

CASE REPORT

Sandwich osteotomy of the atrophic posterior mandible prior to implant placement

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Introduction

The extensive loss of the alveolar ridge and teeth in the posterior mandible presents a complex case for reconstruction. Several augmentation techniques are currently utilized to create sufficient bone volume for predictable placement of endosseous implants in such cases. The numerous surgical approaches proposed consist of autogenous bone grafts, alloplastic materials [1–8], and recently, alveolar distraction osteogenesis [9].

After tooth loss, the alveolar ridge undergoes a continuous resorptive process that is severely accelerated by denture wear [10]. This process is the most pronounced during the first 12 months after the tooth extractions [11, 12]. Extensive resorption of the alveolar ridge in a vertical direction may compromise implant placement and prosthetic rehabilitation. The continuing resorption of the alveolar ridge will eventually result in insufficient bone height superior to the IAN, making dental implant placement impossible without performing augmentation of the alveolar bone in terms of height. The augmentation procedure above the IAN provides sufficient bone for implant placement and allows for long-term successful restoration of missing teeth with implant-supported prosthesis. All the methods suggested should take into consid-

Key Clinical Message

The continuing resorption of the alveolar ridge will eventually result in insufficient bone height superior to the IAN, making dental implant placement impossible. The augmentation procedure above the IAN in terms of height provides sufficient bone for implant placement and allows long-term successful restoration of missing teeth with implant-supported prosthesis.

Keywords

Atrophic mandible, bone graft, implant placement, sandwich osteotomy.

eration patient-related issues, which consist of pain, swelling, sensory nerve disturbances, incidence of graft failure and resorption, and functional long-term restoration.

The reconstruction of vertically atrophic posterior mandibles with onlay bone grafts has been well documented, but the results have not been promising. Different donor sites (symphysis menti, calvaria, iliac crest) have been used as sources of autogenous bone. Vermeeren and associates [13] demonstrated bone resorption up to 50% even when autogenous onlay grafts were used. Rigid fixation of the graft material is imperative to prevent microrotation, which can result in nonunion or fibrous union of the graft material. Guided bone regeneration was proposed in a 1991 report by Dahlin and colleagues [14]. The use of expanded polytetrafluoroethylene membranes is a treatment option for posterior mandibular reconstruction that has been used with varying degrees of success, as reported by various authors [15, 16]. Tinti and coworkers [17] commented that vertical augmentation is a highly sensitive technique, predictable only when the surgical protocol is followed strictly. Vertical ridge augmentation of the atrophic maxilla and mandible by means of a titanium mesh and autogenous bone grafts has been used successfully and has gained popularity since

its introduction [18, 19]. The titanium mesh used must be fixed by titanium screws, and infection is a common complication [18] that may cause loss of grafted bone, resulting in failure. Visor osteotomy was first described in 1975 by Harle [20] to increase the absolute height of the atrophic edentulous mandible. In this technique, the alveolar ridge of the mandible is osteotomized and moved on the visor principle. The two bony parts require fixation with wires. When the procedure is applied to vertical ridge augmentation in the posterior mandible, the mandible is split vertically and, unfortunately, the width of the ridge is reduced. The sandwich technique, which uses bone block graft positioned between osteotomized bony segments, was developed by Schettler [21] in 1974. Stoeltinga and colleagues [22] combined the visor osteotomy and sandwich techniques to augment the severely atrophic edentulous mandible with success [22].

Case Report

A 49-year-old female patient was presented with a bilaterally atrophic mandible and a need for implant therapy. A thorough radiographic examination using cone-beam

