3-D alveolar ridge reconstruction in a case with severe bone loss

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_Introduction

A high clinical evidence of grafting procedures from extraoral autologeous donor sites like i.e. from the iliac crest in difficult bone loss sites is still the practice in oral or oral-maxillofacial surgery. However, the invasive surgery combined with a prevalence of patients morbidity and suffer is an issue to discuss the persisting legitimation of this procedure. Since the appearance of reliable bone substitute materials with or without any autologeous bone added, the positive results concerning longterm stability of regenerated bone even in difficult cases have become very predictable.

This article will point out in a case report the reliability of alternative and less invasive techniques for 3-D bone reconstruction in the mandible and question the necessarity of iliac hip grafts for intraoral bone augmentation.

_Materials and methods

A female patient aged 48 years old with a severe and advanced periodontitis in the maxilla and the mandible came into our clinic with the desire of a complex treatment plan with an implant retained denture in both jaws. This case report will pinpoint the treatment of the mandible. A CBVT was revealing massive bone loss in height and width in the mandible arch from canine to canine and apical cyst at tooth 23, 26 and 28 (Figs. 1 & 2). According to our protocol we started with an initial scaling and HELBO®-Laser decontamination prior to the surgery to decrease the number of pathologic germs and post op infections. Tooth 18 and 19 in the left mandible were intended to maintain until the finalization of the prosthetics to give some comfort during temporization with an immediate denture that was placed post op. Preoperative the patient received 1,200 mg of Clindamycin. The patient desired the surgery of tooth removal and ridge augmentation persued under general sedation.

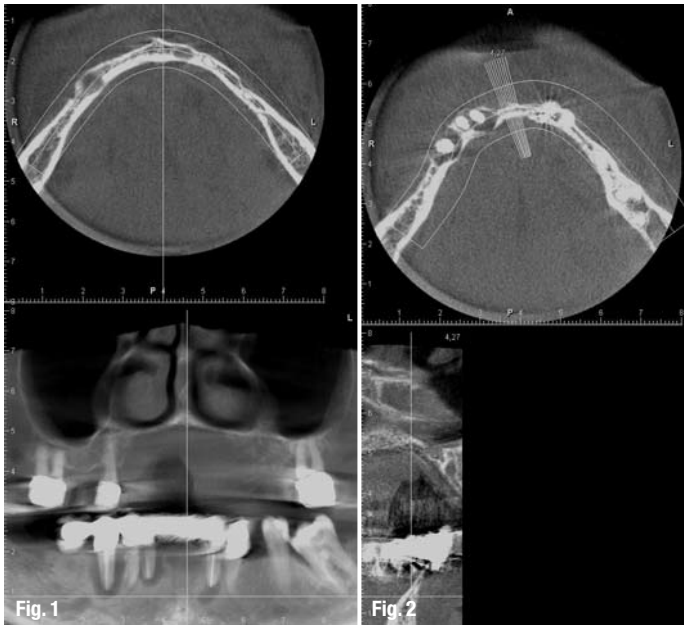


Fig. 1_Presurgical aspect revealing massive Periodontitis and bone resorption in region 32, 42, 44.
Fig. 2_The CB-Scan exposing region 32—with partial loss of the buccal and lingual wall region 32–44.

After nasal intubation and local anesthesia the bridge in the lower was removed and the remaining teeth despite from 18 and 19 as mentioned before (Figs. 3 & 4). After full flap preparation with crestal incision, releasing incisions and exposure of the mental nerve exit, the volume of the severe bone loss was revealed as well as the minor soft

