

LEADING REGENERATION

**Geistlich**  
Biomaterials

# Oral and Maxillofacial Surgery

Innovative Treatment Concepts





Please find additional online information here:  
[www.geistlich-pharma.com/oms](http://www.geistlich-pharma.com/oms)

#### CLINICAL CASES

- 8 Dr. J. Aranda – Onlay grafting for horizontal augmentation
- 9 Prof. Dr. D. Buser et al. – Onlay grafting for horizontal augmentation
- 10 Prof. Dr. C. Maiorana et al. – Onlay grafting for horizontal augmentation
- 11 Prof. Dr. R. Carvalho da Silva et al. – Onlay grafting for horizontal augmentation
- 12 Dr. G. Iglhaut – Inlay grafting for horizontal augmentation
- 13 Prof. Dr. I. Urban – Onlay grafting for horizontal augmentation and soft tissue regeneration
- 14 Prof. Dr. M. Chiapasco – Onlay grafting for vertical augmentation
- 15 Prof. Dr. M. Simion et al. – Onlay grafting for vertical augmentation
- 16 Dr. M. Merli – Onlay grafting for vertical augmentation
- 17 Dr. P. Felice et al. – Inlay grafting for vertical augmentation
- 18 Prof. Dr. Dr. H. Terheyden – Osteotomies and inlay grafting for vertical augmentation
- 19 PD Dr. Dr. D. Rohner – Orthognathic surgery and inlay grafting

Artwork by Bettina Vogelsanger

# The art of major bone augmentation

Meet the challenge with Geistlich biomaterials

## STIMULATE NEW BONE FORMATION

Due to its osteoinductive potential, autologous bone is the gold standard for major bone augmentations. It stimulates new bone formation in large-scale defects perfectly. But human bone grafts are subject to a certain amount of resorption, which may affect the long-term clinical success of the therapy.

“Human bone grafts are subject to unwanted resorption. Therefore, we always combine Geistlich biomaterials with autologous bone for larger augmentations.”

PROF. DR. ISTVAN URBAN

## PROTECT AGAINST BONE RESORPTION

Geistlich biomaterials complement human bone. Thanks to its high re-sorption stability and osteoconductivity<sup>18-20</sup>, Geistlich Bio-Oss<sup>®</sup> protects human bone grafts against degradation<sup>21</sup>. Geistlich Bio-Gide<sup>®</sup> native collagen membrane provides a barrier function long enough to protect the newly forming bone from soft-tissue ingrowth and provides support for wound healing.<sup>14, 22-24</sup>

## BIOMATERIALS CREATE MORE ROOM FOR SUCCESS<sup>14</sup>

- > Less invasive surgery – fewer complications – lower morbidity – **higher patient satisfaction**<sup>6-14</sup>
- > Less bone resorption – **stable clinical outcome**<sup>1-5</sup>
- > Predictable bone gain – **long-term implant survival**<sup>8,12,13</sup>



AUTOLOGOUS BLOCK + GEISTLICH BIO-OSS<sup>®</sup> + GEISTLICH BIO-GIDE<sup>®1,4,5</sup>

93%

AUTOLOGOUS BLOCK + GEISTLICH BIO-OSS<sup>®3</sup>

91%

AUTOLOGOUS BLOCK + BONE CHIPS<sup>3</sup>

82%

Ridge width maintenance

## References:

- 1 von Arx T, Buser D: Clin Oral Implants Res. 2006 Aug;17(4):359–66. (Clinical study)
- 2 Canullo L, et al.: Int J Periodontics Restorative Dent. 2006 Aug;26(4):355–61. (Clinical study)
- 3 Maiorana C, et al.: Int J Periodontics Restorative Dent. 2005 Feb;25(1):19–25. (Clinical study)
- 4 Maiorana C, et al.: Open Dent J. 2011 Apr 25;5:71–8. (Clinical study)
- 5 Cordaro L, et al.: Clin Oral Implants Res. 2011 Oct;22(10):1145–1150. (Clinical study)
- 6 Li J, et al.: Implant Dent. 2013 Apr;22(2):112–6. (Clinical study)
- 7 Felice P, et al.: Clin Oral Implants Res. 2009 Dec;20(12):1386–93. (Clinical study)
- 8 Urban IA, et al.: Int J Periodontics Restorative Dent. 2013 May-Jun;33(3):299–307. (Clinical study)
- 9 Merli M, et al.: Eur J Oral Implantol. 2013 Spring;6(1):27–37. (Clinical study)
- 10 De Santis E, et al.: Clin Oral Implants Res. 2013 Jan;24(1):77–86. (Pre-clinical study)
- 11 Trevisiol L, et al.: J Craniofac Surg. 2012 Sep;23(5):1343–8. (Clinical study)
- 12 Chiapasco M, et al.: Minerva Stomatol. 2013 Jan-Feb;62(1-2):3–16. (Clinical study)
- 13 Jung RE, et al.: Clin Oral Implants Res. 2013 Oct;24(10):1065–73. (Clinical study)
- 14 Schwarz F et al.: Clin Oral Implants Res. 2014 Sep;25(9):1010–5. (Clinical study)
- 15 Kim M, et al.: In Vivo. 2008 Mar-Apr;22(2):231–6. (Pre-clinical study)
- 16 Reddy KP, et al.: J Contemp Dent Pract. 2006 Feb 15;7(1):60–70. (Clinical study)
- 17 Tal H et al.: Clin Oral Implants Res. 2008;19(3):295–302. (Clinical study)
- 18 Orsini G et al.: Oral Dis. 2007 Nov;13(6):586–93. (Clinical study)
- 19 Mordenfeld A et al.: Clin Oral Implants Res. 2010 Sep;21(9):961–70. (Clinical study)
- 20 Lindgren C et al.: Int J Oral Maxillofac Implants. 2009 Nov-Dec;24(6):1093–100. (Clinical study)
- 21 Schlegel KA et al.: Int J Oral Maxillofac Implants. 2003 Jan–Feb;18(1):53–8. (Pre-clinical study)
- 22 Becker J et al.: Clin. Oral Implants Res. 2009 Jul;20(7):742–9. (Clinical study)
- 23 Rothamel D et al.: Clin Oral Implants Res. 2005 Jun;16(3):369–378. (Pre-clinical study)
- 24 Rothamel D et al.: Int J Oral Maxillofac Implants. 2012 Jan–Feb;27(1):146–54. (Pre-clinical study)

# All our science in your hands

## Leader in the field of biomaterials

Geistlich biomaterials are among the most frequently used and most documented biomaterials in regenerative oral surgery<sup>25</sup>. More than 200 studies on larger bone augmentation have been published with Geistlich biomaterials<sup>26</sup>.

