

Utilizing Edentulous Ridge as Autogenous Block Graft for Buccal Contouring Horizontal Ridge Augmentation

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Running title – Utilizing Edentulous Ridge as Autogenous Block Graft

Summary – Horizontal ridge augmentation can be effectively performed with autogenous block grafts harvested from an edentulous ridge.

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All authors (WK, SA, LV, CM, PFA) has contributed substantially to the manuscript, according to the criteria established by the International Committee of Medical Journal Editors, including but not limited to, study design, analysis, drafting the manuscript, final approval of the paper. They all agree to be accountable for all integrity and accuracy of the work.

Abstract

**Introduction:** Augmenting the edentulous anterior mandible can be a challenge. This case report describes a novel technique that combines bone reduction and buccal contouring using an autogenous block graft.

**Case Presentation:** A patient presented with a conventional mandibular denture that had poor retention. The patient had a deficient ridge that could not support dental implants without hard tissue augmentation. The anterior mandible was reduced vertically with an osteotomy to allow harvest of an autogenous block graft for horizontal ridge augmentation. After 8 months, dental implants were placed in a ridge with adequate width and patient proceed to final prosthesis.

**Conclusion:** The technique may be considered in the atrophic mandible when a narrow ridge requires vertical height reduction as an autogenous block can be harvested and placed at a single surgical site.

**Key Words:** alveolar ridge augmentation; bone grafting; dental implants

Background

Edentulism is long-standing problem in the United States. Over 36 million Americans are edentulous<sup>1</sup> and these patients are commonly treated with conventional dentures. Patient satisfaction is low with conventional mandibular dentures. Only 29% of mandibular denture wearers are satisfied with the retention of their denture compared to 65% with the maxillary denture.<sup>2</sup> The poor retention of the

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mandibular denture can be attributed to poor ridge form and interference by the musculature.<sup>3</sup> Dental implants are commonly placed in patients that are not satisfied with the retention of their denture and the literature shows that these patients have significantly higher ratings of general satisfaction, comfort, stability and ease of chewing compared to conventional denture wearers.<sup>4,5</sup>

Ridge atrophy is an expected outcome following tooth loss and it is exacerbated by long-term edentulism, especially in denture wearers.<sup>6</sup> The progression of ridge atrophy following tooth loss has been classified by several authors.<sup>7-9</sup> Managing ridge atrophy has been a challenge for decades, and several therapies have been utilized to treat deficient ridges in the edentulous mandible to include osteoplasty, ridge splitting, block and particulate grafting.<sup>6</sup> Osteoplasty is sometimes required in implant overdenture cases to facilitate the necessary restorative space, and it can allow implant placement by removing knife-edge ridges which serves to increase ridge width through the sacrificing of ridge height.<sup>6</sup> Block grafting has a documented history of success<sup>10,11</sup> and is the gold standard of graft materials due to its osteogenic, osteoinductive and osteoconductive properties.<sup>12</sup> This case report describes a combination approach to augment a narrow ridge using autogenous block grafts harvested through a vertical ridge reduction.

#### Clinical Presentation

A 68-year-old male presented with a chief complaint of inadequate retention of his mandibular denture with the following medical history: hypertension, liver cirrhosis, type 2 diabetes mellitus, irritable bowel syndrome, gastroesophageal reflux disease, history of myocardial infarction and bypass surgery. The patient reports taking albuterol, aspirin, atorvastatin, clopidogrel, metformin, ferrous sulphate, furosemide, metoprolol, omeprazole, Prilosec, spironolactone, trazadone, and warfarin. The patient had been edentulous for several years and wore conventional maxillary and mandibular dentures. A CBCT was acquired and showed severe ridge atrophy in the proposed implant positions of #23 and #26 (Fig. 1). In order to place dental implants at this time, an excessive vertical reduction would be needed to reach an area of adequate ridge width, so buccal contouring would be required. The treatment plan included osteoplasty of the knife-edge ridge followed by block

grafting in the proposed implant sites using the bone reduction. The patient would be allowed to heal for 4 months without an interim prosthesis and dental implants would be placed for a mandibular overdenture. Consent for the procedure was obtained verbally and in writing.

