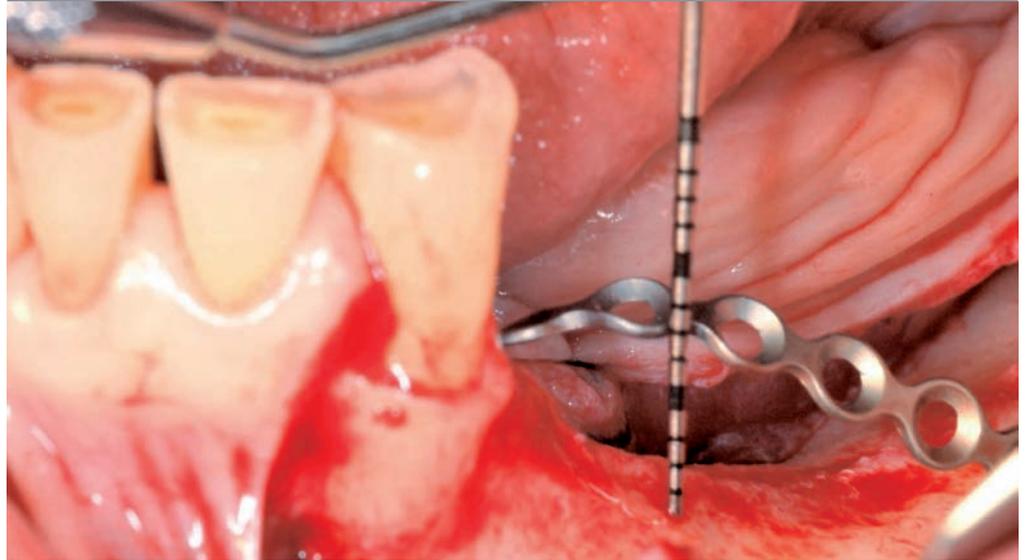


# Vertical Augmentation



Vertical alveolar ridge augmentation by means of the fence technique with Geistlich biomaterials

> Original publication of the technique on PubMed; Merli et al., Int J Periodontics Restorative Dent, 2013



## 1. Indication profile

<b>Region</b>	<input type="checkbox"/> single tooth gap	<input checked="" type="checkbox"/> multiple tooth gaps
	<input checked="" type="checkbox"/> partially edentulous ridge	<input checked="" type="checkbox"/> posterior region
		<input checked="" type="checkbox"/> free end situation
	Remark: The shown procedure is also applicable in the aesthetic region, for single tooth loss or larger edentulous sites	
<b>Bone situation</b>	<input checked="" type="checkbox"/> combined vertical and horizontal bone defect	<input type="checkbox"/> no bone defect present
	Remark: The shown procedure is applicable for both vertical and horizontal defects.	
<b>Soft tissue situation</b>	<input checked="" type="checkbox"/> primary wound closure possible	<input type="checkbox"/> primary wound closure not possible
	<b>Implantation</b>	<input type="checkbox"/> sequentially after bone augmentation (2 steps)
	<input type="checkbox"/> simultaneously with bone augmentation (1 step)	

## Background information

Placement of dental implants requires sufficient quantity of bone. In cases where advanced resorption has already occurred and has led to an atrophied alveolar ridge, a combination of horizontal and vertical augmentation is indicated. For such complex clinical situations, either in- or onlay block graftings or guided bone regeneration by means of a form-stable membrane are used. In particular, autologous bone grafts from a second intra- or even extraoral surgery site not only potentially cause additional morbidity but may also be associated with an increased rate of subsequent complications<sup>1</sup>. In addition, the autologous bone used for the augmentation of the site is subjected to a certain degree of resorption<sup>2</sup> which may impair the clinical outcome. Another risk is the occurrence of dehiscences after inappropriate soft tissue healing with non-resorbable membranes<sup>3-5</sup>. Surgical and technical innovations combined with the appropriate choice of materials helped to overcome those disadvantages. One such innovative approach for the 3-dimensional augmentation of the severely atrophied alveolar ridge is the so-called fence technique developed by Dr. Mauro Merli<sup>6-8</sup>. The technique uses an osteosynthesis plate as a form-stable element under which a combination of autologous bone and Geistlich Bio-Oss<sup>®</sup> is used. The augmented site is covered with a tightly pinned native collagen membrane Geistlich Bio-Gide<sup>®</sup>. Its elasticity allows stretching which results in a stable augmentation while providing a barrier function long enough to generate optimal conditions for bone regeneration. At the same time Geistlich Bio-Gide<sup>®</sup> ensures uneventful soft tissue healing. This 3-dimensional reconstruction of even demanding alveolar ridge defects improves outcomes and contributes to reduced patient morbidity and overall treatment costs.

