

INTERPOSITIONAL INLAY BONE GRAFTING ENHANCED BY AUTOLOGOUS PLATELET GEL (APG) IN ATROPHIC POSTERIOR MANDIBLE TREATMENT: A CASE REPORT

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SUMMARY

Background. The severe atrophy of the posterior mandible requires surgical bone grafting for implant positioning and fixed prosthetic rehabilitation. The interpositional inlay grafting procedure is a predictable technique to increase the bone volume after loss of teeth. The purpose of this case report was to evaluate the clinical and radiographical effectiveness of an interpositional inlay grafting enhanced by Autologous Platelet Gel at 6 months healing.

Materials and methods. An interpositional inlay grafting was clinically provided in the region of the third quadrant of the posterior atrophic mandible. The study findings were evaluated by clinical and radiographical parameters at 6 months healing. No miniscrews nor miniplates were used for stabilizing the bovine bone block.

Results. The healing phase was uneventful and no impairment regarding inferior alveolar nerve sensibility was reported. At 6 months the tomographical scans showed the complete volumetric stability of the bone graft.

Conclusion. The Interpositional Inlay Grafting enhanced by Autologous Platelet Gel represents a predictive and improving treatment for severe atrophies of the posterior mandible.

Key words: inlay bone graft, collagen, bovine bone block, autologous platelet gel, atrophic mandible.

Introduction

Severe atrophy of the posterior mandible is a clinical condition related to different factors and sequelae of the teeth loosening due to caries, periodontal disease or trauma (1, 2).

The rate of bone remodelling follows individual patterns and increases during the first year of the tooth loss and continues throughout life with a slower bone resorption (3, 4).

Rehabilitation with a mobile prosthesis or overdenture could produce a non-physiological pressure and an overloading on the bone ridge, that could consequently induce a higher rate of

bone remodelling (5).

Other anatomical and systemic conditions, sex, age, hormonal balance, masticatory function could represent important, non prosthetic factors that could generate bone atrophy of the jaws (6). The reconstruction of the atrophic posterior mandible represents the elected treatment for implant-supported restoration of the region, in order to provide an adequate bone volume for the positioning of the fixture (7-9).

The reconstructive approach of prosthetically driven implant placements has advantages related to increased esthetical and functional outcome, normal prosthetical crown dimension.

For the treatment of mandible vertical bone

atrophy, classified as Class II alveolar crestal defect by Siebert classification (10), several augmentation techniques have been described in literature such as: Guided Bone Regeneration (GBR), Osteogenic Distraction, Onlay and Inlay grafting.

The Inlay grafting approach consists into a horizontal osteotomy associated with an interpositional grafting to increase the bone volume (11-13). The advantage of this procedure is related to an increased blood support, higher level of osseointegration and mineralization of the graft and decreased rate of bone resorption (14).

The aim of this case report was to describe the clinical and radiographical outcome of interpositional inlay bone grafting for the treatment of an atrophy of the posterior mandible.

Case report

A female patient aged 51 years was scheduled for fixed prosthetic rehabilitation of the molar zone of the posterior mandible and included in this study after the signing of informed consent. The investigation was conducted following the Declaration of Helsinki and was approved by the Ethic Committee of Chieti-Pescara University, Chieti, Italy. The subject was treated in the Department of Medical, Oral and Biotechnological Sciences of University of Chieti-Pescara. The diagnosis and the surgical planning were based on the preliminary visit observation with radiographic Orttopanthomography (OPT) and three-dimensional Cone Beam Tomography (CBCT) (Figure 1). The pre-operative mean residual bone height above the mandibular canal

