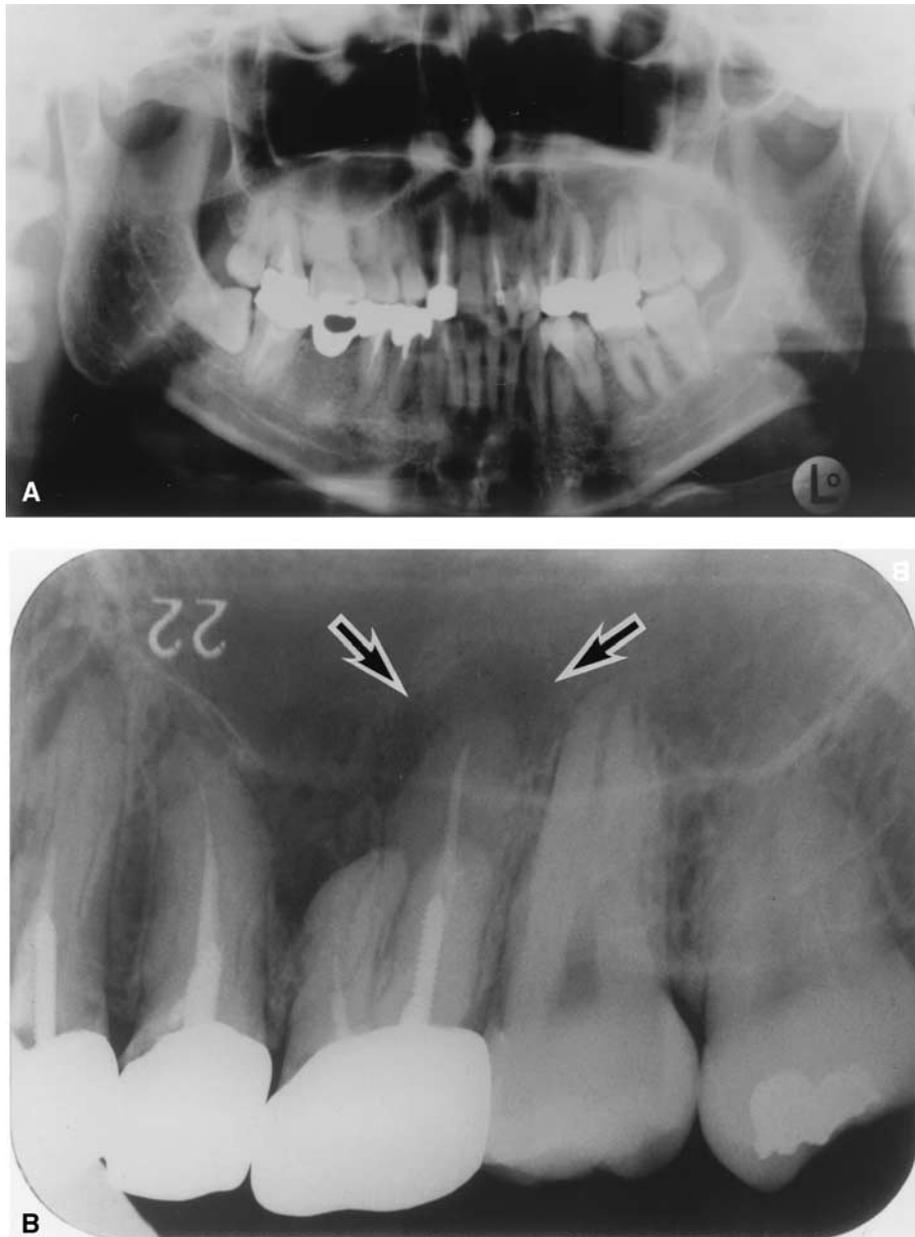


Fig 1. Patient 1: A preoperative panoramic radiograph (A) and a dental radiograph (B) showing unrestorable tooth No. 26, which had a periapical granuloma (arrows) and odontogenic maxillary sinusitis.

surrounding the transplanted tooth, without root resorption (Fig 4). At a 3-year follow-up examination, she presented with good functional results and no recurrence of disease.