**“Geistlich biomaterials have demonstrated their superiority for many years. No other products are as evidence-based.”**

**PROF. DR. DANIEL BUSER**

The expanding number of scientific publications is based on our long-term collaboration with outstanding researchers from more than 100 universities and appropriate treatment concepts are validated by leading clinicians around the world. New products are investigated rigorously before being released to the market and existing products are evaluated with regard to their long-term clinical success<sup>13,18,27-33</sup>. Thus Geistlich biomaterials have earned the trust of clinicians world-wide and have opened the way for more predictable treatment concepts also in complex situations.

### YOUR WORLDWIDE NO.1 REFERENCE<sup>34,35,40-44</sup>

- > **Clinically confirmed a million times** – Geistlich biomaterials are used every 18 seconds world-wide.
- > **Studied a thousand times** – Geistlich Bio-Oss<sup>®</sup> and Geistlich Bio-Gide<sup>®</sup> belong to the most documented regenerative biomaterials.<sup>25</sup>
- > **Documented over many years** – Geistlich Bio-Oss<sup>®</sup> and Geistlich Bio-Gide<sup>®</sup>: more than 30 years of long-term data.<sup>13,36</sup>

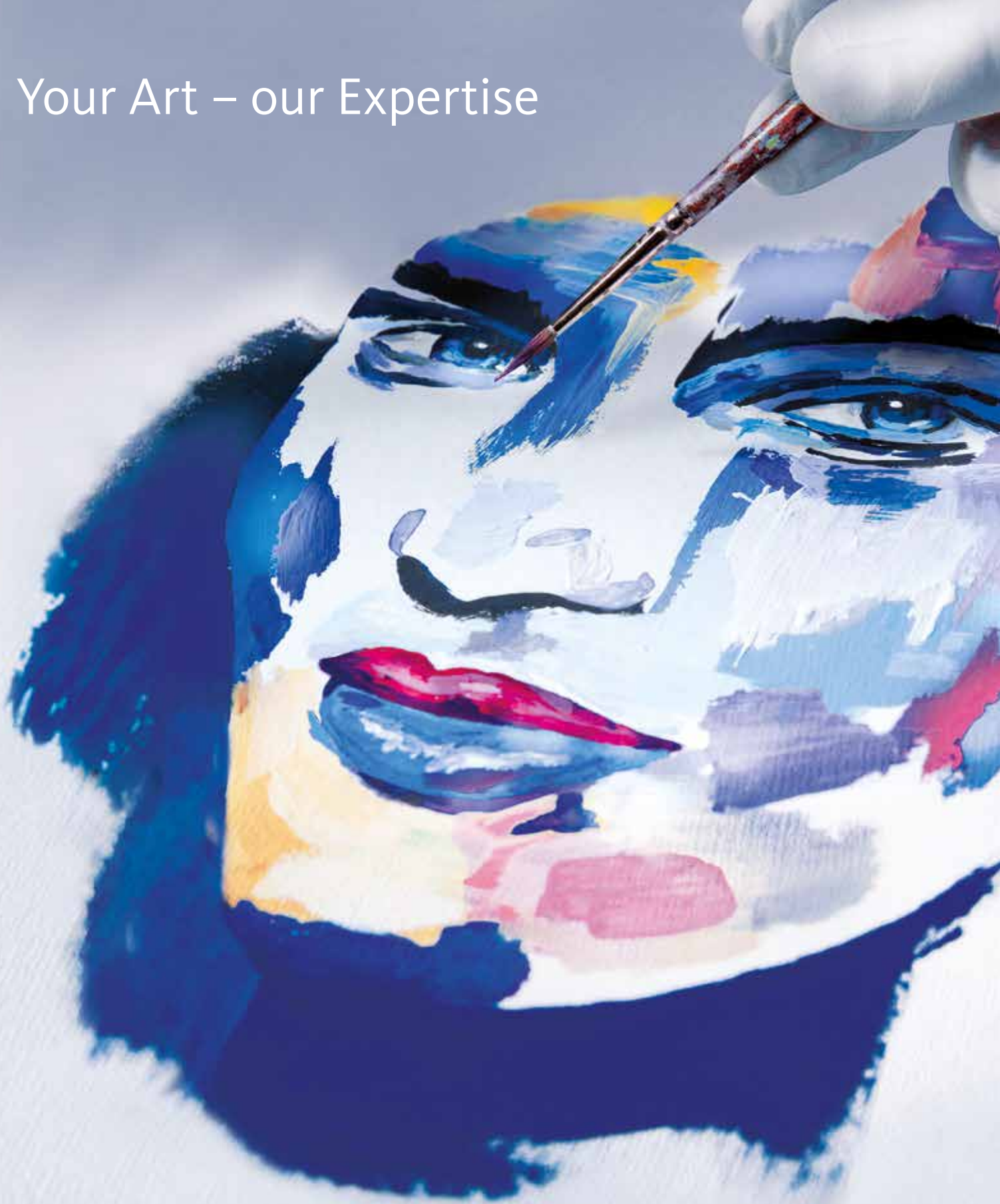


#### References:

- 25 NCBI Pubmed, September 2019, Search term: Bio-Oss OR Bio-Gide, PubMed Filter "Species: Humans" (816 hits) or "Other animals" (659 hits). (Market Research)
- 26 Data on file, Geistlich Pharma AG, Wolhusen. (Non-Clinical)
- 27 Piattelli M, et al.: Int J Oral Maxillofac Implants. 1999 Nov–Dec;14(6):835–40. (Clinical study)
- 28 Aghaloo TL, et al.: Int J Oral Maxillofac Implants. 2007;22 Suppl:49–70. (Review)
- 29 Benić GI, et al.: Clin Oral Implants Res. 2009 May;20(5):507–13. (Clinical study)
- 30 Dahlin C, Johansson A: Clin Implant Dent Relat Res. 2011 Dec;13(4):305–10. (Clinical study)
- 31 Juodzbaly G, Wang HL: Clin Oral Implants Res. 2007 Apr;18(2):237–43. (Clinical study)