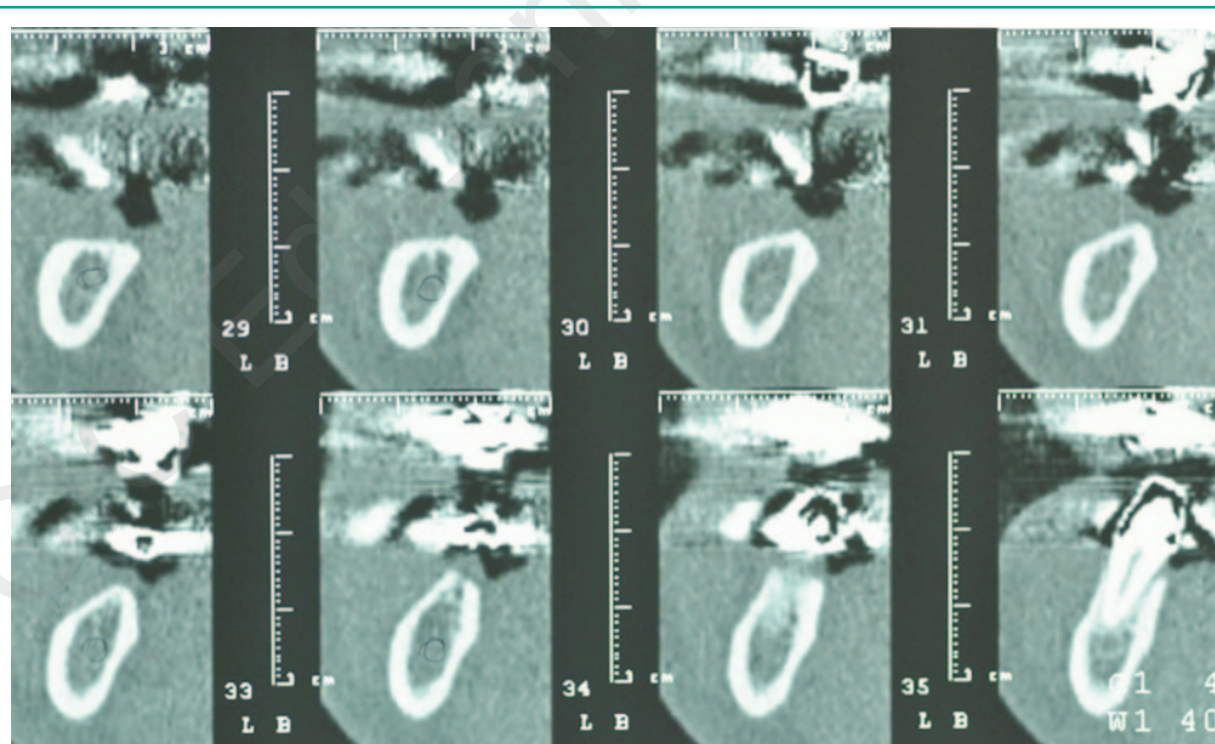


Figure 1
Preoperative Dentascan Computed Tomography scans.

and the cortical margin of the alveolar ridge were measured on CT scans.

Bovine Block Graft

The grafting inlay procedure was provided by a bovine bone block (RE-BONE, UBGEN, Vigonza PD, Italy), in order to reconstruct the alveolar ridge volume for implant rehabilitation. The bone block graft is a cancellous heterologous bone produced by a production process which avoids ceramization of the hydroxyapatite matrix, thus accelerating physiological resorption. This graft presents a rigid consistency and is able to induce blood clotting stability and the creation of a favourable site for new bone formation.

Surgical procedure

The patient's blood was collected from venipuncture using a disposable vacuette and centrifuged at 1750 RCF for 7 min at room temperature, producing autologous platelet gel (APG) (UBGEN, Vigonza PD, Italy) following the manufacturer's protocol.

The antibiotic prophylaxis was administered during the surgical phases with amoxicillin/clavulinate (Augmentin, Glaxosmithkline Brentford, England) at a loading dose of 2 g, followed by 2 g/day for 6 days beginning the day after surgery, associated with a non-steroidal analgesic therapy drug.

Local anesthesia was performed by Articain 4% and adrenaline 1:100,000 solution (Pierrel, Milano Italy). The mucosal flap was cut by a paracrestal incision in the buccal vestibule, avoiding with care the emergence of the mental nerve, and a subperiosteal tissue dissection limited to the buccal side.