Patient 2

A 30-year-old woman was referred to our clinic at Fukui Medical University to determine whether a dental implant was indicated at the site of a decayed left upper second molar. A clinical and radiologic examination revealed that the alveolar crest of the posterior maxilla was insufficient for dental implant anchorage and a maxillary sinus floor augmentation

procedure with a bone graft would be needed for implant placement after the extraction of the left upper second molar (Figs 5 and 6). Thus, it was decided that, immediately after the extraction of the 3-rooted left upper second molar, the single-rooted right lower third molar should be transplanted to close the anticipated OAC. After removal of the tooth at the recipient site, a 5-mm defect of the OAC involving the mucosa of the sinus floor was confirmed. Transplantation and closure of the OAC were successfully performed by means of firm finger pressure and light tapping of the tooth (Fig 7, A). Endodontic therapy began at 3 weeks, and final prosthetic

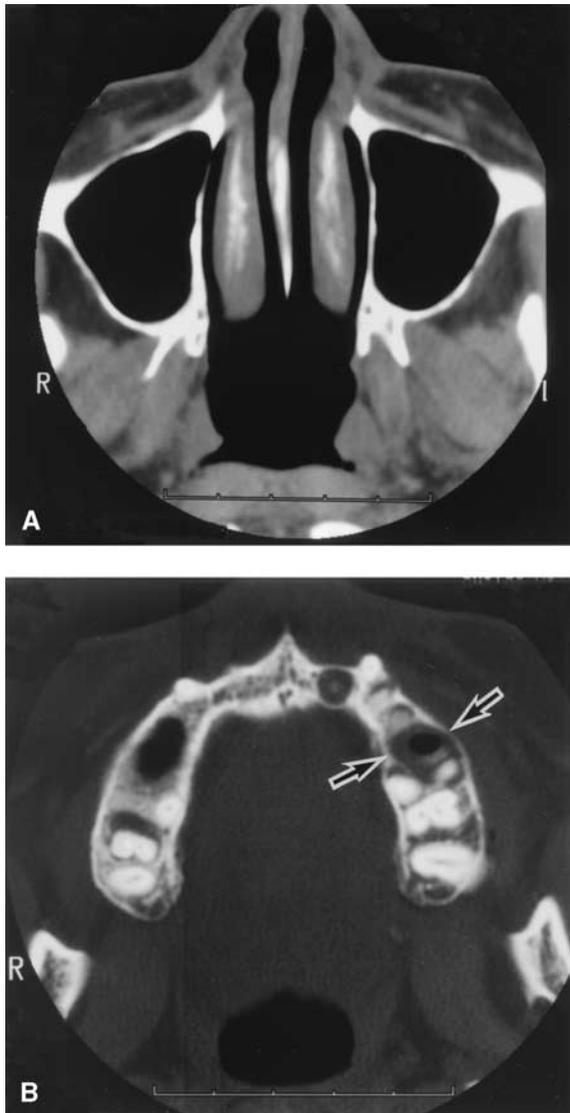


Fig 2. One month after the appropriate therapy with drainage and antibiotics. Axial computed tomography images reveal a clear maxillary sinus without inflammation (A), except for a periapical low-density lesion (arrows) in tooth No. 26 (B).

treatment was satisfactorily completed at 5 months after the operation. The postoperative course was uneventful. The transplanted tooth was stable without any sign of root resorption or ankylosis at a 6-month follow-up examination (Fig 7, B). Furthermore, at that time, CT images revealed no sign of sinusitis; however, a slight thickening of the sinus floor mucosa was observed (Fig 8). Even now, at 2 years after the surgery, the patient has had no complications and has continued to show excellent functional results.