- 32 Traini T, et al.: J Periodontol. 2007 May;78(5):955–61. (Clinical study)
- 33 Jensen SS, et al.: J Periodontol. 2014 Nov;85(11):1549–56. (Clinical study)
- 34 US market report suite for dental bone graft substitutes and other biomaterials, iDATA\_USDBGS19\_MS, Published in January 2019 by iData Research Inc., 2019. (Market Research)
- 35 Europe market report suite for dental bone graft substitutes and other biomaterials, iDATA\_EUDBGS19\_MS, Published in July 2019 by iData Research Inc., 2019. (Market Research)
- 36 Hürzeler M et al., Deutsche Zahnärztliche Zeitschrift. 1996; 51. (Clinical study)

Your Art – our Expertise





The regenerative capacity of autologous bone combined with Geistlich biomaterials makes all the difference.

# Unsurpassed quality standards

## Responsibility for every step

### A PIONEER IN THE FIELD OF BIOMATERIALS

Geistlich Bio-Oss® and Geistlich Bio-Gide® have been recognized as pioneering products of oral bone regeneration since their development. With the collagen matrices Geistlich Mucograft® and Geistlich Fibro-Gide®, Geistlich Biomaterials has revolutionized the market of soft-tissue regeneration.

“We have a thorough knowledge of our products and take responsibility for every single step by developing them ourselves, testing them ourselves and producing them ourselves.”

**DR. TERANCE HART, DIRECTOR RESEARCH, GEISTLICH PHARMA**

### STRONG COMMITMENT TO SCIENCE

The overall goal of Geistlich Pharma is to give back patients some quality of life. Dr. Peter Geistlich founded the Osteology Foundation and the Osteo Science Foundation to advance global research and clinical practice in oral and maxillofacial tissue regeneration.

Geistlich Pharma also takes its social responsibility seriously. The company supports the humanitarian organisation Doctors of the World in the field of plastic surgery for children with cleft lips and palates<sup>37</sup>.

“The regenerative capacity of autologous bone is unmatched. With our developments, we intend to optimally complement nature.”

**DR. MICHAEL BUFLER, DIRECTOR MATERIAL RESEARCH & TECHNOLOGIES**

### References:

37 [www.aerztderwelt.org/index.php?id=38](http://www.aerztderwelt.org/index.php?id=38) [www.aerztderwelt.org/ueber-uns/partner-foerderer/kooperationspartner.html](http://www.aerztderwelt.org/ueber-uns/partner-foerderer/kooperationspartner.html)

38 Perelman-Karmon M et al. Int J Periodontics Restorative Dent. 2012 Aug;32(4):459-65. (Clinical study)

39 Data on File. Geistlich Pharma AG, Wolhusen, Switzerland. (Pre-clinical study)

40 China market report suite for dental bone graft substitutes and other biomaterials, iDATA\_CHDBGS18\_MS, Published in November 2018 by iData Research Inc., 2018. (market research)

41 Australia market report suite for dental bone graft substitutes and other biomaterials, iDATA\_AUDBGS18\_MS, Published in November 2018 by iData Research Inc., 2018. (Market Research)

42 India market report suite for dental bone graft substitutes and other biomaterials, iDATA\_INDBGS18\_MS, Published in November 2018 by iData Research Inc., 2018. (Market Research)

43 South Korea market report suite for dental bone graft substitutes and other biomaterials, iDATA\_SKDBGS18\_MS, Published in November 2018 by iData Research Inc., 2018. (Market Research)

44 Japan market report suite for dental bone graft substitutes and other biomaterials, iDATA\_JPDBGS18\_MS, Published in November 2018 by iData Research Inc., 2018. (Market Research)

### DEVELOPING PRODUCT RESPONSIBILITY

- > Geistlich Biomaterials has built up in-depth knowledge on the preparation and refinement of bone tissue and collagen over more than 160 years.
- > The company collaborates with more than 100 universities and private practitioners to develop and clinically test its products.
- > New products are launched only once the researchers and clinical partners are 100% certain of their quality and clinical performance.
- > Geistlich Biomaterials manages everything – from the initial idea until it is in your hands – always to the highest Swiss quality standards.
- > Oral and maxillofacial surgeons worldwide use Geistlich biomaterials in their innovative, well-documented treatment concepts.

