Three-Dimensional Reconstruction of the Posterior Mandible After Implant Removal: A Case Report of a Simplified Protocol

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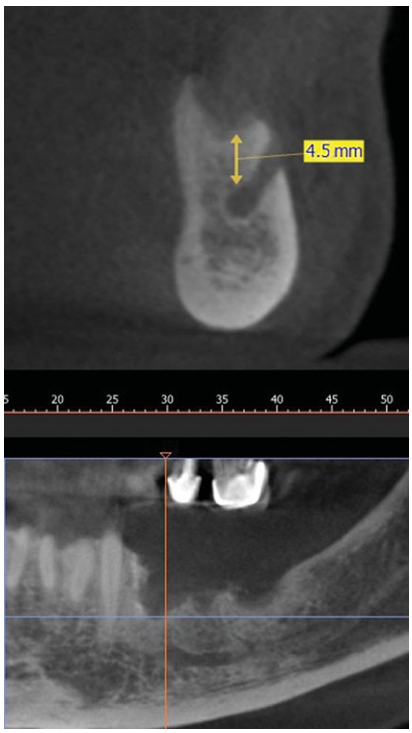

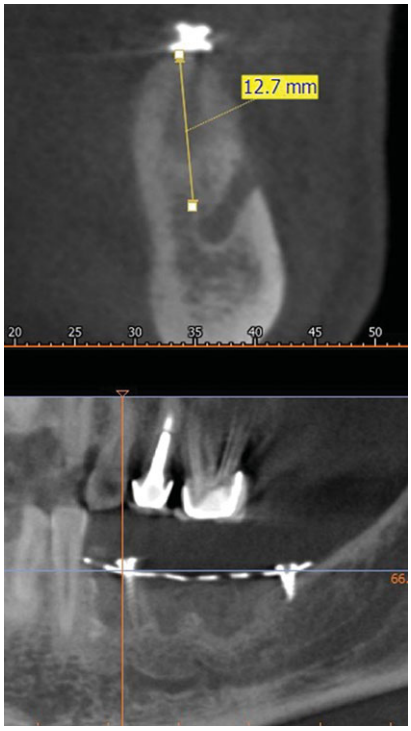

Introduction: Peri-implantitis has become a prominent challenge among clinicians worldwide, leading to severe bone loss and potential implant removal. Such cases require extensive regenerative surgical procedures to replace the ridge prior to implant replacement. This case report introduces a novel protocol after implant removal for the vertical and horizontal regeneration of the posterior mandible.

Case Presentation: A 43-year-old female patient was referred to Dr. Surmenian's clinic after severe peri-implantitis was detected in her left mandible. Implants were atraumatically removed; however, major bone atrophy resulted after implant removal. The patient was scheduled for a ridge augmentation procedure utilizing a combination of titanium mesh to maintain space and an allograft rehydrated in platelet rich fibrin (PRF).

Results: Both vertical and horizontal bone regeneration were achieved with a bone gain of 8.2 mm in height. Thereafter, 3 × 10 mm implants were successfully placed.

Conclusion: This case report describes a simplified protocol used to obtain drastic vertical and horizontal bone gain of the posterior mandible, without requiring autogenous bone, expensive recombinant growth factors, and/or non-resorbable membranes. *Clin Adv Periodontics* 2018;0:1–6.

Key Words: bone regeneration; dental implant; mandibular ridge augmentation; peri-implantitis.

Background

Implant dentistry has become a very reliable treatment protocol that has certainly improved the replacement of missing teeth, esthetics, and quality of life of many patients. Despite this, a significant number of patients suffer from peri-implantitis, with epidemiologic studies now showing that up to 40% of implants placed result in peri-implant infection.[1,2] Many approaches have been used to attempt to treat the disease, including laser decontamination, bone grafts, growth factors, and barrier membranes; however, up until now, the regenerative outcomes have not been consistent.[3] Although the clinician is instructed to

