Bilateral Vertical Ridge Augmentation With Block Grafts and Guided Bone Regeneration in the Posterior Mandible: A Case Report

Maria A. Peñarrocha*
Jose A. Vina
Laura Maestre
David Peñarrocha-Oltra

The aim is to describe bilateral vertical ridge augmentation with intraoral block grafts and guided bone regeneration in the posterior mandible in preparation for implant placement. A 61-year-old woman, edentulous in the posterior mandible, presented for implant rehabilitation. The radiographic study showed 3 to 6 mm of bone height from the ridge to the mandibular canal. Autogenous bone block grafts from the chin and the mandibular ramus, harvested with ultrasonics, were used to augment the alveolar ridge. To reduce resorption, the grafts were covered with particulate alloplastic material and a collagen membrane. Delayed implants were placed 6 months after vertical augmentation, and 3 months later implants were loaded with a fixed prosthesis. A temporary sensory complication occurred, but 12 months after implant loading, there were no failures. In this case report block bone grafting was a feasible option to vertically augment the alveolar ridge in the posterior mandible.

Key Words: autogenous bone graft, guided bone regeneration, vertical ridge augmentation, block graft

INTRODUCTION

Posterior mandible and vertical augmentation are a major challenge for bone block grafting because of the high degree of resorption. To regenerate vertical defects, block grafts, together with guided bone regeneration and distraction osteogenesis, have the most scientific evidence-based support. It has been demonstrated that resorption diminishes when the graft is covered; a good example was presented by von Arx and Buser, who performed a clinical cohort study demonstrating that an organic bovine bone mineral and a bioabsorbable collagen membrane protect autogenous block grafts from surface resorption in horizontal augmentations. Other types of materials, such as polytetrafluoroethylene membranes, have been used to cover grafts, also with good clinical results but with more complications than collagen membranes.

When reviewing the literature about implant survival in vertical augmented sites, a high range of survival rates is found (76% to 100%). Also, in a recent review, Aghaloo and Moy pointed out that implant survival may be a function of residual bone supporting the implant rather than grafted bone.

The aim of this case report is to describe bilateral vertical ridge augmentation with intraoral block grafts and guided bone regeneration in the posterior mandible to facilitate placement of implants.

CASE REPORT

A 61-year-old female nonsmoker, edentulous in the posterior mandible, presented for implant rehabilitation. Clinical and radiographic examinations (panoramic film and computerized tomography) showed severe vertical mandibular atrophy (3 to 6
mm of bone height from the ridge to the mandibular canal) (Figures 1a through d). Prosthetic space was increased because of bone atrophy. Bilateral vertical ridge augmentation was planned to allow for future placement of implants.

Surgery was carried out under conscious sedation with 1% propofol solution and local anesthesia, (4% articaine and adrenalin 1:100 000; Ultracain, Aventis Pharma, Bad Soden, Germany). A supra-crestal incision was made in the edentulous ridges and on the mucogingival line in the anterior region, and a full mucoperiosteal flap was raised. The emergence of both inferior dental nerves at the mentonian foramina was exposed. Both mentonian nerves were exposed (Figure 2a). Small perforations were made in the bed preparation. Two block grafts from the mandibular symphysis and 1 from the mandibular ramus were harvested using piezoelectric equipment (Ultrasonic Piezon Master Surgery, EMS Electro Medical Systems, Madrid, Spain) (Figures 2b through d). The grafts were fixed on the top of the ridge with osteosynthesis screws (Osteoplac, San Sebastian, Spain). A particulate alloplastic graft containing β-tricalcium phosphate (Keracos, Keramat, Santiago de Compostela, Spain) was placed on the block grafts, and a resorbable collagen membrane (Bioguide, Geistlich AG, Wolhusen, Switzerland) was placed to protect the augmented site (Figures 2e through n). A releasing periosteal incision at the base of the buccal flap was made to obtain a completely tension-free suture. The flap was closed with nonabsorbable monofilament sutures (Figure 2O). Amoxicillin plus clavulanic acid (500/125 mg 3 times a day for 5 days) and ibuprofen (600 mg 3 times a day for 3 days) were administered. Sutures were removed after 1 week.