## 2. Aims of the therapy

- > Vertical alveolar ridge augmentation and implant placement
- > Reduction of complication rate and patient morbidity

## 3. Surgical procedure



Fig. 1a Preoperative view showing the severely atrophied mandibular ridge in posterior region 34-38 and 45-48, respectively.

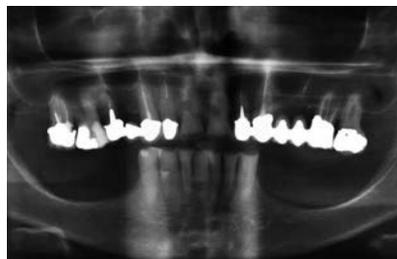


Fig. 1b Preoperative radiograph depicting the severe bilateral bony atrophy in the posterior mandible. This situation makes a prosthetic rehabilitation with dental implants impossible.

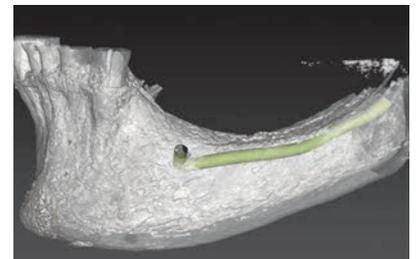


Fig. 2 Preoperative image. 3D rendering of the bone tissue.



Fig. 3 Stereolytographic model with preformed osteosynthesis plate.



Fig. 4 Intraoperative situation of the first surgical phase depicting the bone defect of Caewood Class V. A semilunar buccal flap was made with the incision line starting distally and continues mesially until it reaches the last tooth with an intrasulcular incision and a vertical buccal releasing incision. This flap design ensures appropriate tissue thickness and an accurate contact between the deep tissue layers of the lingual and the buccal flaps for later soft tissue closure.



Fig. 5 Fixation of the pre-formed osteosynthesis plate with miniscrews. The vertical dimension of the defect is around 7 mm. Cortical perforations are performed before applying the autologous bone and Geistlich Bio-Oss<sup>®</sup>.



Fig. 6 Augmentation with autologous bone harvested from the angular region of the mandible and mixed in a 40:60 % ratio with Geistlich Bio-Oss® (0.25–1 mm) up to the level of the osteosynthesis plate.

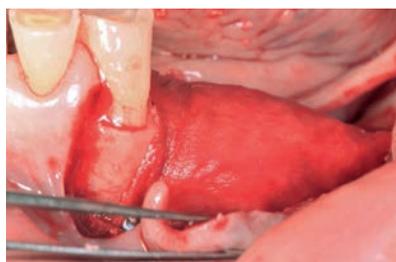


Fig. 7 The grafted site including the osteosynthesis plate is covered with Geistlich Bio-Gide® and the tensile collagen membrane is pinned down. Thus, the augmented site is accurately sealed and stabilized.



Fig. 8 On the lingual side a periosteal incision and on the buccal side a muscular dissection is facilitating flap elevation and primary wound closure. A double-layered suturing technique is used apically combined with a horizontal internal mattress, and a coronal single stitch technique. Antibiotics are administered for 8–10 days after reconstructive surgery.



Fig. 9 Radiograph of the treated sextant immediately after augmentation.



Fig. 10a Post-operative situation after 6 months prior to implant placement.



Fig. 10b Post-operative lateral view before re-entry showing the augmented ridge volume.

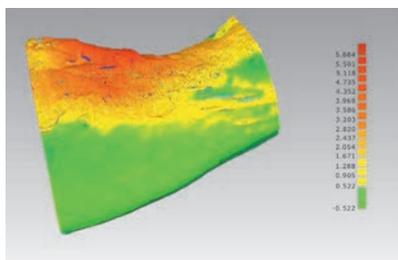


Fig. 11 Volumetric digital analysis of the regenerated area (courtesy of 3DIEMME) 6 months after augmentation. The mean gain in bone height in a case series was shown to be on average 6.75 mm relative to the baseline.