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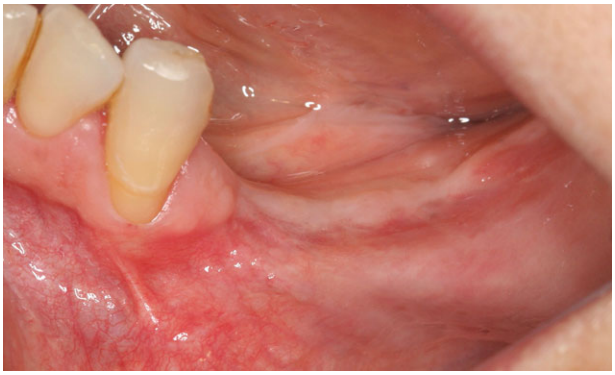

FIGURE 1 Preoperative intraoral view of the posterior atrophy in the mandible.

maintain strict maintenance programs for such cases,[4] in some situations the bone loss is so extensive that there is no alternative to implant removal, resulting in major bone destruction. Within the present study, a case is reported where bone loss was so extensive that implants could not be replaced without a major three-dimensional ridge reconstruction procedure of the posterior mandible, usually performed with autogenous bone from either intra- or extraoral regions.[5] This article introduces a simplified protocol for major augmentations in both the vertical and horizontal dimensions of the posterior mandible using allogeneic bone particles rehydrated in platelet rich fibrin (PRF) and a standard titanium mesh.

Clinical Presentation

A 43-year-old patient was referred to Dr. Surmenian's clinic on December 2, 2016 for a consult regarding severe bone loss in her posterior mandible after removal of her implants following severe peri-implantitis (Fig. 1). The patient reported no medical history, was not taking any medications, and declared no allergies. After a clinical exam, a cone-beam computed tomography (CBCT) scan was prescribed and revealed 4.5 mm of height remaining above the emergence of the mental foramen (Fig. 2). Major reconstructive surgery was necessary prior to implant replacement, for which the patient provided written informed consent.

Case Management

After local anesthesia (articaine 1/10,0000), a crestal incision was performed, extending from the posterior mandible to the distal aspect of the mandibular left canine. It continued intrasulcularly, and a vertical releasing incision was made at the mesial aspect of the canine. On the lingual side, the incision continued intrasulcularly until the distal aspect of the mandibular left lateral incisor. After full-thickness flap elevation, any remaining bone grafting particles from a previous attempt to treat the peri-implantitis were cleared (Fig. 3). A soft tissue release started on the lingual side by following the Ronda and Stacchi[6] protocol of detaching the mylohyoid muscle