MATERIAL AND METHODS

After local anesthesia, the tooth at the recipient site is extracted and OAC is confirmed. To prevent damaging

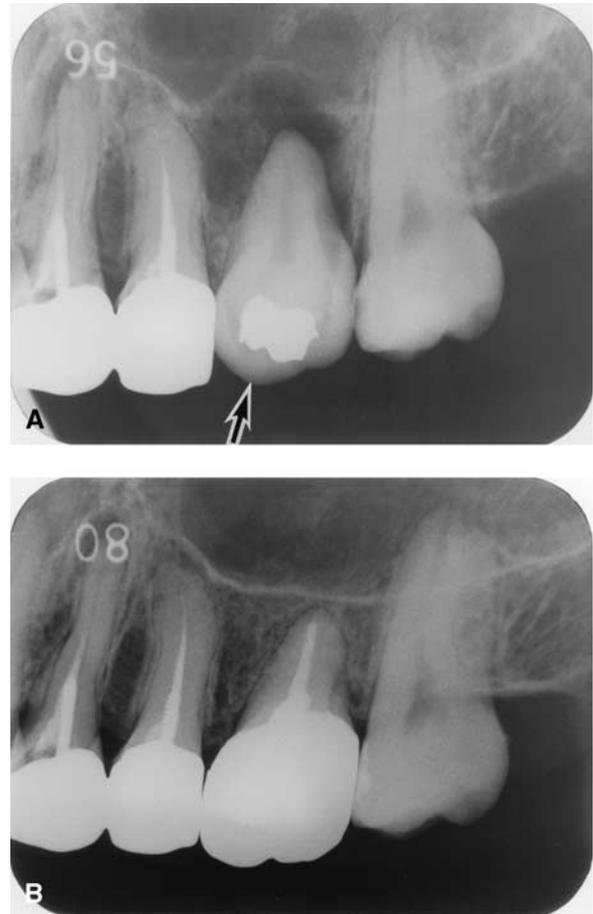


Fig 3. The extraction of tooth No. 26 and 3 roots, along with the extirpation of a periapical granuloma, resulted in entire communication to the maxillary sinus. Tooth No. 28, with a single conical root, was extracted and immediately transplanted to the adjusted recipient socket. A, A radiograph taken immediately after surgery; the arrow indicates the transplanted tooth. B, A radiograph taken 2 years after surgery revealed excellent healing of the transplanted tooth with periodontal ligament-like space.

good vascular supply, the mucoperiosteal flap of the recipient site is not reflected. The recipient socket is carefully prepared by means of round burs in conjunction with copious saline irrigation. CT images and other radiographs of the donor tooth should be used to determine its shape and size. The donor third molar is carefully extracted with minimal injury to the root surface and is transferred to the prepared bone socket. Minimal delay between extraction and transplantation is important to ensure maintenance of periodontal membrane vitality. If further adjustment of the recipient socket is required, the donor tooth can be easily restored to its original socket. The transplanted third molar is seated in the recipient bed by using firm finger

