Sandwich Osteotomy of the Atrophic Posterior Mandible Prior to Implant Placement: A Case Report

SUMMARY

The aim of this report was to present a patient with atrophic posterior mandible, rehabilitated with endosteal dental implants after a sandwich osteotomy of the mandible. Some aspects of the procedure are discussed as well as its outcome.

Keywords: Mandible, atrophic; Sandwich Osteotomy; Dental Implants

Introduction

An 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 were proposed, such as placement of autogenous bone grafts, alloplastic materials1-8, and recently, alveolar distraction osteogenesis9.

After the teeth were lost, the alveolar ridge undergoes a continuous resorptive process that is severely accelerated by denture wear10. This process is the most pronounced during the first 12 months after the tooth extractions11,12. Excessive resorption of the alveolar ridge in a vertical direction may compromise possibility of implant placement and prosthetic rehabilitation. The continuing resorption of the alveolar ridge will eventually result in insufficient bone superior to the inferior alveolar nerve (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 prostheses. All the methods suggested should take into consideration patient-related issues, such as postoperative pain, swelling, sensory nerve disturbances, incidence of graft failure and resorption, as well as functional long term restoration.

Reconstruction of vertically atrophic posterior mandibles with onlay bone grafts has been well documented, but the results have not been promising. Different donor sites (mental symphysis, calvaria, iliac crest) have been used as sources of autogenous bone. Vermeeren et al13 demonstrated bone resorption up to 50% even when autogenous onlay grafts were used. Rigid fixation of the graft material is imperative to prevent micro-rotation, which can result in non-union or fibrous union of the graft material. Guided bone regeneration was proposed in a 1991 report by Dahlin et al14. 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 authors15,16. Tinti et al17 commented that vertical augmentation is a highly sensitive technique, predictable only when surgical protocol is followed strictly. Vertical ridge augmentation of the atrophic maxilla and the mandible by means of a titanium mesh and autogenous bone grafts has been used successfully and has gained popularity since its introduction18,19. However, the titanium mesh used must be fixed by titanium screws, and infection is a common complication18 that may cause loss of the grafted bone, resulting in failure. Visor osteotomy was first described in 1975 by Harle20 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 2 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\textsuperscript{21} in 1974. Stoelinga et al\textsuperscript{22} combined the visor osteotomy and sandwich techniques to augment the severely atrophic edentulous mandible with success\textsuperscript{22}. The aim of this report is to present a case of a patient with atrophic alveolar ridge, treated with sandwich osteotomy and rehabilitation with dental implants.

**Case Report**

A 49-year-old female patient presented with a bilaterally atrophic mandible and requested implant rehabilitation. A thorough radiographic examination using cone-beam 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 mm on the right side). The patient was suggested the augmentation of the ridge using an inter-positional block of allogenic bone under general anesthesia. The patient gave her written informed consent, and a preoperative radiograph and computerized tomography (CT) scan were obtained (Figs. 1 and 2). A horizontal incision was made below the mucogingival line in the edentulous area (Fig 3). The mucoperiosteal flap was raised to expose the mental foramen, and the mental nerve was identified. Two vertical and one horizontal bone cuts were then made 2 mm above the mental foramen. The more mesial vertical cut was performed 2 mm away from the neighbouring 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, with no disturbance of the lingual periosteum (Fig 4). An allogenic bone block was inserted between bone segments and placed in the middle of the space formerly created, without any fixation between the basal and the cranial segment (Fig. 5). The remaining spaces in both ends were filled with particular bone graft. The wound was then closed primarily with 4-0 vicryl U-shaped suture.
A postoperative X-rays were obtained (Figs. 6 and 7) to assess the new vertical height of the mandible. After 3 months, a crestal incision of the attached gingiva was made. The mucoperiosteal flap was detached and endosseous implants were inserted using the classical approach, 2 into the right side, and 3 in the left side of the mandible, measuring 4 mm in diameter and 10 mm in length (Figs. 8 and 9). The primary stability was relatively high and allowed a placement of the healing abutments. The postoperative period was uneventful and the aesthetic result was satisfying (Fig. 10). The patient was followed monthly.

**Discussion**

Moderate to severe posterior mandibular atrophy was successfully treated with inter-positional 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 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.

References


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