

# DELAYED EXPANSION OF ATROPHIC MANDIBLE (DEAM): A CASE REPORT

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## SUMMARY

**Purpose.** The present case report presents the clinical results of delayed expansion of mandibles by ultrasonic surgery in case of mono edentulous.

**Materials and methods.** The patients with a residual alveolar ridge thickness between 2,3 and 4,1 mm in the coronal area of posterior mandible was threatened. In the first stage, four linear corticotomies were carried out by ultrasonic surgical device; bone expansion was not performed. After 4 weeks, in the second stage, adequate bone expansion, without compromising cortical vascularisation, by utilising a combination of scalpel, thin chisels and threaded osteotomes was achieved and one implant was placement, after filling the gaps with a cortico bovine biomaterial.

**Results.** The postoperative course was uneventful and final width ridge was  $6,17 \pm 0,26$  mm.

**Conclusions.** The present case report showed that mandibular ridge expansion using a delayed split-crest technique by means of ultrasonic surgery and association with biomaterial clinically lead to a good horizontal bone gain with no fractures of the buccal plate and high implant success rate.

**Key words:** bone regeneration, bone resorption, alveolar bone loss, piezosurgery, alveolar ridge augmentation.

## Introduction

Insufficiency of bone tissue represents one of the most frequent problems in implant prosthetic rehabilitation in the posterior mandible (1-16).

Localized osseous defects can be treated with various techniques such as grafting with bone blocks or particulates in an onlay form, an inlay technique with or without Guided Bone Regeneration (17).

Bone expansion in oral surgery consists of expanding atrophic bone crests in order to secure sufficient bone width for a proper dental implant placement (18). To avoid these problems, different regenerative surgical techniques have been developed: conventional onlay/inlay grafts, interpositional sandwich osteotomies, guided bone

regeneration with semipermeable membranes, piezoelectric stimulation, and alveolar distraction osteogenesis procedures (19). One of the most predictable regenerative technique to increase the amount of buccal bone is the sagittal osteotomy of the ridge (20-22). Such technique has been reported to have a very high success rate (98-100%), and to show a minimal volumetric contraction in the long-term, since the buccal bone is maintained *in situ* and provided with both endosteal and periosteal blood vessels, limiting secondary bone resorption. Slight separation of a maxillary ridge crest is performed as a hinge-like separation of the buccal cortex. It is more difficult to achieve the same hinge-like separation in the posterior mandible because of the compact outer cortex and external oblique line (23). A previous clinical study we described

delayed expansion of atrophic mandible technique (DEAM) can be used for alveolar ridge augmentation in the posterior mandibular region (24). It is more difficult to achieve the buccal cortex separation in the posterior mandible in case of single edentulous. Aim of the present case report was a clinical evaluation, in human, of delayed expansion of the mandible in single edentulous.

## Case report

A 49-year-old woman was referred to the Department of Oral Surgery of the University of Chieti-Pescara by her dentistry for implant placement in left mandible. Intraoral examination revealed healthy mucosa and there was not any sign of infection. Her health history was negative for osteoporosis, irradiation treatment in the head and neck area, immunosuppressed or immunocompromised, treated or under treatment with intravenous amino-bisphosphonates, active periodontitis, poor oral hygiene and motivation, uncontrolled diabetes, pregnant or nursing, substance abusers. Intraoral examination revealed healthy mucosa and there was not any sign of infection. The CBCT showed a good height and insufficient width and was programmed insertion of implant to 4 x 11 mm after DEAM technique.

Prior to surgery, the patient mouth was rinsed with a chlorhexidine digluconate solution 0,2% for 2 minutes. Local anesthesia was obtained with Articaine® (Ubistesin 4% - Espe Dental AG Seefeld, Germany) associated with epinephrine 1:100.000. In the first stage, four linear corticotomies were carried out by ultrasonic surgical device (Surgysonic, Esacrom, Imola, Italy): a sagittal corticotomy in the coronal area between mesial and distal tooth of the mandibular alveolar crest and two vertical corticotomies in the buccal wall after a supracrestal incision and elevation of a buccal mucoperiosteal flap; and finally a sagittal corticotomy, 2-3 mm above the mandibular canal. At this stage bone expansion