#### Case Management

Treatment was performed under local anesthesia. A mid-crestal incision was made (SA) and a full thickness flap was elevated to adequately expose the edentulous ridge (Fig. 2 a-c). Osseous reduction was completed using a piezo surgical approach.<sup>1</sup> Approximately 8 mm of reduction was made (Fig. 2 d-e). The block was then divided and shaped to fit the residual ridge. Anchorage points were drilled into the blocks using a diamond round bur. The blocks were then fixated with two screws<sup>1</sup> per block and covered with a pericardium membrane<sup>#</sup> (Fig. 2 f-h). Primary, tension-free, closure was achieved with non-resorbable sutures<sup>\*\*</sup> (Fig. 2 i). Postsurgical instructions were given to the patient and he was prescribed Amoxicillin 500 mg TID for 7 days, methylprednisolone, chlorhexidine 0.12% BID for 7 days and ibuprofen 600 mg every 4-6 hrs. The patient was seen at 14 days for suture removal and then monthly. Eight months following surgery, a CBCT was acquired to assess healing and to plan implant placement (Fig. 3). A second surgery was performed under local anesthesia. A mid-crestal incision was made (LV) and a full thickness flap was reflected to completely expose the augmented sites (Fig. 4 a). The fixation screws were removed and good incorporation of the block graft was noted with no signs of detachment. Two dental implants with 3.7 x 10 mm diameters<sup>††</sup> were placed and healing abutments were inserted (Fig. 4 b-d). The patient was seen at 14 days for suture removal.

#### Clinical Outcomes

Block grafts at both sites healed uneventfully. The 8-month CBCT showed well incorporated block bone grafts with adequate ridge width gains to allow the placement of 2 implants in an ideal prosthetic position that was previously unattainable. On average, ridge width increased from 3.5 mm following ridge reduction to 7 mm after block grafting.

## Discussion

Frequently after a knife-edged ridge is removed, an adequate site is present for implant placement. This is not always the case and buccal bone augmentation is sometimes necessary. Autogenous block grafting is the gold standard for grafting material<sup>12</sup>, not only because of the inherent properties of the bone, but because these grafts require minimal healing time, increase the amount of vital bone in comparison to other bone grafting material, undergo minimal resorption and maintain their dense quality at the recipient site.<sup>13</sup> Block grafts harvested from the posterior ramus and symphysis have been described by several groups.<sup>12, 14</sup> Pain from a secondary surgical site is often cited by patients<sup>13</sup> and may steer some clinicians away from harvesting autogenous block grafts. Other disadvantages include a second surgical site, surgical access, limitations to the size of the graft, altered facial contours, increased risks of temporary and permanent post-op morbidity and most commonly, wound dehiscence and exposure.<sup>10-15</sup> The ability to harvest an autogenous block from a single surgical site cannot be understated. The keys to success in these types of cases are an adequately sized block bone harvest and close adaptation with rigid fixation of the block to the recipient site with primary, tension-free, closure. If a bone reduction guide is going to be used, a 3D model of the mandible can be produced and the procedure can be carried out benchtop prior to the surgery. This will allow the surgeon to visualize how the segments will fit together prior to the surgery which can save chair time during the surgery.

This case report presented a novel technique for the treatment of an atrophied ridge using autogenous block grafts harvested from a single surgical site.