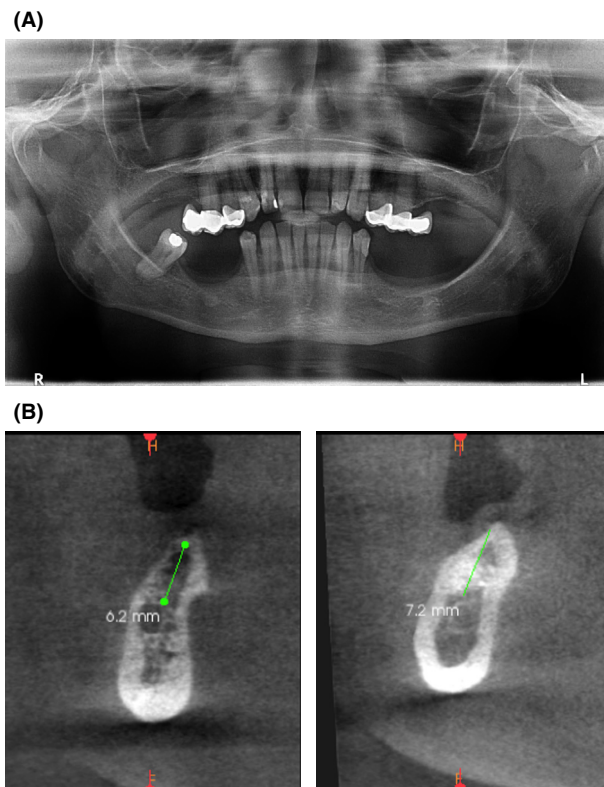


Figure 1. (A) Preoperative radiography displaying the severe atrophic mandibular ridges. (B) Cone-beam tomography of the left and right mandibular ridge.

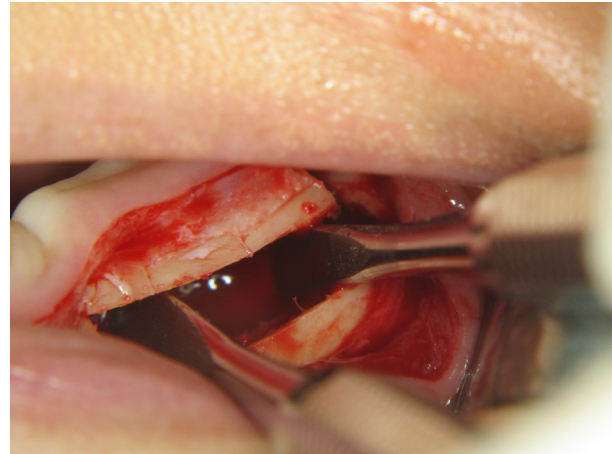


Figure 2. Bone segment raised upward to leave space for the bone graft.

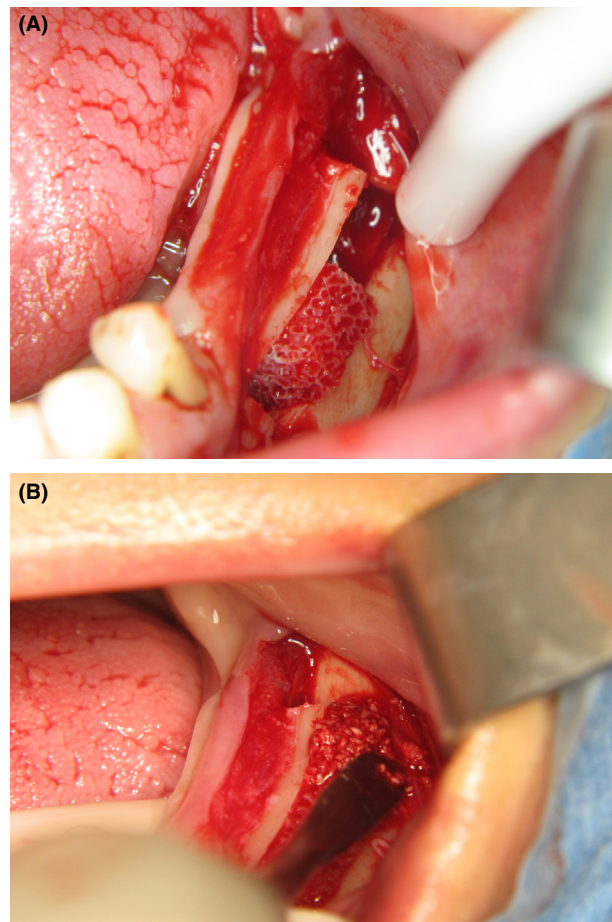


Figure 3. (A) Allogenic bone block inserted interpositionally and placed in the middle of the space between the two bone segments. (B) Remaining spaces in both ends filled with particulate bone graft.