# Block grafting and contour augmentation

Dr. Juan José Aranda | Spain

## Clinical challenge:

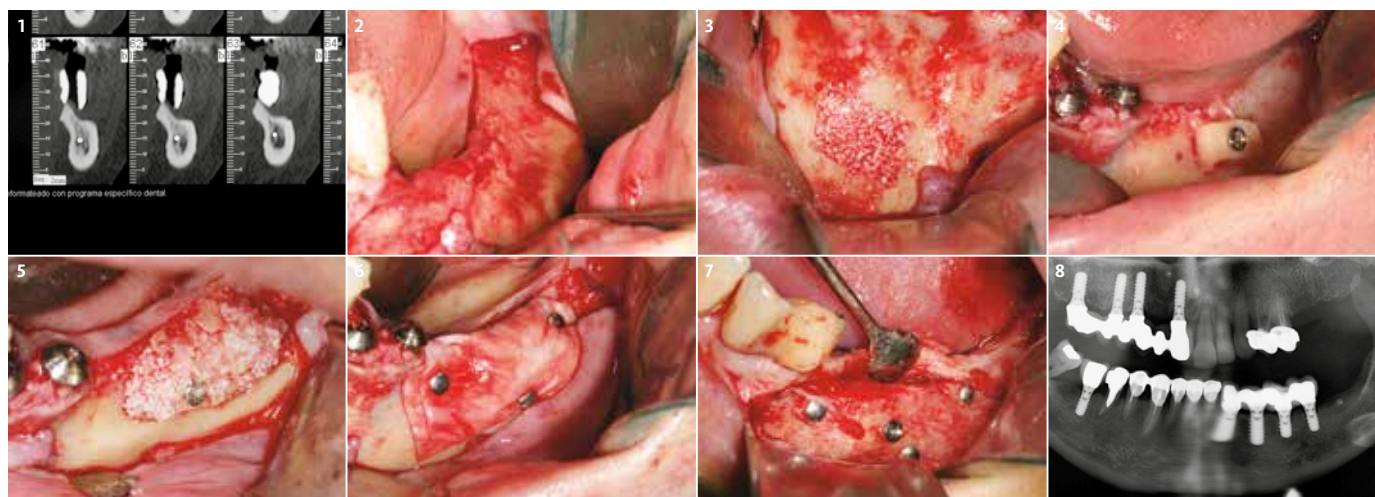
- › Insufficient alveolar ridge width for implant placement
- › Autologous bone blocks are subject to resorption

## Aim / Approach:

- › Autologous bone block grafting and a GBR approach for horizontal augmentation of the alveolar ridge for implant placement
- › Reduction of autologous block resorption and complication rate during healing

Defect	Region	Autologous bone	Additional means
● horizontal	○ anterior    ○ maxilla	○ particulate	● screw
○ vertical	● posterior    ● mandible	● block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide®



1 CT-scan images of the posterior atrophied mandible.

2 Intrasurgical view of the recipient area. Note the severe horizontal ridge resorption.

3 The donor site is filled with Geistlich Bio-Oss®. A single flap was elevated to include the receptor and donor areas.

4 The autologous bone block from the symphysis is fixed with one screw in the correct position at the recipient site.

5 Geistlich Bio-Oss® covers the autologous bone block and is used in the adjacent area in order to achieve an accurate contour of the alveolar ridge. Moreover, this avoids potential complications during the healing process and the collapse of the membrane.

6 Two layers of Geistlich Bio-Gide®, fixed with tacks, cover the augmented area. This provides protection against potential soft tissue fenestration and also any resorption of the grafts.

7 Re-entry after 6 months, demonstrating optimal bone regeneration.

8 Panoramic X-ray long-term follow-up 6 years after implant placement showing a stable bony situation.

## Conclusion:

Within the available treatment modalities for the regeneration of posterior mandibular areas, grafting autologous bone blocks from the mandibular symphysis for ridge augmentation is a popular procedure, as this surgical technique offers easy access and enough graft material for horizontal augmentation. Geistlich Bio-Oss® and Geistlich Bio-Gide® support the surgeon to obtain optimal results, avoiding potential soft and hard tissue complications during the healing process in both the donor and receptor areas.



# Combined block grafting and guided bone regeneration

Prof. Dr. Daniel Buser, Prof. Dr. Thomas von Arx | Switzerland

## Clinical challenge:

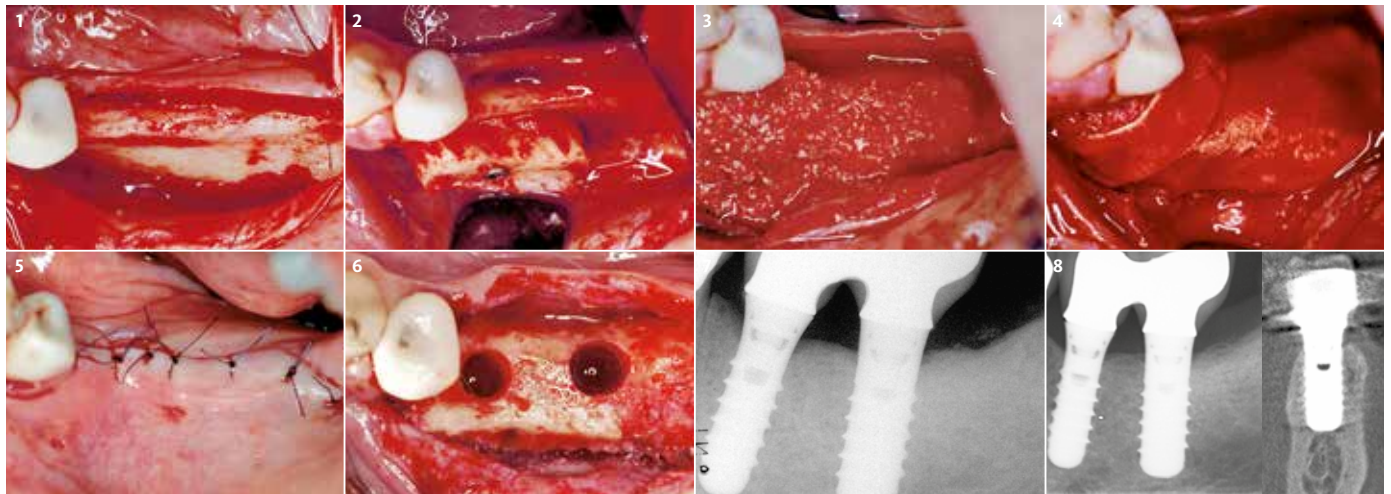
- › Insufficient alveolar ridge width for implant placement
- › Autologous bone blocks are subject to resorption

## Aim / Approach:

- › Autologous bone block grafting and a GBR approach for horizontal augmentation of alveolar ridge for implant placement
- › Minimizing autologous bone block resorption and improving predictability

Defect	Region	Autologous bone	Additional means
● horizontal	○ anterior    ○ maxilla	○ particulate	● screw
○ vertical	● posterior    ● mandible	● block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide®



**1** Thin ridge situation in the posterior mandible.

**2** The autologous bone block from the retromolar area is fixed with a titanium screw.

**3** The autologous bone block and the adjacent area is covered with Geistlich Bio-Oss®.

**4** A double-layer of the collagen membrane Geistlich Bio-Gide® is applied.

**5** Primary wound closure is accomplished with single interrupted sutures.

**6** Optimal bony support for implant placement after approx. 6 months.

**7** Stable bony situation 18 months postoperatively.

**8** Stable peri-implant bone level 11 years postoperatively. The CBCT on the right shows a thick facial bone wall at the distal implant at this time point.