## Summary

Why is this case new information?	<ul style="list-style-type: none"><li>▪ This case presents a novel approach to ridge augmentation in overdenture cases.</li></ul>
What are the keys to successful management of	<ul style="list-style-type: none"><li>▪ Adequately sized block harvest and rigid</li></ul>

this case?	fixation of the block to recipient site.
What are the primary limitations to success in this case?	<ul style="list-style-type: none"> <li>▪ Graft failure</li> <li>▪ Operator inexperience</li> </ul>

#### Footnotes

<sup>1</sup> Mectron PIEZOSURGERY, Mectron S.p.A., Carasco, Italy

<sup>¶</sup> Pro-fix™, Osteogenics Biomedical, Lubbock, TX

<sup>#</sup> CopiOs Pericardium Membrane, Zimmer Dental, Carlsbad, CA

<sup>\*\*</sup> GORE-TEX, WL Gore & Associates, Inc., Flagstaff, AZ

<sup>††</sup> Medrol Dose Pack 4 mg, Sandoz Inc., Princeton, NJ

<sup>‡‡</sup> Zimmer Dental, Carlsbad, CA

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#### Conflicts of Interests

All authors report no conflicts of interests related to this study.

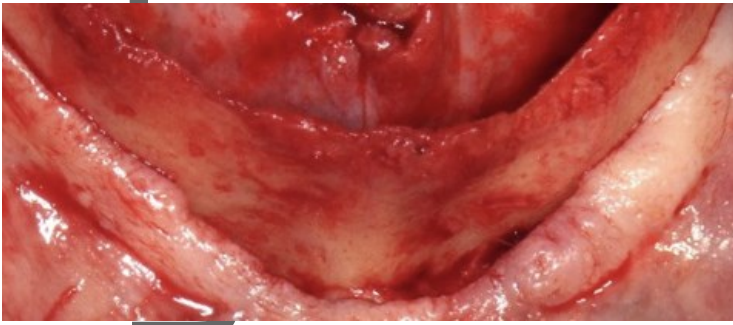
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**Figure Legends**

Before



After

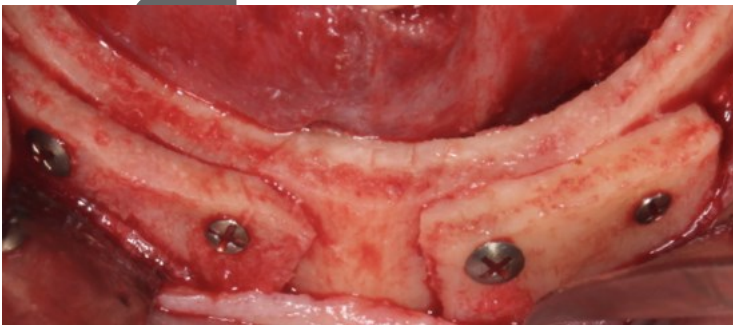
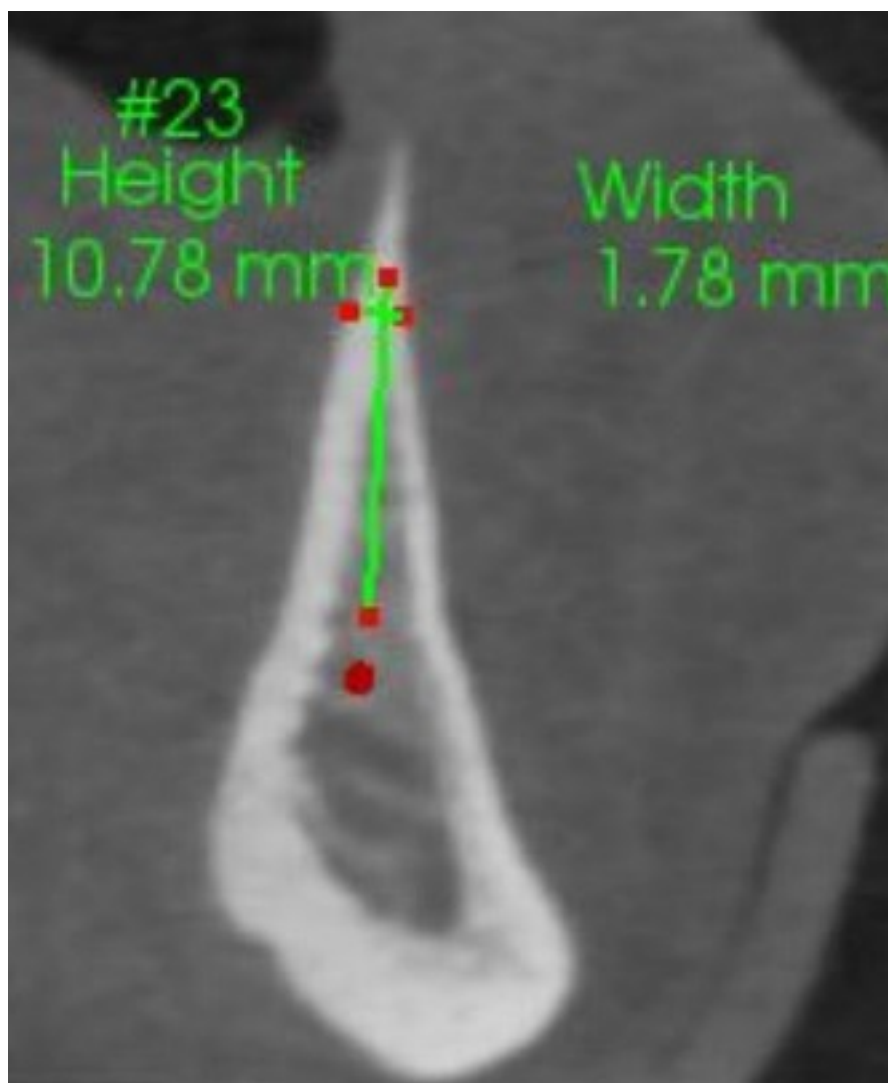