was not performed due to the possible loss of the blood supply to the osteotomized segment owing to the full thickness mucoperiosteal flap reflection. The flap was closed with interrupted sutures (Vicryl 4.0, Ethicon FS-2; St. Stevens-Woluwe, Belgium). After 4 weeks, in the second stage, adequate bone expansion, without compromising cortical vascularisation, by utilising a scalpel as obtained. Specifically, a limited reflection of a soft tissue flap, thus maintaining the blood supply to the buccal bone, and a sequential introduction of osteotomes, with an increasing diameter, were performed (Figure 1).

Ridge width was measured at the baseline, after the first surgery, and finally after the second surgery. One submerged implants (Implacil, De Bortoli, Sao Paulo, Brasil) was inserted in the premolar area (Figure 1), after filling the gaps with a cortico-spongy porcine biomaterial (OsteoBiol Gen-Os, TecnoSS, Coazze, Italy). Implant sockets were made using an ultrasonic surgery device and final conventional drill sequence according to implant size. Implant was inserted by using a mechanical system initially, and final turns were completed with a manual wrench. Immediate stability was clinically evaluated, and all implant had insertion torque greater than 25-30 N/cm. The flaps were closed carefully with interrupted suture with Polimid 4.0 (Sweden & Martina, Italy) CBCT were taken after implant insertion to verify the correct implant position. Amoxicillin (500 mg), one capsule every 8 h for 7 days. Ibuprofen 600 mg was prescribed to be taken when needed. In this phase the patient was not allowed to wear removable dentures before implant uncovering. The postsurgical instructions included a soft-food diet for 2 weeks and appropriate oral hygiene, including twice daily rinsing with a 0.2% chlorhexidine digluconate mouthwash (Parodontax, GlaxoSmithKline, Milano Italy). Clinical follow-ups were performed one month after the surgery, and after three months, when the healing screws were applied and the bone cores harvested.



**Figure 1**

After 4 weeks, in the second stage. The desired crest expansion was achieved by using a combination of scalpel, thin chisels and threaded osteotomes without compromising cortical vascularisation; it was possible to see the crest widening with the osteotomes. The implants have been placed; simultaneous use of grafting material could be seen.

## Results

The healing process was uneventful. No lesion to inferior alveolar nerve was recorded. No dehiscence of the suture, wound infection or total fracture of the buccal plate was observed. At implant placement, dehiscence defects or perforation (either vestibularly or apically) did not occur and implant showed good primary stability (59).

Clinically, the intercortical bony gap seemed to be filled by new formed bone (Figure 2). At re-entry, the healed augmented alveolar crest had a width of  $6.17 \pm 0.26$  mm.