A horizontal osteotomy was performed 2-3 mm

above the mandibular canal, and two oblique osteotomic cuts were made by a piezoelectric device (Surgysonic, Esacrom, Imola Italy) (Figure 2a). The bone segment was then raised in the coronal direction, sparing the lingual periosteum. Bone block grafts of cancellous bovine bone block (RE-BONE, UBGEN, Vigonza PD, Italy) were positioned mesial and distal between the bone segment and the basal ridge (Figure 2 b, c) (2). The space was filled by particulate of cortico-cancellous bovine bone (Figure 2 d) (RE-BONE, UBGEN, Vigonza PD, Italy) and an APG membrane was positioned to cover the grafted site (Figure 3 a). No miniscrews nor miniplates were used to stabilize the bovine bone block.

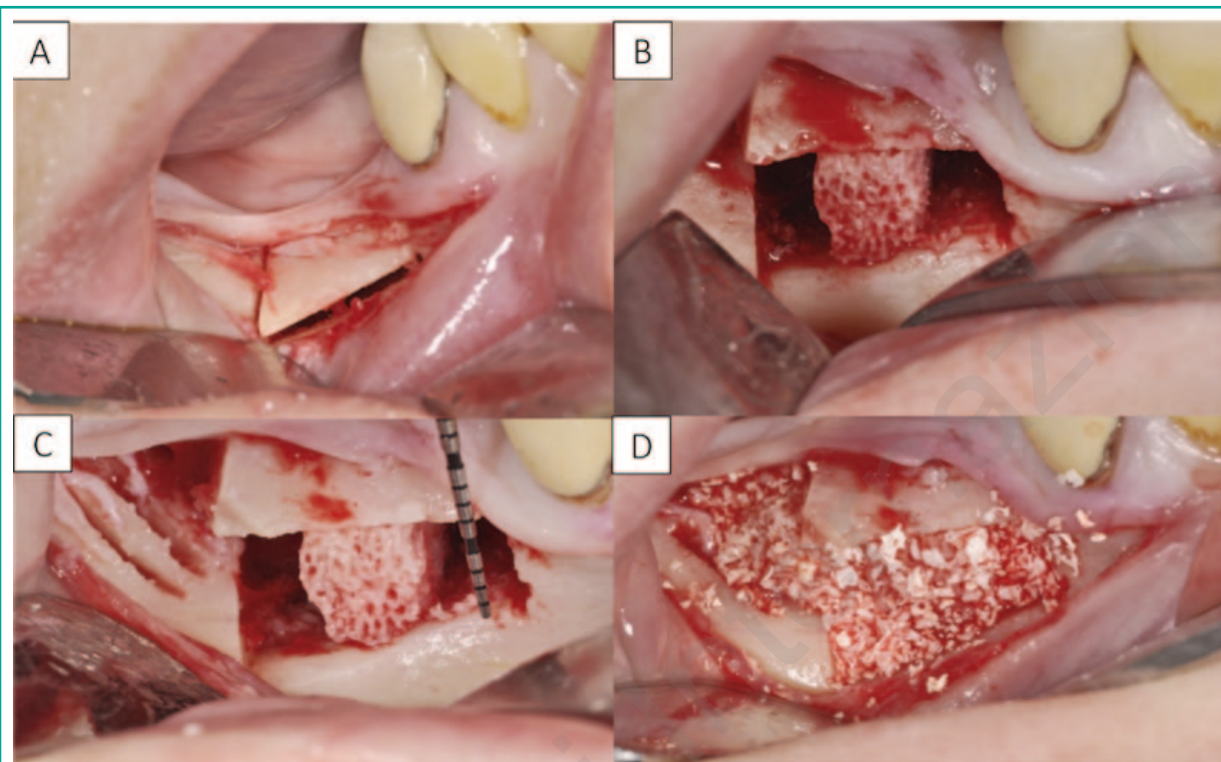
The surgical flap was sutured with Polyglactin 910 3.0 (VYCRIL RAPID, Ethicon, Somerville NJ, USA) (Figure 3 b).