Figure 1 - Pre-operative CBCT showing implant site #26i



Autho

Figure 2 – 2 a Baseline appearance. 2 b Initial incision. 2 c Knife edge ridge. 2 d Piezosurgery reduction. 2 e Ridge following bony reduction. 2 f Ridge width following stabilization of block graft. 2 g Bilateral augmentation. 2 h Membrane placement. 2 i Primary closure.

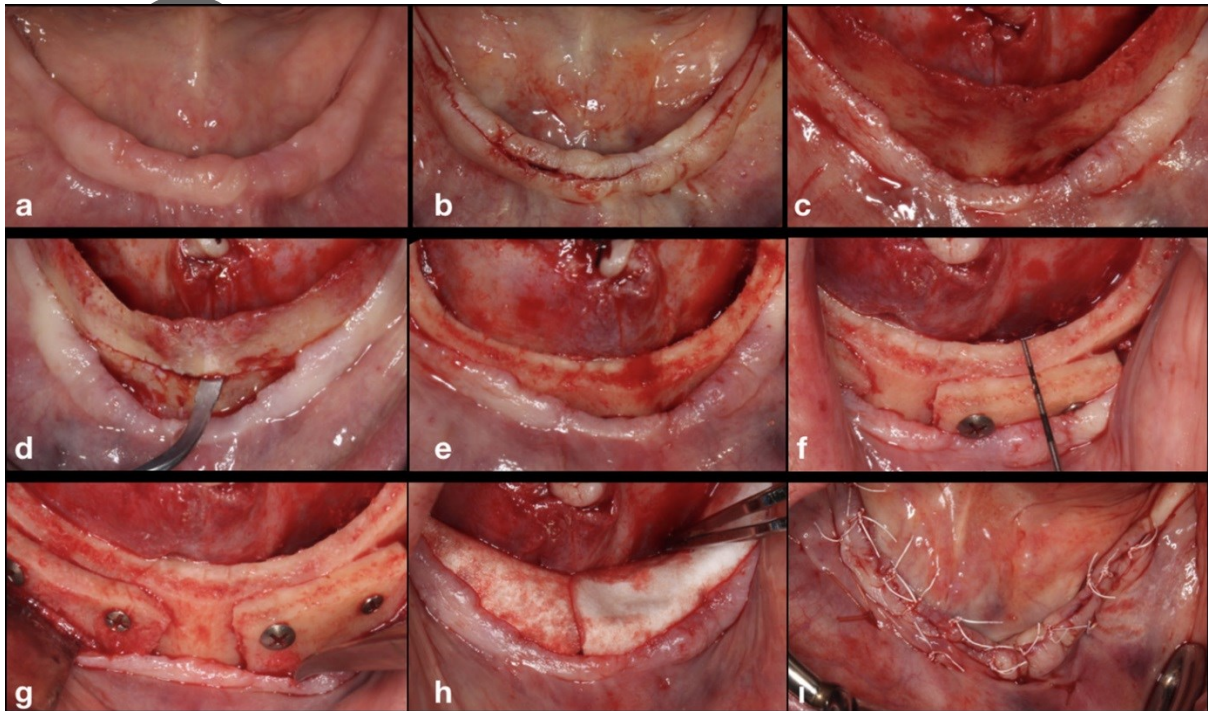


Figure 3 – CBCT 8 months after block fixations

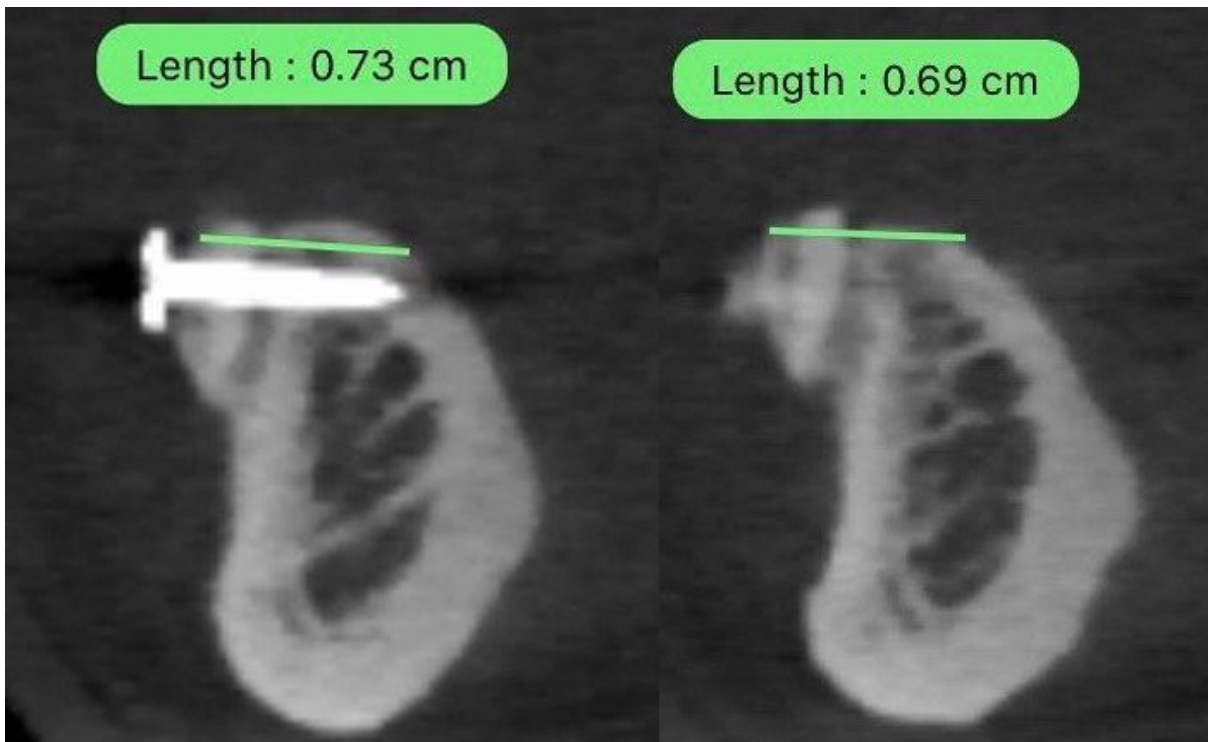


Figure 4 – 4 a Block graft after 8 months of healing. 4 b,c Implant placement. 4 d 1 month following implant placement.