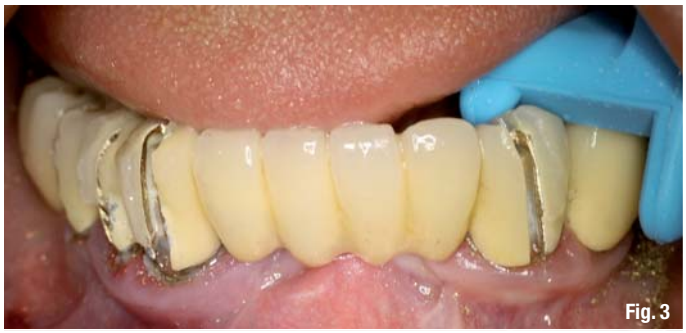
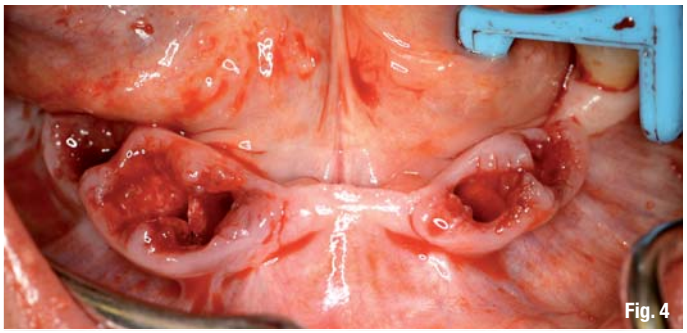


Fig. 3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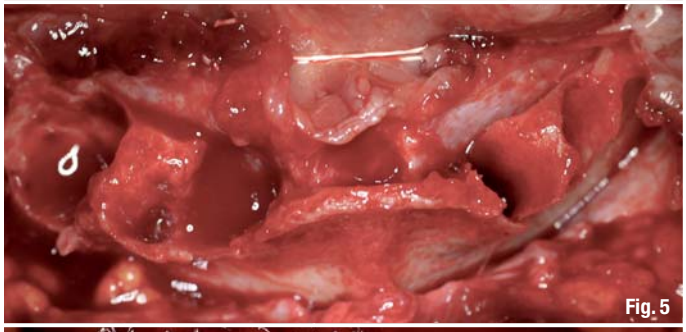
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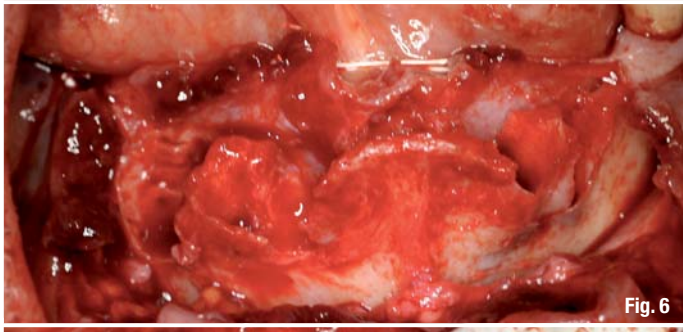


Fig. 6


Fig. 7

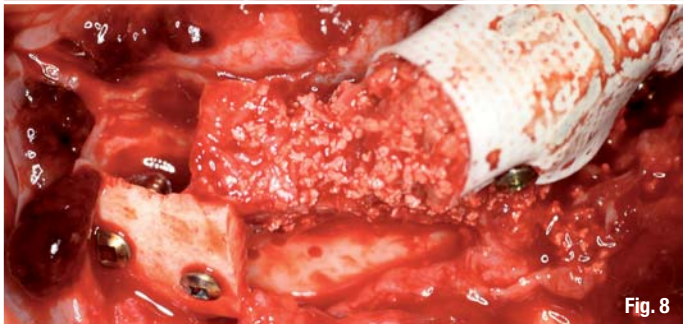


Fig. 8

tissue conditions due to inflammatory tissue proliferation (Figs. 5 & 6). The success of 3-D bone augmentation is bonded to primary wound closure and tensionless flap adaptation. Thus, the periosteum is dissected with a scissor from the epiperiostal connective tissue before augmentation procedures to reduce bleeding and guarantee a flap flexibility without compromising soft tissue and nutritive blood vessels.

For bone augmentation a bone block was harvested via ultrasonic surgery from the retromolar region distal from 32 of the right mandible (Piezotome II, Acteon France).