The oral disinfection was performed by rinses with chlorhexidine 0.2% (Curasept®, Curaden Healthcare S.p.A) twice daily for 10 days with a soft diet. Moreover, the patient carried out a rigid protocol of oral care, without the use of a removable prosthesis. The suture was removed at 10 days from the surgical procedure. Radiographical scans were taken at the end of surgery and six months after the healing for the implant positioning. A mucoperiosteal flap was elevated and two implants (Isomed, Albignasego, Padova, Italy) were positioned following the protocol of the implant manufacturer.

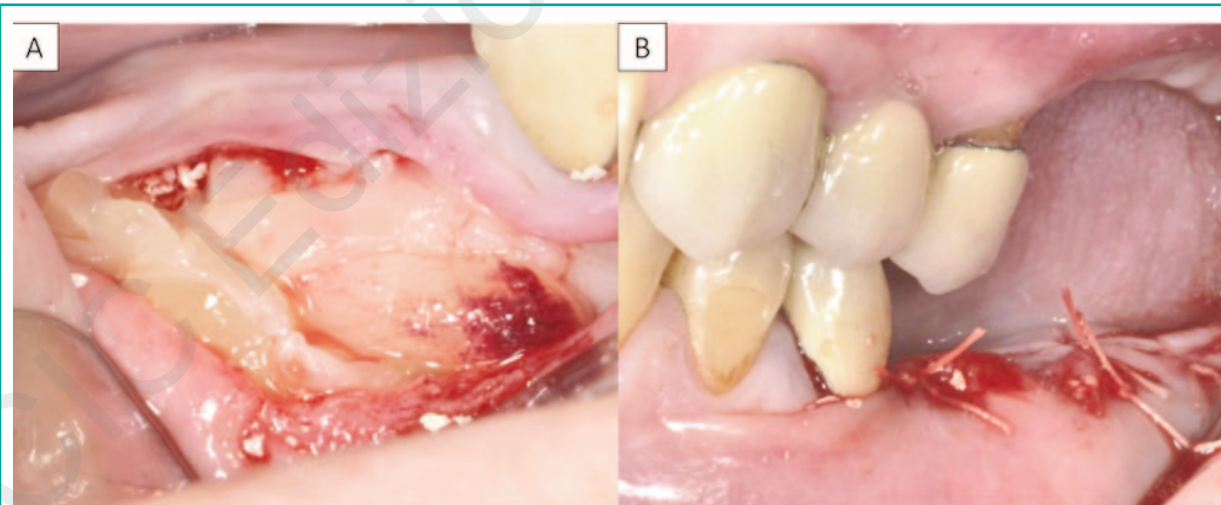
Results

The postoperative phases were uneventful, and no neurosensory disturbance was present after the surgery and no mucosal exposure was reported during the healing of the site.

The bone volume gained was maintained after the healing period and no grafting height loss was evident after 6 months (Figure 4).

**Figure 2**

Clinical phases of the surgical procedure: A] bone osteotomy lines; B] interpositional bone graft; C] bone height gain; D] Particles of bovine bone positioned in the gap. No miniscrews or miniplates were used.

**Figure 3**

Surgery phases: A] APG membrane positioned covering the grafted site.; B] Flap repositioned and sutured.

The radiographic evidence showed that no radiolucency of the graft was present after the healing process, and the radiopacity increased

gradually at 1 month after surgery. No pathological evidence of radiolucency was found after the dental implant placement.