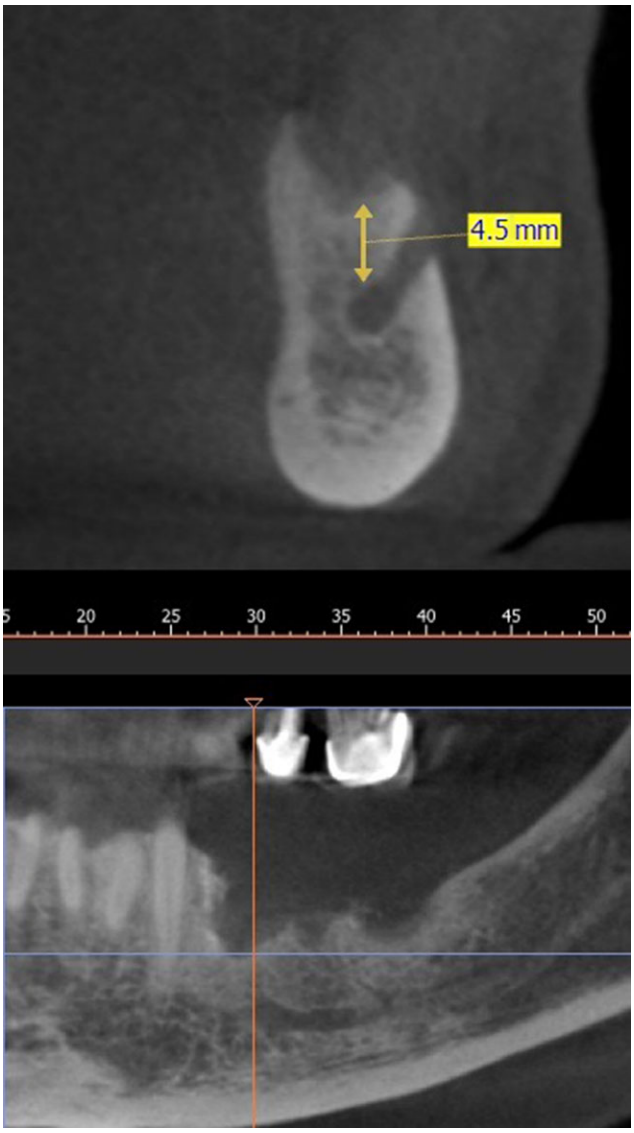

FIGURE 2 Preoperative CBCT. At the lowest point, only 4.5 mm of bone remained above the mental foramen.

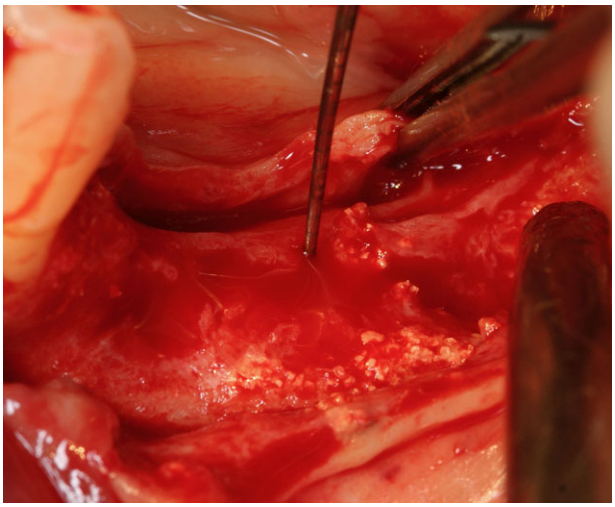

FIGURE 3 After full-thickness flap elevation, bone biomaterials were still observed from the previous attempt to treat the peri-implantitis. Notice the 3-mm soft tissue release of the lingual flap prior to soft tissue management with a blunt instrument.

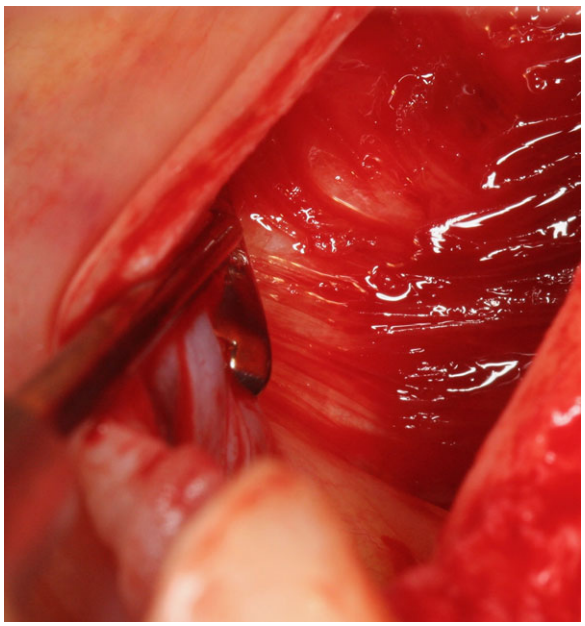

FIGURE 4 A brushing motion is applied to the lingual flap with a non-cutting instrument. The fibers from the mylohyoid muscle are stretched and subsequently detached.

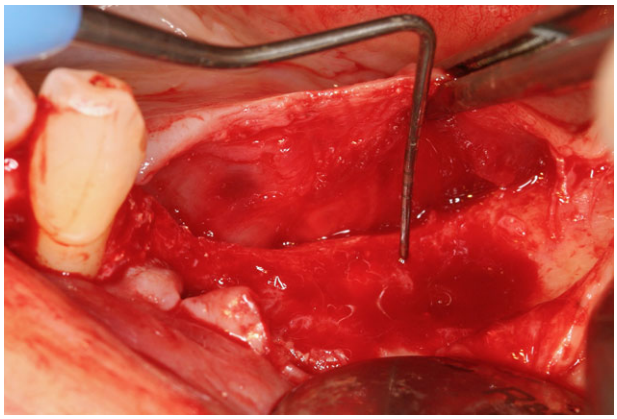

FIGURE 5 Lingual flap release of 20 mm after brushing of the flap.