This bone block was devided into two halfs. One was used for two "bone shields" to create a mold for the grafting material, one was particulated with a bone mill and mixed with defect blood and a β-TCP (Nanobone®, Artoss GmbH, Rostock, Germany). The bone blocks were fixed with two osteosynthesis screws (Fig. 7) and the mixture of autologenous bone plus β-TCP in mixing ratio 50:50 was used to fill the gaps and increase the rigde width and height. To increase the bone augmentation material volume an allograft block (Puros®, Zimmer Dental) was particulated and added to the mixture. Before placing the material a non resorbable titanium-reinforced membrane (Cytoplast Ti-250, Sybron Implant Solutions) was adapted lingually and folded to shape the augmentation complex according to the new and desired crest volume (Fig. 8). Upon the non resorbable membranes three xenogenous resorbable membranes (Tutodent®, Zimmer Dental) were placed according to the sandwich membrane layer technique to create a better adaptivity to the flaps (Fig. 9) and enhance wound healing. Primary wound closure (Fig. 10) was achieved with a 4-0 metric suture (Gore-Tex®, Gore). The patient carried a clamb retained provisional denture that was rebased with a soft material and was instructed to have no solid food for 10 days. Postoperative the patient continued with 1,800 mg Clindamycin, Ibuprofen 600 mg and a decongestant enzyme based medicine (Bromelain-Pos®, Ursapharm, Germany). The next day the patient had an expected cheek swelling but was not suffering from pain, after 10 days the sutures were removed. However, 6 weeks later a membrane exposure of the non resorbable membrane was evident, but due to the fact that this is tollerable when the patient is instructed to maintain oral hygiene and re-called once a week, the success of the outcome was not threatened (Fig. 11a). The titanium pins and the titanium reinforced membranes were removed after 4 months.

Fig. 3_ Site before bridge removal and extraction.
Fig. 4_Surgical Site after bridge removal and extraction of teeth 33, 32, 42, 43, 44.
Fig. 5_After Cystektomy the dramatic severe horizontal and vertical bone loss is visible.
Fig. 6_Frontal aspect of the compromised bone situation.
Fig. 7_Fixation of the autologous bone blocks which have been harvested ultrasonically from the retromolar region of the right mandible.
Fig. 8_3-D crest reconstruction with the "mold-technique" with clearly visible horizontal and vertical augmentation. Fixation of a titanium reinforced ePTFE- membrane with pins.

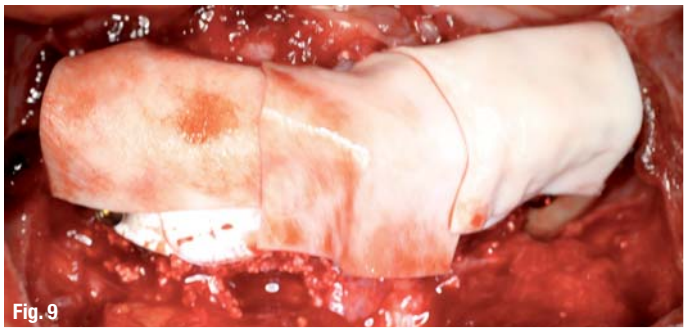
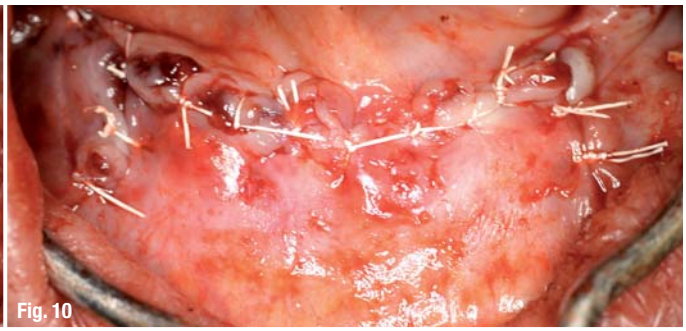


Fig. 9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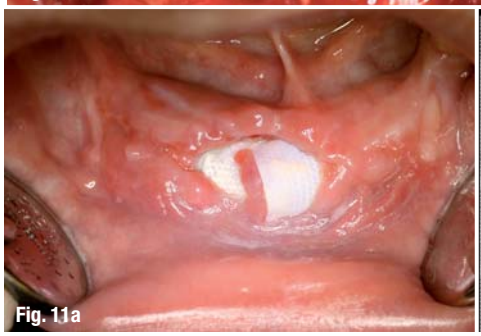
Fig. 11a