The postoperative clinical and radiographic examination showed an increase in the height of the alveolar ridge (Figures 3a through c). A temporary hypoesthesia of the chin occurred; hidroxil (30 mg/d for 2 months) was administered, and symptoms disappeared completely after 2 months. Implants were placed 6 months after augmentation (Figure 3d) and were loaded 3
FIGURE 2. Vertical augmentation surgery. (a) Flap raised, showing both mentonian nerves. (b) Chin graft with piezoelectric technique. (c) Alveolar ridge. (d) Perforations in the reception bed. (e) Graft adapted on the top of the ridge. (f) Mandibular ramus block graft. (g) Graft adapted to the reception site. (h) Alloplastic material covering the grafts. (i) Collagenous membrane covering the graft. (j) Chin block graft. (k) Perforations in the reception bed. (l) Graft adapted with microscrews. (m) β-tricalcium phosphate covering the graft. (n) Collagen membrane covering the graft. (o) Suture with monofilament.
**Figure 2.** continued.

**Figure 3.** Preoperative study, implant surgery, and implant loading. (a) Intraoral view of the right alveolar ridge after vertical augmentation. (b) Intraoral view of the left alveolar ridge after vertical augmentation. (d) Orthopantomography after block bone augmentation. (d) Orthopantomography with implants placed. (e) Intraoral view of the inferior right prosthetic rehabilitation. (f) Intraoral view of the inferior left prosthetic rehabilitation. (g) Occlusal view of both implant-supported restorations. (h) Orthopantomography 12 months after implant loading.
months after placement (Figures 3 e through g). No implant failures were recorded 12 months after loading (Figure 3h).

**DISCUSSION**

The aim was to vertically increase the posterior mandibular ridge to permit implant placement. Augmentation was performed successfully. The temporary sensory complication probably occurred because the nerve stretched during flap detachment. Implants were loaded successfully.

The implant bed was perforated to increase the blood supply. This issue is controversial in the literature. Some studies have demonstrated that perforations increase hard-tissue formation at the interface between graft and bed preparation, but others have found no differences between perforated and nonperforated sites in bone formation at the interface.

Grafts were harvested from the chin and the mandibular ramus. Different intraoral locations have been proposed as donor areas. These intraoral (membranous) bone grafts have the advantage of suffering less resorption than iliac crest (endochondral) grafts. In any case, resorption is always present and can be reduced by covering the graft. Von Arx and Buser demonstrated that in cases of horizontal augmentation if the block graft is covered with a slow resorption material (xenograft) and a collagen membrane, a low surface resorption is found (mean = 7.2%). Similarly, in the present case report, particulate alloplastic graft material and collagen membrane was used to protect the graft. Collagen membranes have the advantage of lower exposure rates than polytetrafluoroethylene membranes. In this case report, the technique of von Arx and Buser was used to increase alveolar ridge, but in the vertical dimension, so the graft was fixed on the top of the ridge instead of on the side of the ridge.

Guided bone regeneration and distraction osteogenesis are other options for vertical augmentation, and both are supported by strong evidence in the literature. Guided bone regeneration requires that the potential space beneath the membrane be maintained to gain a predictable quantity of bone in the dimension needed. Distraction osteogenesis can only be implemented in areas of the mouth where 6 to 7 mm of bone remains above anatomical structures. The patient in the present clinical case did not present either of these 2 conditions. Temporary postoperative paresthesia in the mental area was present for 2 months. To minimize this kind of complication, piezoelectric techniques can be used to obtain the graft. We used this technique to obtain the grafts from the chin and the mandibular ramus.

A clinical case report is presented that describes vertical augmentation of the posterior segments of the mandible to allow dental implants. Good clinical results and implant success were achieved. A temporary sensory complication as a consequence of bone grafting occurred. In this case report block bone grafting was a feasible option to vertically augment the alveolar ridge in posterior mandible.

**REFERENCES**