fibers attached to the lingual flap. Instead of inserting a blunt instrument in between the muscle fibers and detaching them by applying coronal traction, a blunt angulated instrument[†] was used in a brushing motion to detach all muscle fibers attached to the lingual flap (Fig. 4). By brushing the internal site of the lingual flap, 20 mm of release was obtained in a very non-invasive manner, since no instruments were inserted in the floor of the mouth (Fig. 5). The release of the buccal flap was also obtained by brushing the buccal periosteum using these blunt angulated instruments. This study was conducted in accordance with the Helsinki declaration of 1975, revised 2000.

A titanium mesh was adjusted from the distal portion of the canine to the posterior part of the mandible, and the mesh was secured in place using two screws (Fig. 6). The area was grafted using allograft bone[‡] that was rehydrated

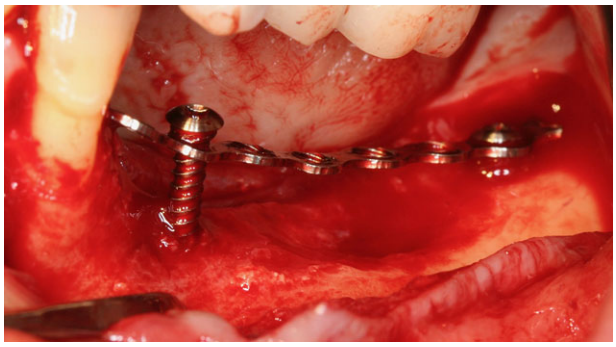

FIGURE 6 The titanium mesh is adjusted and secured to the site. It is placed flush with the bone from the distal aspect of the canine to the most distal portion of the grafted area.

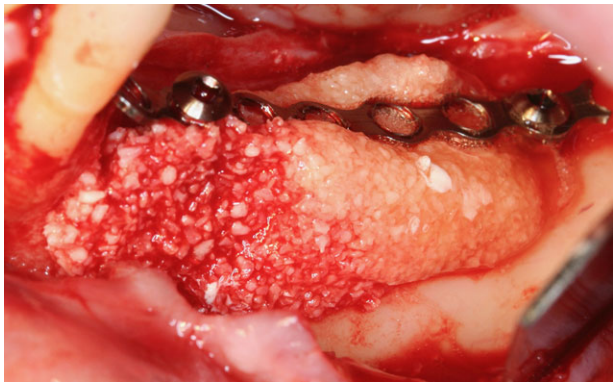

FIGURE 7 The allograft is rehydrated in A-PRF to obtain a "sticky" bone graft, and it is inserted under the titanium mesh.

with advanced PRF (A-PRF) to obtain a "sticky" bone graft (Fig. 7). The area was covered by A-PRF membranes, and the sutures were realized in two layers using a resorbable monofilament.[§] A horizontal mattress suture deep in the vestibule and a continuous lock suture on the crest were then applied (Fig. 8). Postoperatively, the patient was prescribed amoxicillin 1,000 mg twice daily for 7 days, prednisolone 60 mg for 3 days, and ibuprofen 400 mg four times daily in the event of pain. The patient was asked to rinse twice daily with 0.12% chlorhexidine for 10 days.

Clinical Outcomes

After 4 months of uneventful healing, a CBCT was performed, and 12.7 mm of bone height above the mental foramen was observed (Fig. 9). Most importantly, regeneration of bone in both the horizontal and vertical direction was found by simply using a titanium mesh with a bone allograft hydrated in PRF.

The implant surgery was scheduled 4 months after grafting. After local anesthesia, a crestal incision was performed, the titanium mesh was removed (Fig. 10), and three implants[‖] were placed (Fig. 11). The insertion torque

[†]ST-UP, Process, Nice, France.

[‡]Allodyn, OST Developpement, Clermont-Ferrand, France.