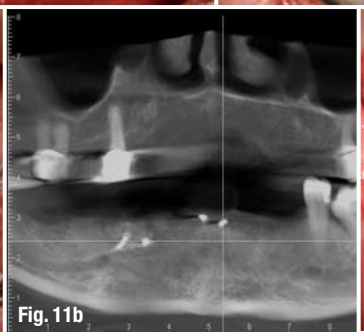
Fig. 11b

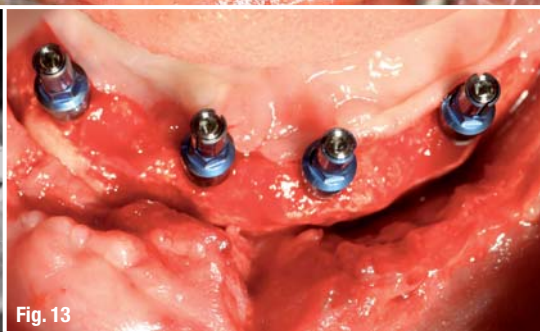
Fig. 13

Fig. 9_Resorbable collagenous membranes are placed upon the non resorbable membranes.
Fig. 10_Wound closure with 4-0 metric GoreTex sutures after flap mobilasation.
Fig. 11a_Membrane exposure of the non resorbable ePTFE membrane after 4 weeks. Clearly visible ist the enhanced soft tissue situation.
Fig. 11b_6 months post surgical the fully reconstructed bone situation is obvious.
Fig. 12a_CBS of the pre-op region 44 with entire loss of the buccal plate in region tooth 44.
Fig. 12b_Region tooth 44 after 6 months of healing with fully reconstructed bone prior to implant surgery.
Fig. 13_Inserted implants in the fully reconstructed bone.

Eight months after augmentation the 2-D aspect of the CBVT showed clear evidence for entire ridge reconstruction of the deficient sites (Fig. 11b) with osteosynthesis screws in position. To emphasize the efficiency and predictability of this technique the pre-op scan of region 28 (Fig. 12a) and the reconstructed bone 8 months later (Fig. 12b) show clear an increasement of bone height and width.

The well vascularized bone was used to insert 4 dental implants (4 x 3.75 x 13 BEGO Semados®, BEGO, Germany) for a later bar-retained denture, the healing time is estimated with 8 weeks (Fig. 13) and was not completed before publication, here my apologies to that.

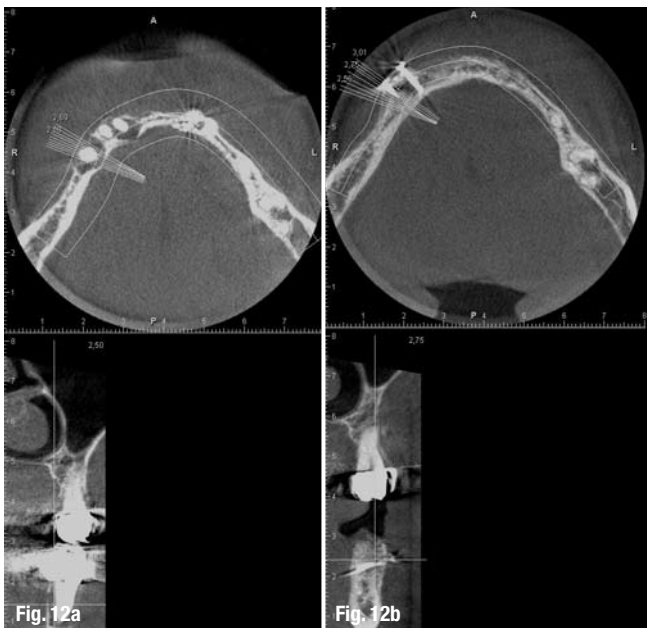
Fig. 12a

Fig. 12b

_Discussion

3-D bone augmentation in cases with severe bone loss can be accomplished also with a less invasive surgical protocol than the iliac hip graft. The morbidity can be dramatically reduced with the use of ultrasonic devices. Regarding the donor site, which may be favorized with the retromolar region patients have close to zero complains if a single incision procedure is performed. Allograft materials may enlarge the volume of the augmentation material and in addition to that the success of β-TCP is not to be questioned. Regarding the long term stability the regenerated bone is superior to pure autologous bone from the iliac crest, which resorption rate is much higher compared to intraoral bone or β-TCP. Reduced pain and postoperative complains should be reduced and enlarges the number of patients willing to undergo oral augmentative procedures. _

_contact implants

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