## Conclusion:

The technique is appropriate for patients with severe horizontal bone atrophy and provides successful ridge augmentation with high predictability. Covering the autologous block graft with Geistlich Bio-Oss® and Geistlich Bio-Gide® significantly reduces autologous bone block resorption. The resorbable membrane, Geistlich Bio-Gide® is easy to handle and simplifies the surgical method. The stability of the membrane can be further improved using the double-layer technique.

# Contouring of autologous bone blocks

Prof. Dr. Carlo Maiorana, Dr. Mario Beretta | Italy



## Clinical challenge:

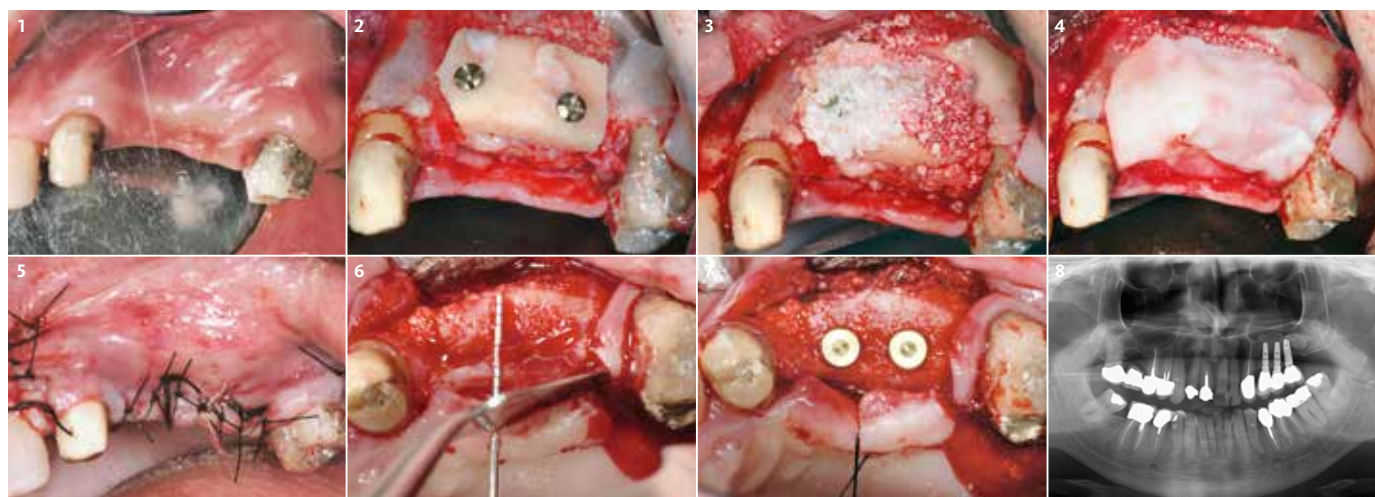
- › Atrophied alveolar ridge has insufficient width for implant placement
- › Autologous bone blocks are subject to resorption

## Aim / Approach:

- › Autologous bone block grafting and contouring with Geistlich Bio-Oss® for horizontal augmentation of the alveolar ridge for implant placement
- › Reduction of autologous bone block resorption

Defect	Region	Autologous bone	Additional means
● horizontal	○ anterior ● maxilla	○ particulate	● screw
○ vertical	● posterior ○ mandible	● block	

**Regenerative Geistlich biomaterials:** GGeistlich Bio-Oss® | Geistlich Bio-Gide®



**1** Clinical situation in the posterior maxilla depicting a large buccal defect in the edentulous area.

**2** Fixation of the autologous block from the symphysis.

**3** Contouring of the grafted site with Geistlich Bio-Oss®.

**4** The augmented area is covered with the collagen membrane Geistlich Bio-Gide®.

**5** Primary wound closure is accomplished with single interrupted sutures.

**6** Clinical aspect of the augmented ridge with no signs of block resorption.

**7** Implant placement 3 months post augmentation.

**8** Long-term follow-up showing stable peri-implant bone level 3 years after implant placement.

## Conclusion:

Stable horizontal alveolar ridge augmentation can be achieved in partially edentulous areas by contouring the autologous bone block with Geistlich Bio-Oss®, thus compensating for the process of autologous bone resorption that inevitably occurs. Coverage of the site with Geistlich Bio-Gide® further contributes to uneventful healing and reduction of graft resorption. This approach aids to obtain predictable and successful long-term result.

# Horizontal augmentation using Geistlich Bio-Gide® and particulate bone graft

Prof. Dr. Robert Carvalho da Silva, Prof. Dr. Paulo Fernando Mesquita, Prof. Dr. Julio Cesar Joly | Brazil