[§]Glycolon, Resorba, Nürnberg, Germany.

[‖]Axiom TL, Anthogyr, Sallanches, France.

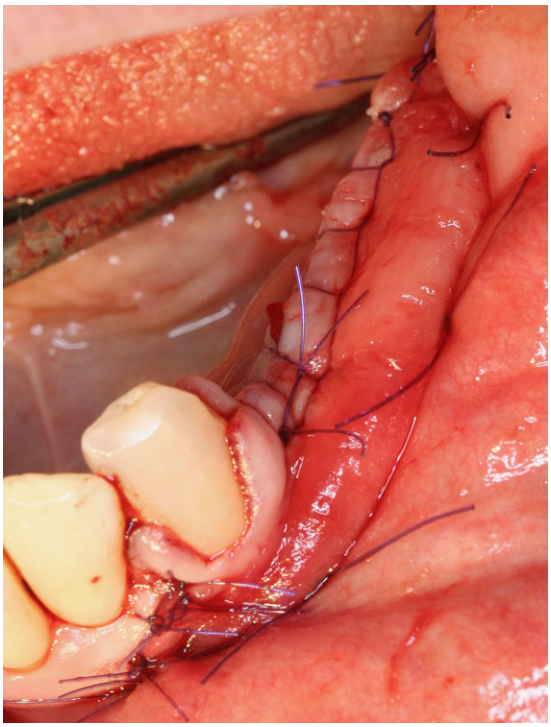

FIGURE 8 Sutures are realized with a resorbable monofilament. Four mattress sutures are done deep in the vestibule, and a continuous lock suture is used to secure the crestal portion.

was over 35 Ncm for all implants. The flaps were secured with a continuous lock suture.

Discussion

First, regenerating bone in the posterior mandible is a challenging scenario after implant loss with the potential subsequent problem: obtaining tension-free closure and coronal advancement of the lingual flap. Techniques to augment large vertical defects (>5 mm) have been described in the literature but remain clinically demanding.[6,7] Within the present case report, a simple brushing movement with a non-cutting instrument, capable of safely detaching the mylohyoid muscle fibers from the lingual flap, is introduced and demonstrated.

Second, it has been well described in the literature that space-maintaining devices are required to protect the graft material, and clinicians have used a variety of non-resorbable and resorbable materials with good results. Nevertheless, membrane exposures have been reported,[8] and the handling of these flaps and membranes is clinically demanding.

Finally, autogenous bone has been considered and referred to as the gold standard for any augmentation procedure, including vertical regeneration.[9,10] In the present

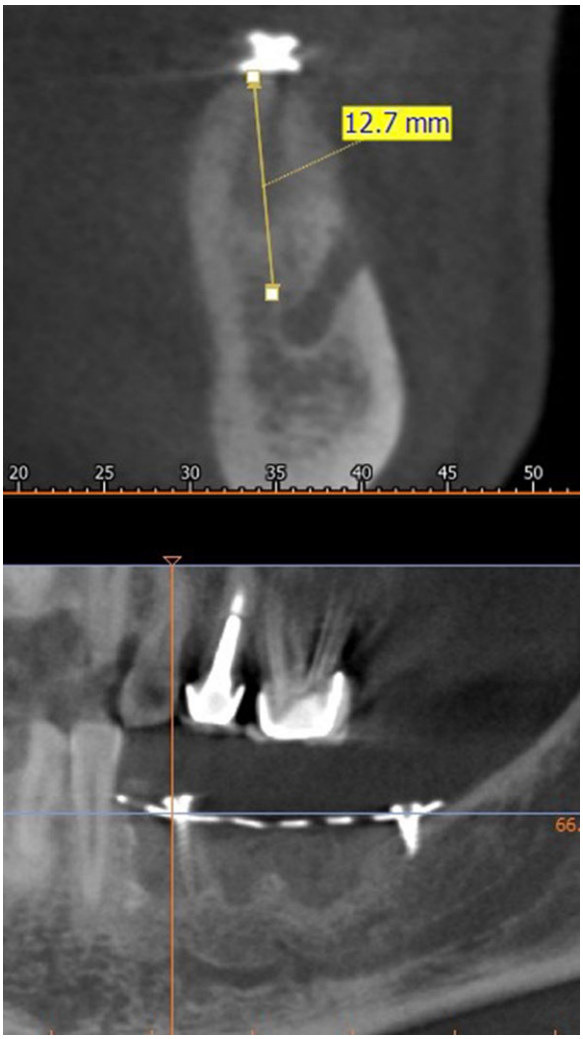

FIGURE 9 Postoperative scan at 4 months. Notice the vertical and horizontal regeneration of the posterior mandible. The vertical gain averages around 8.2 mm.