Fig. 12 Intraoperative situation after reopening for implant placement and before removal of the osteosynthesis plate. The envelope flap was generated by a primary mediocrestal incision line and an intrasulcular extension towards the first two teeth at the mesial extremity. Note the high degree of vascularization of the graft.



Fig. 13 Histological image of the regenerated bone tissue showing good integration of Geistlich Bio-Oss® particles into newly generated bone (bone biopsy taken at the removal of the osteosynthesis device).



Fig. 14 Implants are inserted 6 months after augmentation and the healing abutments are connected to the implants.

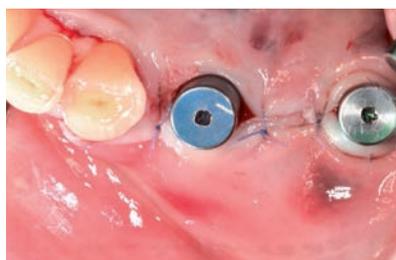


Fig. 15 Occlusal view of the transmucosal healing approach. The envelope flap was closed with single stitches in order to obtain soft tissue closure.



Fig. 16 Radiograph immediately after implant insertion.



Fig. 17a Lateral view of the provisional prosthesis 6 weeks after implant placement.

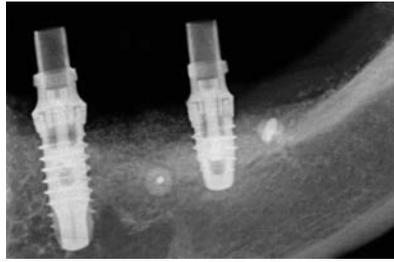


Fig. 17b Radiographic image taken at the provisional prosthesis application.



Fig. 18 Lateral view of the definitive prosthetic rehabilitation 6 months after implant placement.

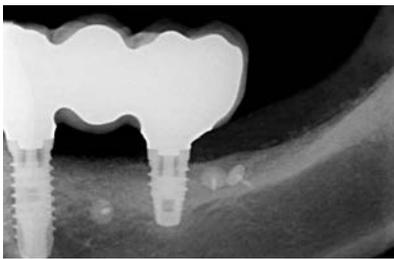


Fig. 19 Intraoral radiograph 15 months after augmentation procedure showing stable bony situation.

## Literature

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- <sup>1</sup> Esposito, M., Grusovin, M. G., Felice, P., Karatzopoulos, G., Worthington, H. V., Coulthard, P. Interventions for replacing missing teeth: horizontal and vertical bone augmentation techniques for dental implant treatment. *Cochrane Database Syst Rev* 2009.
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  - <sup>8</sup> Merli M, Moscatelli M, Mazzoni A, Mazzoni S, Pagliaro U, Breschi L, Motroni A, Nieri M. Fence technique: guided bone regeneration for extensive three-dimensional augmentation. *Int J Periodontics Restorative Dent.* 2013 Mar-Apr;33(2):129-36.
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## Source of supply for special materials (used suture material, medication, implant system etc.)

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- > Augmentation: Geistlich Bio-Oss® (0.25–1 mm); Geistlich Bio-Gide® (30×40 mm).
  - > Osteosynthesis plate: KLS Martin.
  - > 3-D scanner: 3d DIEMME, Bioimaging Technologies.
  - > Suture material: Supramid 4/0, 5/0.
  - > Implant System: Thommen SPI® Element Inicell.
  - > Antibiotics: Cefixima (Cefixoral) 400 mg cpr riv.
  - > Histology performed by Dr. Annalisa Mazzoni, University of Bologna, Italy.
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## Your contact

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## Further Indications Sheets in the same therapeutic area

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- > Horizontal bone regeneration with autogenous intraoral block and Geistlich Bio-Oss® contouring as well as Geistlich Bio-Gide® covering (Prof. Carlo Maiorana, Dr. Mario Beretta; Italy)
- > Horizontal ridge augmentation utilising the resorbable Geistlich Bio-Gide® membrane and a combination of particulated autogenous bone with Geistlich Bio-Oss® (Prof. Istvan Urban, Hungary/USA)
- > Vertical ridge augmentation with autogenous bone, Geistlich Bio-Oss® and a non-resorbable reinforced membrane (Prof. Massimo Simion, Italy; Dr. Isabella Rocchietta, UK/Sweden)
- > Vertical ridge augmentation with autogenous bone, Geistlich Bio-Oss® and Geistlich Bio-Gide® (Prof. Matteo Chiapasco, Italy)

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