## Clinical challenge:

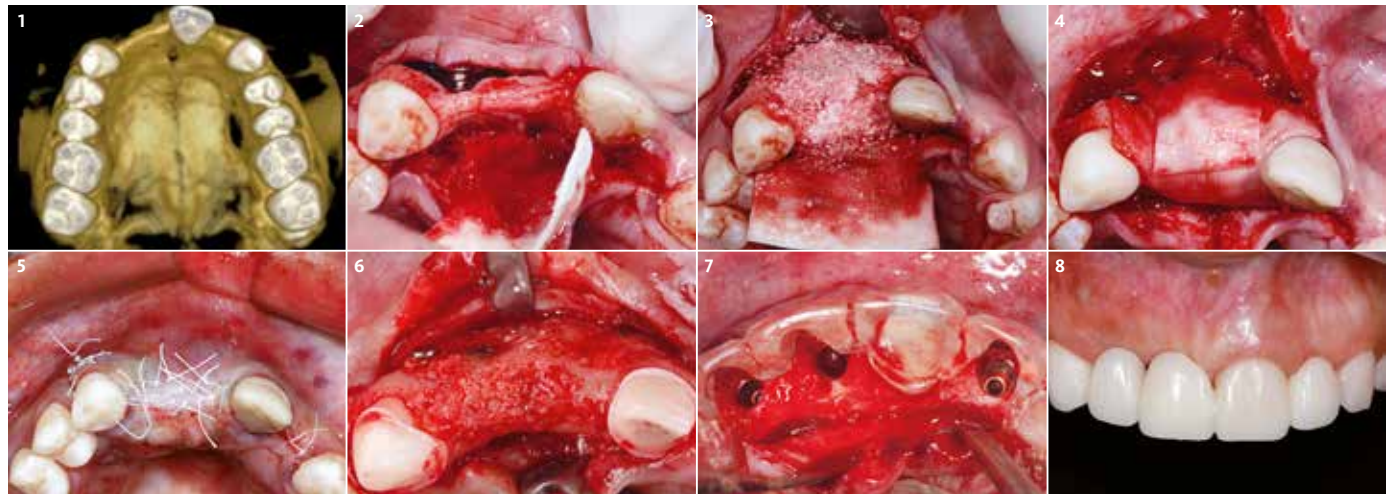
- › Insufficient alveolar ridge width for implant placement
- › Donor site morbidity after autologous bone block harvesting and resorption of autologous bone

## Aim / Approach:

- › Horizontal alveolar ridge augmentation with Geistlich Bio-Oss® and Geistlich Bio-Gide®
- › Minimizing autologous bone harvesting and resorption protection

Defect	Region	Autologous bone	Additional means
● horizontal	● anterior   ● maxilla	● particulate	● tenting screws
○ vertical	○ posterior   ○ mandible	○ block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide®



**1** 3D reconstruction from CBCT images showing horizontal maxillary atrophy at the two-teeth-gap.

**2** Intraoperative view of the atrophied anterior maxillary site. Tenting screws are placed to support the collagen membrane.

**3** Application of a mixture (1:1) of autologous bone chips from the retromolar area and Geistlich Bio-Oss®.

**4** Coverage with a double layer of collagen membrane Geistlich Bio-Gide®.

**5** Tension-free, primary wound closure by mattress and single interrupted sutures.

**6** Situation at re-opening after 6 months showing vital bone and reconstructed ridge contour.

**7** Guided implant placement in regenerated bone with stent (additional implant placement at position 22).

**8** Final prosthetic restoration.

## Conclusion:

Using this approach, horizontal ridge augmentation can be achieved with just particulate bone (Geistlich Bio-Oss® and autologous bone chips) and Geistlich Bio-Gide® in combination with supporting tenting screws. This procedure avoids harvesting of an autologous bone block and the related morbidity of the donor site. Moreover, Geistlich Bio-Oss® counteracts resorption and the collagen membrane not only stabilizes the graft, but also minimizes the risk of soft tissue dehiscences.

# Crest splitting

Dr. Gerhard Iglhaut | Germany

## Clinical challenge:

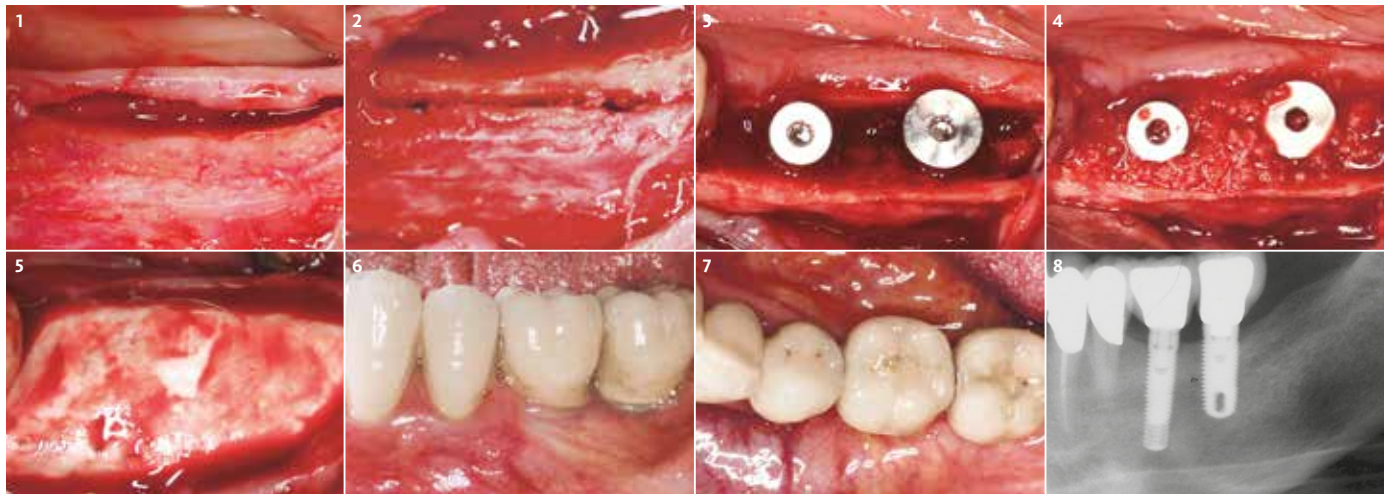
- › Insufficient alveolar ridge width for implant placement
- › Autologous bone is subject to resorption and may lead to loss of volume

## Aim / Approach:

- › Crest splitting procedure in combination with Geistlich Bio-Oss® and Geistlich Bio-Gide® for horizontal augmentation
- › Preservation of the alveolar ridge volume

Defect	Region	Autologous bone	Additional means
● horizontal	<input type="radio"/> anterior <input type="radio"/> maxilla	● particulate	● none
<input type="radio"/> vertical	● posterior    ● mandible	<input type="radio"/> block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide®



1 Occlusal view of the ridge after flap elevation.

2 Longitudinal split of the alveolar crest by use of piezo-surgical instruments.

3 Two implants are placed in the expanded crest.

4 The split around the implants is filled with a mixture (1:1) of autologous bone chips from the retromolar area and Geistlich Bio-Oss®.