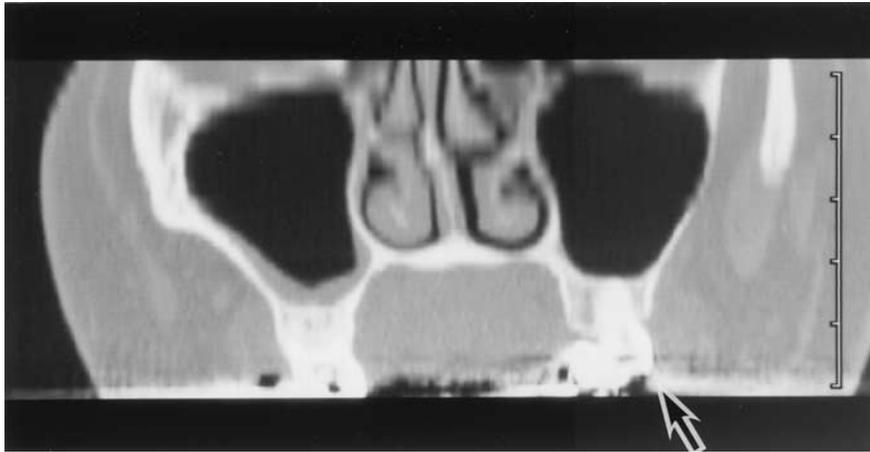


Fig 4. The computed tomograph taken 2 years after surgery revealed a clear sinus and new bone formation surrounding the transplanted tooth (*arrow*), without root resorption.

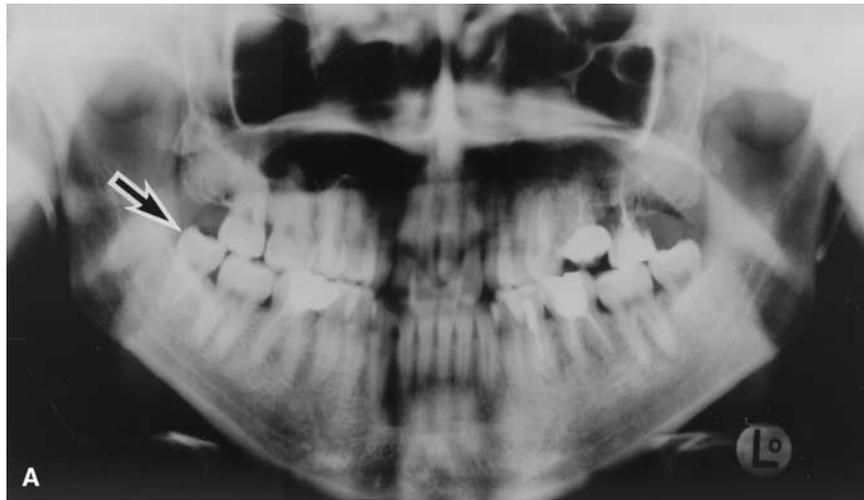


Fig 5. Patient 2: A preoperative panoramic radiograph (**A**) and a dental radiograph (**B**) reveal unrestorable decayed tooth No. 27 with roots protruding into the sinus. Tooth No. 48 (*arrow*) was scheduled to be transplanted to the socket of tooth No. 27 for closure of the oroantral communication.

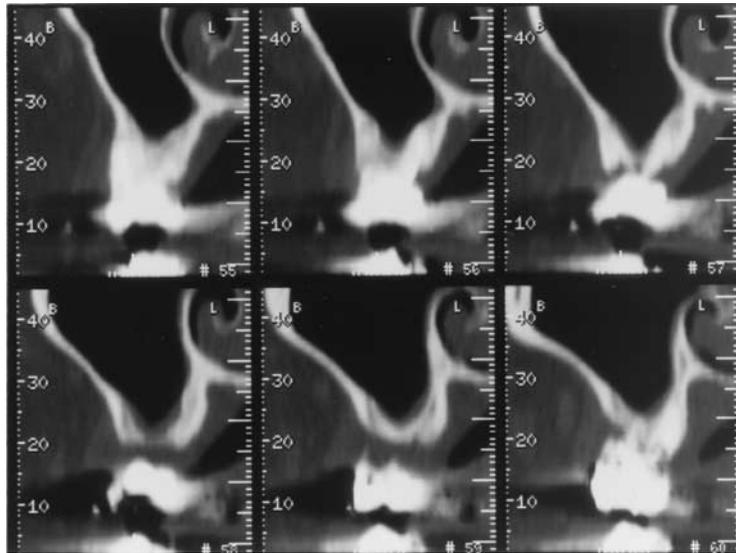


Fig 6. A preoperative computed tomograph revealed that a dental implant was not indicated because of an insufficient alveolar crest at tooth No. 27.

pressure and then is immobilized by light tapping of the tooth with a small hammer. If needed, the transplanted tooth can be stabilized with a suture splint, adhesive resin, or other common methods. The stabilized transplanted tooth should be in slight infraocclusion such that contact with the opposing teeth is avoided during chewing. The patient is given perioperative antibiotics. Each patient undergoes endodontic treatment, which begins at approximately 1 month after surgery, and final prosthetic treatment, which is concluded at 5 months after surgery.