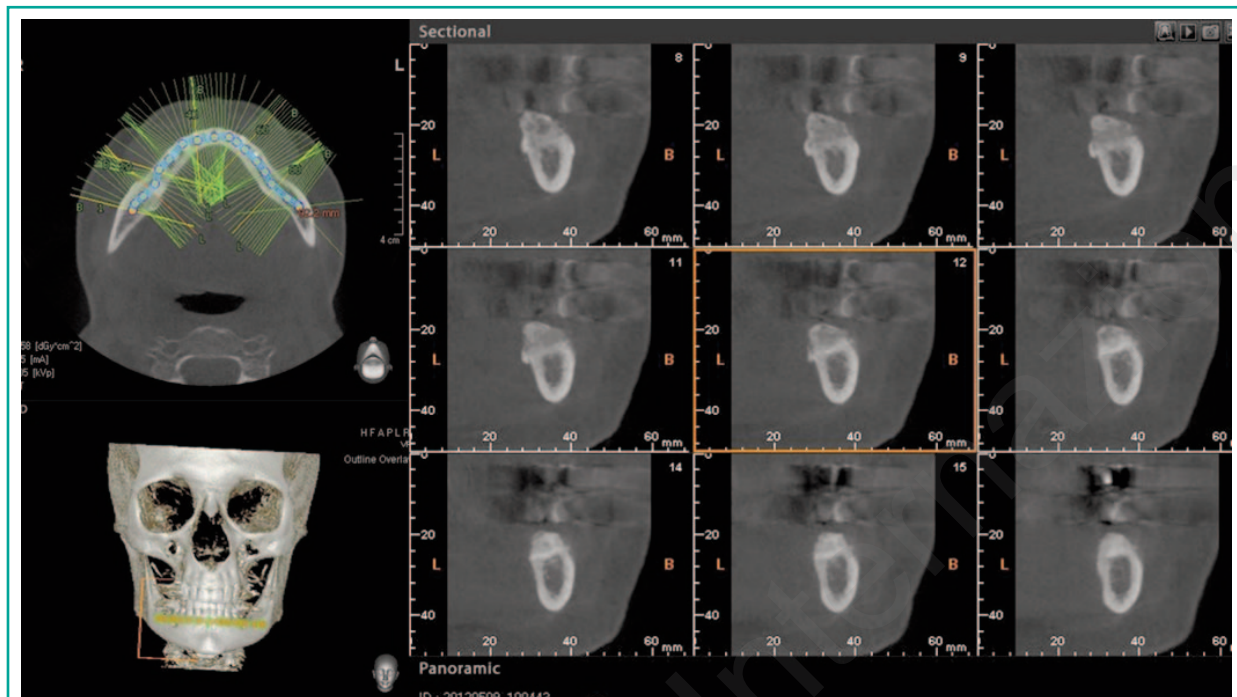


Figure 4
Post-Operative CBCT of the vertical ridge augmentation after 6 months (Arrows).

Discussion

Vertical ridge augmentation of the atrophic posterior mandible and implant placement represents a clinical challenge for the surgeon, related to a difficult learning curve, clinical complications, technical problems and the success rate of the procedure (15). Some of these clinical complications related to the bone grafting are fracture of the cortical bone, bone resorption, membrane exposure, neurological impairment (16). The application of more acceptable procedures with predictable outcome should become the goal of jaw reconstructive surgery for dental implant rehabilitations.

The piezosurgery device represents a useful tool, able to produce a micrometric cut of the osteotomy lines, with the preservation of the soft tissue, with a drastic decrease of those

complications if compared with the use of conventional rotary instruments (17, 18).

The absence of micromovement and the blood supply are key factors for a successful integration of the grafted biomaterials and substitution with new bone (14, 19).

In this case report the effectiveness was shown by a post-operative course without any adverse event, accompanied by a high level of graft integration reported in the radiographical follow up.

The interpositional inlay bone grafting without using a fixation device is a procedure already described in literature and has the advantage of the decreased risk of failure for fracture or bone resorption related with the application of miniscrews and miniplates (18, 20).

Barone et al. reported a high success rate of the inlay graft technique (93.8 %) for the treatment of posterior mandible atrophy (13).

With the interpositional inlay technique, the stability of the whole is strictly related to the rigidity of the block graft. Moreover, the use of platelet concentrates, in form of the membrane, produced the advantage of a supraphysiological concentration of growth factors that was present in the APG membrane, with a stimulating effect on cell activity and molecular modulation involved in the healing process (21, 22).

The clinical outcome showed the maintaining of the bone grafted, after 6 months healing with a correct vertical jaw distance.

The creation of an optimal occlusal relation is important to achieve the three-dimensional positioning of prosthetic driven implants and the correct dimensional ratio of the anatomical crown (23).

Conclusions

The interpositional inlay bone grafting approach represents an effective treatment option for implant-supported rehabilitation of severe atrophy of the posterior mandible, with high stability of the surgical outcome and it is clinically acceptable by the patient.

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