5 The augmented ridge is covered with a Geistlich Bio-Gide® membrane before closure of the soft tissue.

6 Buccal view of the final situation.

7 Occlusal view of the prosthetic outcome.

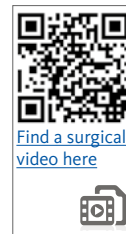
8 X-ray findings 6 months after implant placement.

## Conclusion:

The crest splitting technique allows the placement of implants in anatomic situations with insufficient ridge thickness, by moving the external cortical plate in a buccal direction. This technique allows immediate implant placement, despite the need for considerable ridge augmentation. The gap resulting from crest splitting is filled with autologous particulate bone and Geistlich Bio-Oss®, which allows predictable bone volume preservation. Due to the good adhesion of Geistlich Bio-Gide® to the defect, the particulate bone graft is kept in place during the regeneration process.

# Sausage technique and gain of vestibular depth

Prof. Dr. Istvan Urban | Hungary / USA



## Clinical challenge:

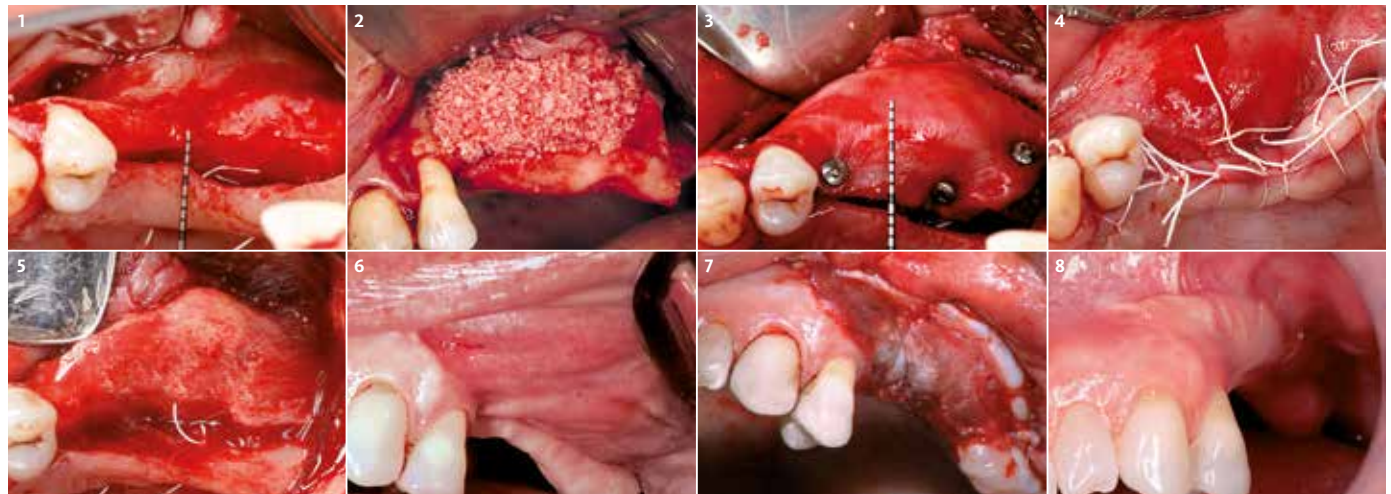
- › Insufficient alveolar ridge width for implant placement
- › Avoiding patient morbidity after harvesting larger quantities of autologous bone
- › Insufficient vestibular depth and keratinized tissue after wound closure

## Aim / Approach:

- › Extensive horizontal alveolar ridge augmentation with Geistlich Bio-Oss® and Geistlich Bio-Gide®
- › Gain of vestibular depth and keratinized tissue by use of Geistlich Mucograft®

Defect	Region	Autologous bone	Additional means
● horizontal	○ anterior ● maxilla	● particulate	● titanium pins
○ vertical	● posterior ○ mandible	○ block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide® | Geistlich Mucograft®



1 Preoperative view of the atrophied ridge.

2 Application of a mixture (1:1) of autologous bone and Geistlich Bio-Oss®.

3 Geistlich Bio-Gide® is tightly fixed and pinned, thus immobilizing the particulate graft. The sausage-like augmentation allows extended horizontal augmentation.

4 Primary wound closure is obtained with a combination of mattress and single interrupted sutures.

5 Sufficient amount of augmented bone for implant placement 8 months after augmentation. Implants are placed in a submerged procedure.

6 Insufficient vestibular depth and keratinized tissue after alveolar ridge augmentation.

7 Application of a keratinized strip towards the vestibulum and Geistlich Mucograft® over the augmented area where it is left exposed for healing.

8 Situation before reopening for abutment connection after 3 months showing increased vestibular depth and more keratinized tissue.

## Conclusion:

The sausage technique combined with the keratinized strip technique is an innovative approach to horizontally augment the alveolar ridge and to compensate for the lack of vestibular depth and keratinized tissue after primary wound closure. This procedure avoids harvesting of an autologous bone block and the related morbidity of the donor site. The technique requires no dimensionally-stable element for bone augmentation and uses the unique property of Geistlich Mucograft®, the surface of which may be left exposed for soft tissue regeneration.