DISCUSSION

A small OAC of less than 2 mm in diameter resulting from tooth removal will usually close spontaneously if the sinus is clear and the blood clot fills the socket.¹¹ However, defects that are larger than 5 mm in diameter or those that linger for more than 3 weeks rarely heal spontaneously and typically will require surgical intervention for closure.¹⁰ The use of a buccal sliding flap is a simple conventional surgical method of treatment, but it produces a reduction in the depth of the vestibular sulcus during the postoperative period.¹² Palatal flaps also produce a denuded area requiring secondary granulation that may be accompanied by pain; in addition, such flaps take a long time to heal and leave scars.^{13,14} The buccal fat pad method is not suitable for treatment of small defects such as OACs after the removal of 1 tooth.^{15,16} In contrast, the technique introduced here with a transplanted tooth proved to be successful in closing 2 OACs and preserving the normal anatomic architecture of the oral mucosa. The most important

advantage of this method is that the transplanted tooth not only closes the communication to the maxillary sinus, but it also functions at the recipient site during mastication. This method does not require the preparation of OAC-adjacent teeth for bridge work.

For the replacement of missing or unrestorable teeth, autogenous tooth transplantation, including the use of third molars, is a well-established surgical procedure.¹⁷ Autotransplantation with mature third molars with closed root apices is thought to be disadvantageous because of its low success rate,¹⁸ unlike autotransplantation with immature teeth,^{19,20} although according to recent literature, the transplantation of third molars with complete root formation has also elicited a satisfactory success rate when the appropriate protocol has been followed.^{21,22} Neukam and Girod²³ studied the complications after tooth transplantation to the upper molar regions, showing that transplantation with immature teeth adjacent to the OAC was safely carried out in young patients. In their study, tooth germs, along with dental sacs, were used for autotransplantation, and the mucosa of the maxillary sinus floor at the site of the OAC was confirmed to be intact without perforation. In contrast, despite the fact that mature third molars with complete root formation were used and an entire OAC with perforated mucosa of the sinus floor was observed, our results reveal a successful outcome, even in adult patients.

The transplantation of mature third molars for the closure of the OAC remains a challenging procedure. The success of tooth transplantation for the closure of the OAC depends on the presence of a proper recipient