case report it is demonstrated how an allograft hydrated in PRF combined with a titanium mesh generated excellent final outcomes with >8 mm in augmented vertical height. Therefore, future studies are aimed at comparing in randomized clinical studies the potential alternative use of allografts + PRF versus autogenous bone for major ridge augmentation procedures. Other modalities, including titanium mesh and titanium-reinforced membranes, have also been used for vertical augmentation procedures utilizing different bone grafts with various results.[11–15]

In conclusion, it is reported that although standard vertical augmentation procedures are routinely performed with bone autografts either as a bone block or particulate form, here a vertical augmentation procedure of ⩾8 mm utilizing allografts alone is demonstrated.■

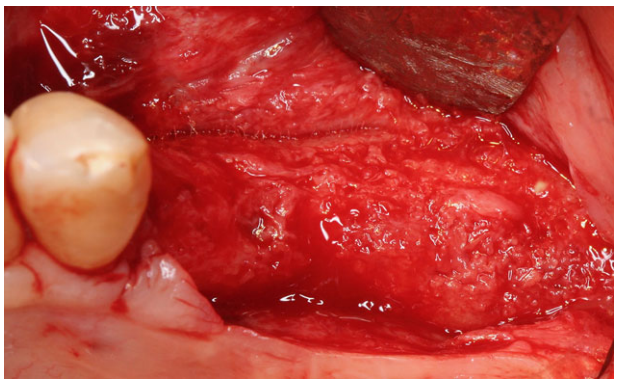

FIGURE 10 After full-thickness flap elevation, the titanium mesh was removed. At 4 months postoperatively, an appreciable amount of bone regeneration of the new ridge was observed.

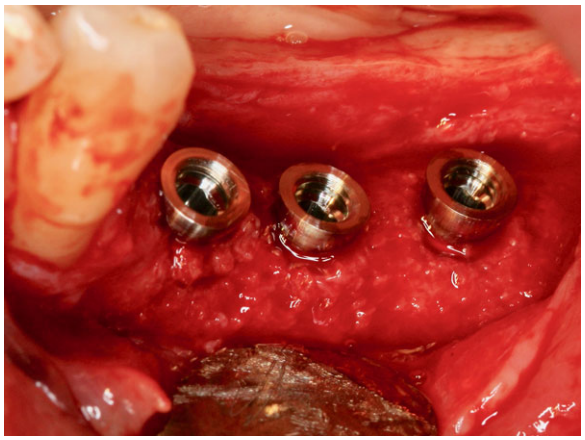

FIGURE 11 Three implants were placed in the ridge.

Summary

Why is this case new information?	■ Regenerating bone in the posterior mandible classically requires a very complex and invasive surgery. ■ This case describes an easier and less invasive surgical approach for the treatment of major defects utilizing bone allografts hydrated in PRF with a standard titanium mesh, which resulted in >8 mm of vertical bone augmentation.
What are the keys to successful management of this case?	■ The space maintenance device is very rigid, allowing for proper protection of the grafted area. ■ The coronal advancement of the lingual flap by a simple brushing motion is key to the passive closure of the site.
What are the primary limitations to success in this case?	■ The height of the interproximal bone of the tooth adjacent to the defect represents the limitation to the bone height that can be regenerated. ■ If the bone level of the adjacent tooth is low, extraction of that tooth should be considered.

Acknowledgments

Dr. J Choukroun is the inventor of the platelet rich fibrin (PRF) used in the study. Dr. J Surmenian reports no conflicts of interest related to this study.

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