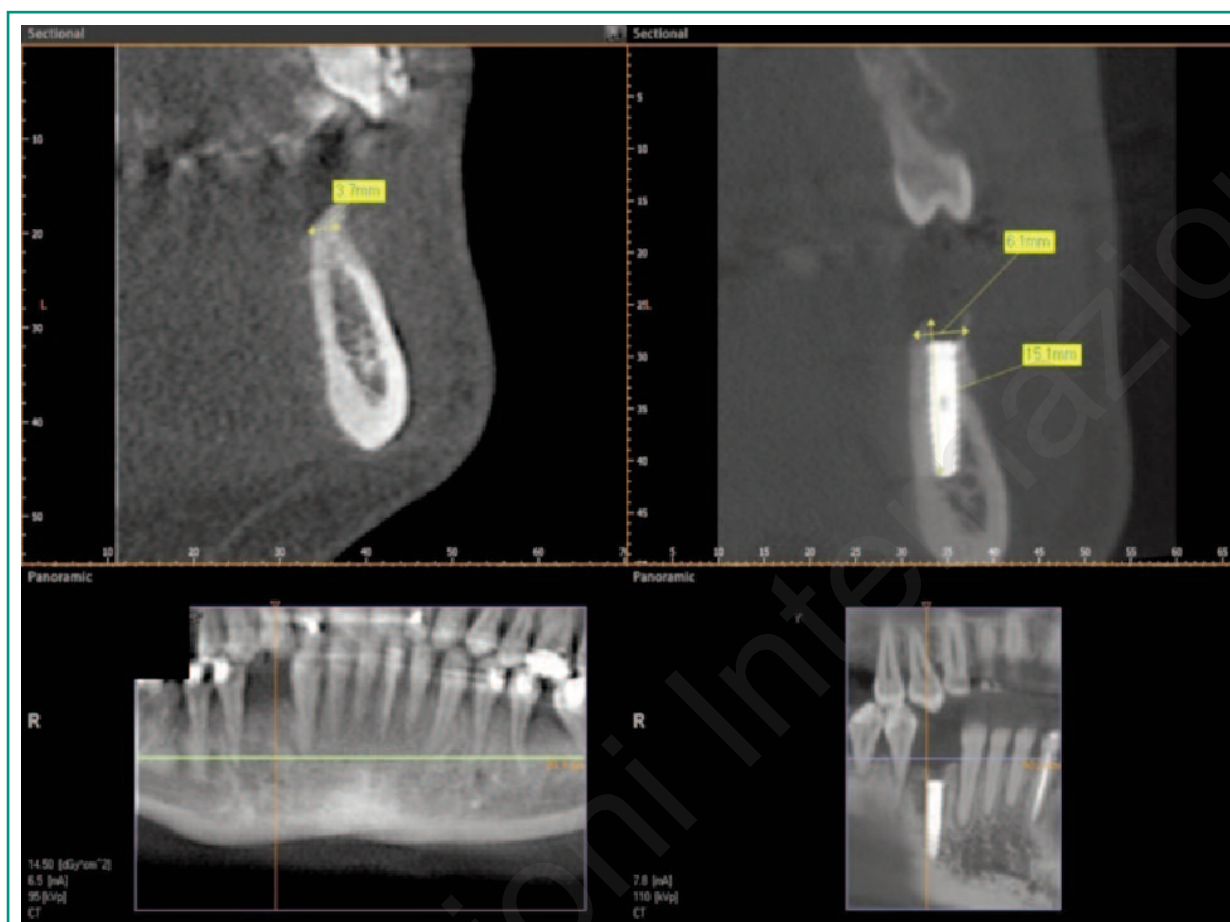
## Discussion

The rehabilitation of missing teeth can be problematic in cases where bone width is reduced (25-52).

Horizontal bone augmentation is possible using 3 different procedures:

- 1) lateral augmentation, i.e.: guided bone regeneration techniques (53), or cortical bone blocks (54, 60-65);
- 2) interpositional augmentation (split crest) (55); or
- 3) distraction osteogenesis (56).





**Figure 2**  
CT image showing alveolar width deficit in zone 44 width ridge 3.1 mm. CBCT after augmented alveolar crest had a width of  $6,17 \pm 0,26$ mm

The alveolar crest division technique allows the predictable treatment of clinical conditions that would otherwise be impossible without implementing bone augmentation techniques. However, no definitive recommendations can be made, especially with regard to the best instruments and implant design to be used (57). Mandibular bone has, however, a higher density compared with maxillary bone, requiring a different approach in ridge splitting. The posterior mandible is the most difficult region for reconstruction and early implant placement, in cases of severe alveolar resorption speciality in case of single edentulous. The presence of mesial and distal teeth makes more difficult to achieve the buccal

cortex separation. In previous clinical study we showed that ridge splitting with a basal longitudinal discharge osteotomy in addition to the vertical and longitudinal ones the elasticity of the vestibular bony flap can be increased, by minimizing any chance of bone fracture (58). This longitudinal osteotomy increases the bone resilience and eases the mobilization of the vestibular bone flap also in case the single edentulous. Indeed in this phase, there is a risk of fracture with bone resorption than conventional methods (23). These results were confirmed histologically with a recent study (58). Narrow single edentulous ridges was successfully expanded by a DEAM technique. Obviously,

even with one case, the data presented in this study cannot be considered conclusive. However, these results help to set practice parameters that will assure a study with a large number of patients in the future.

The outcome of present case report to support the hypothesis that DEAM technique can be used for increase width ridge in case of single edentulous.

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