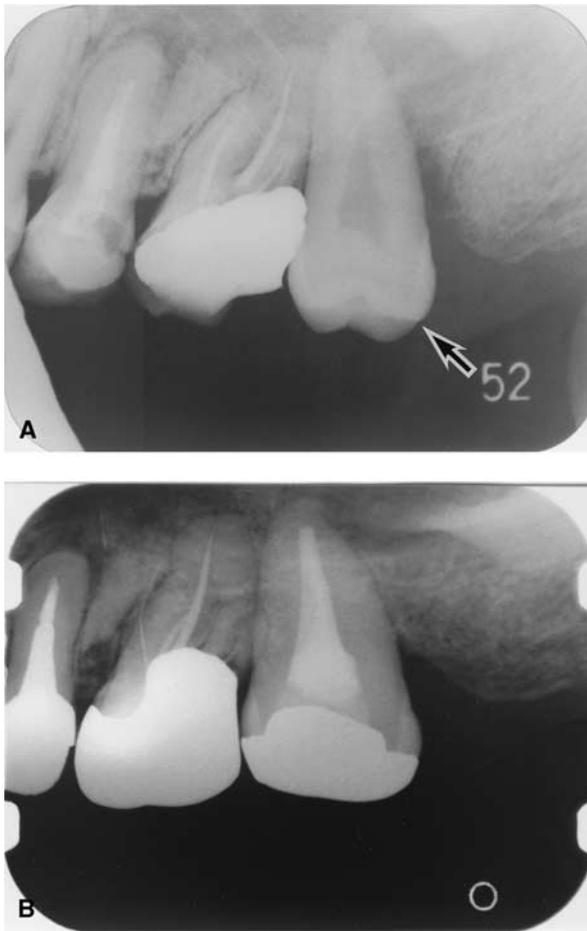


Fig 7. Total communication to the maxillary sinus involving perforated sinus mucosa was observed after the extraction of a 3-rooted tooth (No. 27). Tooth No. 48 possessed a single root and was extracted and then transplanted to the prepared recipient socket. **A**, A radiograph taken immediately after surgery; the *arrow* indicates the transplanted tooth. **B**, A radiograph taken 6 months after surgery revealed excellent healing of the transplanted tooth, with a continuous periodontal ligament space.

socket used to support the transplanted tooth. Therefore, the recipient tooth should be carefully removed to prevent damage to the alveolar process. Moreover, the recipient socket should be meticulously adapted to the donor tooth. Our results show that the alveolar crest at the recipient site should be more than 5 mm in depth as visualized on preoperative CT images. This technique is not recommended in the following situations: when there are space limitations for a donor tooth among adjacent teeth of the recipient site and when the mucoperiosteal tissue is injured.

It is also important to maintain the viability of periodontal tissues of the donor tooth to ensure a good prognosis.^{24,25} The incidence of replacement root re-

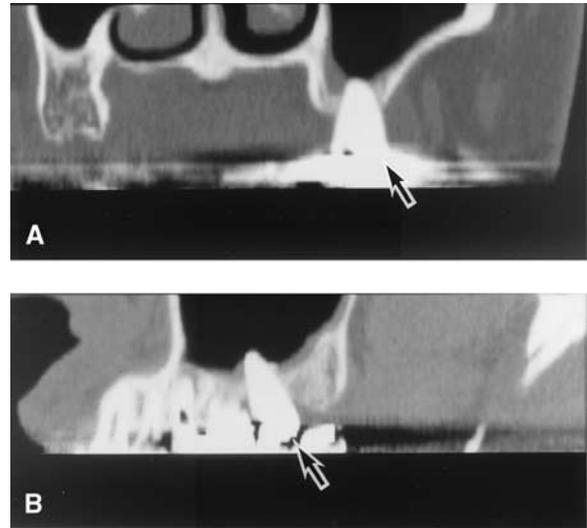


Fig 8. Coronal (**A**) and sagittal (**B**) computed tomographs 6 months after surgery reveal an almost clear sinus with slight thickening of the sinus floor mucosa covering the surface of the protruded root; new bone formation surrounded the transplanted tooth (*arrow*), without root resorption.

sorption and ankylosis can be lessened through atraumatic extraction of the donor tooth and immediate transfer to the recipient site, which minimize the risk of injury to the cementum and to the periodontal ligament.^{26,27} Another factor facilitating success is the absence of pathosis and inflammatory root resorption. The transplanted mature tooth with complete root formation can rarely be expected to revascularize and reinnervate at the site of the OAC. Thus, endodontic treatment is usually required within approximately 1 month after surgery to prevent sinusitis and inflammatory root resorption.

We have determined that tooth transplantation, used for the closure of the OAC, is a simple, useful, and minimally invasive method that should be incorporated as a surgical option when a donor tooth is available in indicated cases. Although it is an investigational type of procedure, this technique nonetheless was used successfully in these 2 patients with follow-up periods of 3 years and 2 years. Further investigation with longer follow-up periods is recommended.

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