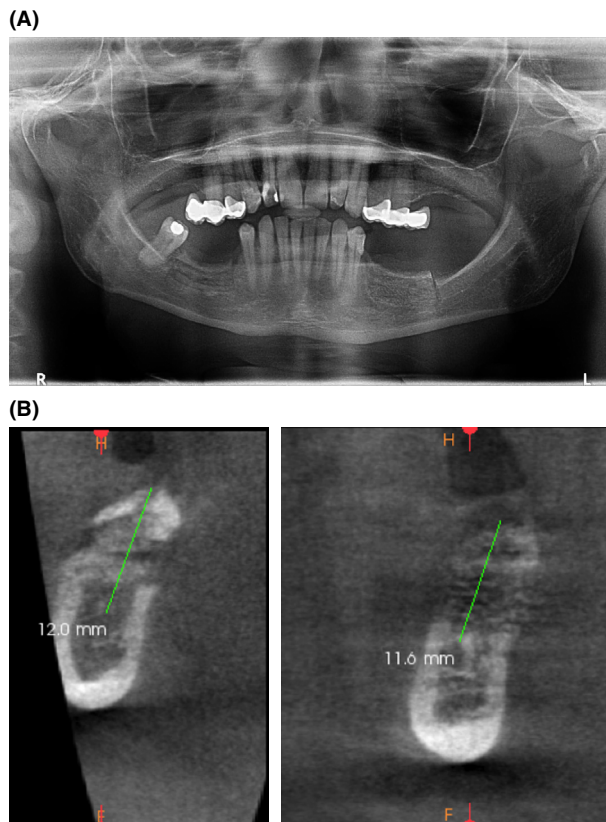


Figure 4. (A) Panoramic radiography following the bone augmentation procedure. (B) Cone-beam tomography of the new mandible heights after the surgical procedure.

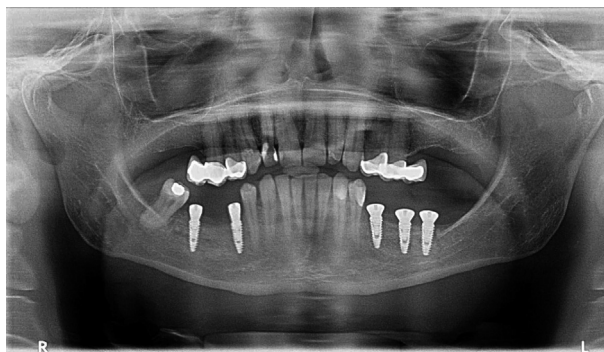


Figure 5. Panoramic radiography of implant placement after 3 months of healing.

tomography revealed mandibular ridges that were not suitable for immediate implant placement in terms of height (6.2 mm on the left side and 7.2 on the right side). The patient was suggested the augmentation of the ridge using an interpositional block of allogeneic bone under local anesthesia. The patient gave her written informed consent, and a preoperative radiograph (Fig. 1A),



Figure 6. Abutment placement.



Figure 7. Final result.

computerized tomographic (CT) scan and Cone-beam tomography of the left and right mandibular ridges were obtained (Fig. 1B). A horizontal incision was made below the mucogingival line in the edentulous area. The mucoperiosteal flap was raised to expose the mental foramen, and the mental nerve was identified, this helps to design the horizontal bone cut. One horizontal bone cut was then made 2 mm above the mental foramen. Then, two other vertical bone cuts were performed on the extremities of the horizontal cut. The more mesial vertical cut was performed 2 mm away from the adjacent tooth. A SG1 handpiece of NSK VarioSurg piezoelectric surgery was utilized to complete the osteotomy. The bone segment was then raised upward to leave space for the bone graft (Fig. 2), with no disturbance of the lingual periosteum. An allogeneic bone block was inserted interpositionally and placed in the middle of the space formerly created without any fixation between the basal segment and the cranial segment (Fig. 3A) The remaining spaces in both ends were filled with particular bone graft (Fig. 3B). The wound was then closed primarily with 4-0

vicryl U-shaped suture. A postoperative cone-beam X-ray and CT scan were obtained to assess the new vertical height of the mandible (Fig. 4A and B). After 3 months of healing, a crestal incision on the attached gingiva was made. The mucoperiosteal flap was detached and endosseous implants were inserted using the classical approach, two into the right side, and three in the left side of the mandible, measuring 4 mm in diameter and 10 mm in length. The primary stability was relatively high (Fig. 5), and allowed for placement of the healing abutments (Fig. 6). The postoperative period was uneventful and the esthetic result was satisfying (Fig. 7). Post surgical follow-up visits were carried out at months 1, 3, 6, 12, 18, and 24 after the surgical procedure. At each follow-up procedure, a clinical and radiographic evaluation was performed. After 2 years of follow-up, the patient's conditions were optimal, the hard and soft tissue did not show any changes.

Conclusions

Moderate to severe posterior mandibular atrophy was successfully treated with interpositional sandwich osteotomy bone grafts. This led to the successful placement of implants and fixed prosthetic implant restorations, thus allowing ever more patients to be considered for implant treatment. The placement of implants of 10 mm in height was made possible. The technique, which has been recently revisited, permits dental rehabilitation in terms of raising the bone above the nerve, reshaping the alveolar crest, and normalizing the interocclusal distance and the crown-implant ratio.

Conflict of Interest

None declared.

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