# Block grafting and contouring with simultaneous sinus lifting

Prof. Dr. Matteo Chiapasco | Italy



## Clinical challenge:

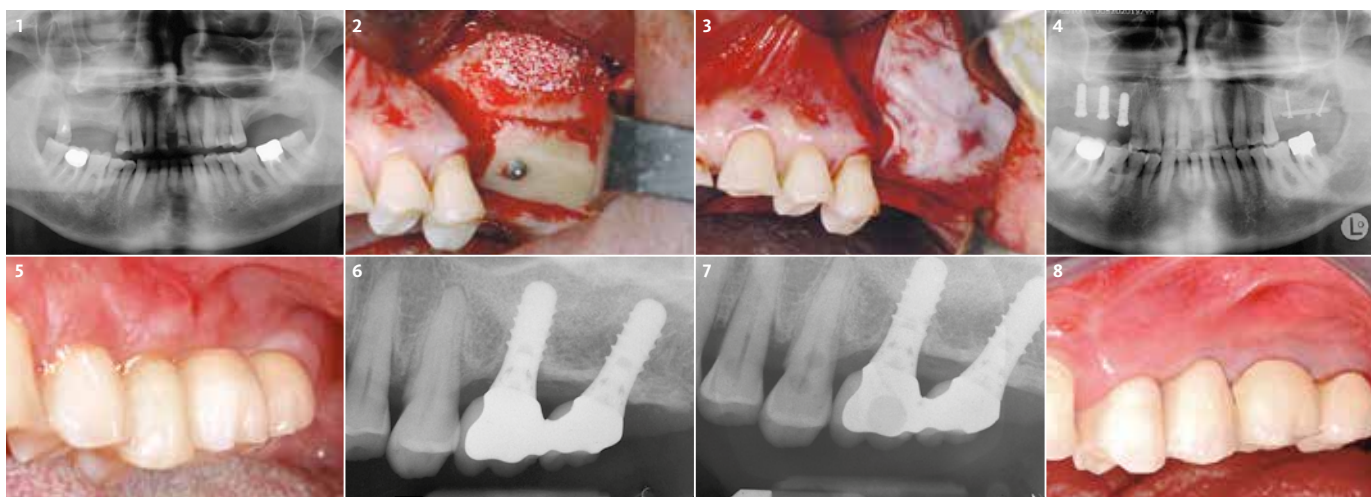
- › Insufficient alveolar ridge height and width for implant placement
- › Autologous bone is subject to resorption and may lead to loss of volume

## Aim / Approach:

- › Autologous block transplantation in combination with sinus lift procedures with Geistlich Bio-Oss® and Geistlich Bio-Gide®
- › Alveolar ridge volume preservation

Defect	Region	Autologous bone	Additional means
<input type="radio"/> horizontal	<input type="radio"/> anterior <input checked="" type="radio"/> maxilla	<input checked="" type="radio"/> particulate	<input checked="" type="radio"/> screws
<input checked="" type="radio"/> vertical	<input checked="" type="radio"/> posterior <input type="radio"/> mandible	<input checked="" type="radio"/> block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide®



**1** Preoperative radiograph showing a partially edentulous maxilla on both sides with associated vertical atrophy, more severe on the left side.

**2** Sinus grafting with a mixture of Geistlich Bio-Oss® and autologous bone and vertical onlay grafting with an autologous bone block. Coverage of the block graft and in the area of the lateral fenestration with Geistlich Bio-Oss®.

**3** The lateral window and the autologous bone block are covered with Geistlich Bio-Gide®.

**4** Radiographic control after surgery (sinus grafting with simultaneous implant placement on the right side).

**5** Clinical situation after completion of prosthetic restoration (left side).

**6** Radiographic control 3 years after surgery.

**7** Long-term radiographic control 7 years after surgery shows stable situation of the augmented site.

**8** Clinical picture 7 years post surgery showing stable and excellent esthetic outcome.

## Conclusion:

An autologous block graft combined with sinus elevation compensates for the severe vertical atrophy. Using a mixture of autologous bone and Geistlich Bio-Oss® counteracts bone resorption and preserves the augmented volume in the long-term. The collagen membrane Geistlich Bio-Gide® is placed over the entire augmented site to protect it and to favor an optimal esthetic outcome.

# Vertical augmentation with form-stable membrane and particulate bone graft

Prof. Dr. Massimo Simion | Italy, Dr. Isabella Rocchietta | UK / Sweden



## Clinical challenge:

- › Insufficient alveolar ridge height for implant placement
- › Loss of augmented ridge volume and patient morbidity after using large amounts of autologous bone

## Aim / Approach:

- › Vertical ridge augmentation by use of a form-stable titanium-reinforced barrier membrane
- › Alveolar ridge volume preservation using a mixture of Geistlich Bio-Oss® and autologous particulate bone

Defect	Region	Autologous bone	Additional means
<input type="radio"/> horizontal	<input type="radio"/> anterior <input type="radio"/> maxilla	<input checked="" type="radio"/> particulate	<input checked="" type="radio"/> tenting screws
<input checked="" type="radio"/> vertical	<input checked="" type="radio"/> posterior <input checked="" type="radio"/> mandible	<input type="radio"/> block	<input checked="" type="radio"/> Ti-reinforced membrane

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss®



**1** Intraoral view of the defect in the posterior right mandible.

**2** Cortical perforations to enhance and promote bleeding. Tenting screws for later support of the overlying barrier membrane.

**3** Augmentation with Geistlich Bio-Oss® and autologous bone (1:1) and covering with a titanium-reinforced ePTFE barrier membrane.

**4** The ePTFE barrier membrane is secured on the lingual and buccal side by two fixation screws on each side. Alternatively, Geistlich Bio-Gide® can be applied additionally to reduce the risk of soft tissue dehiscences.

**5** Tension-free primary wound closure is performed with alternating horizontal mattress and interrupted sutures.

**6** Panoramic X-ray of the augmented sites.

**7** After 6 months of uneventful healing, the tenting screws and the non-resorbable barrier membrane are removed.

**8** Placement of implants in the stably regenerated alveolar ridge.

## Conclusion:

Successful vertical ridge augmentation can be achieved in the lower jaw by applying a mixture of particulate autologous bone and Geistlich Bio-Oss® covered by a form-stable barrier membrane. Geistlich Bio-Oss® only undergoes minimal resorption which is advantageous for the long-term stability of regenerated bone while reducing the amount of autologous bone harvesting necessary. Covering the non-resorbable Ti-reinforced barrier membrane with a Geistlich Bio-Gide® may reduce the risk of complications.

# Fence technique for 3-dimensional alveolar ridge augmentation

Dr. Mauro Merli | Italy



## Clinical challenge:

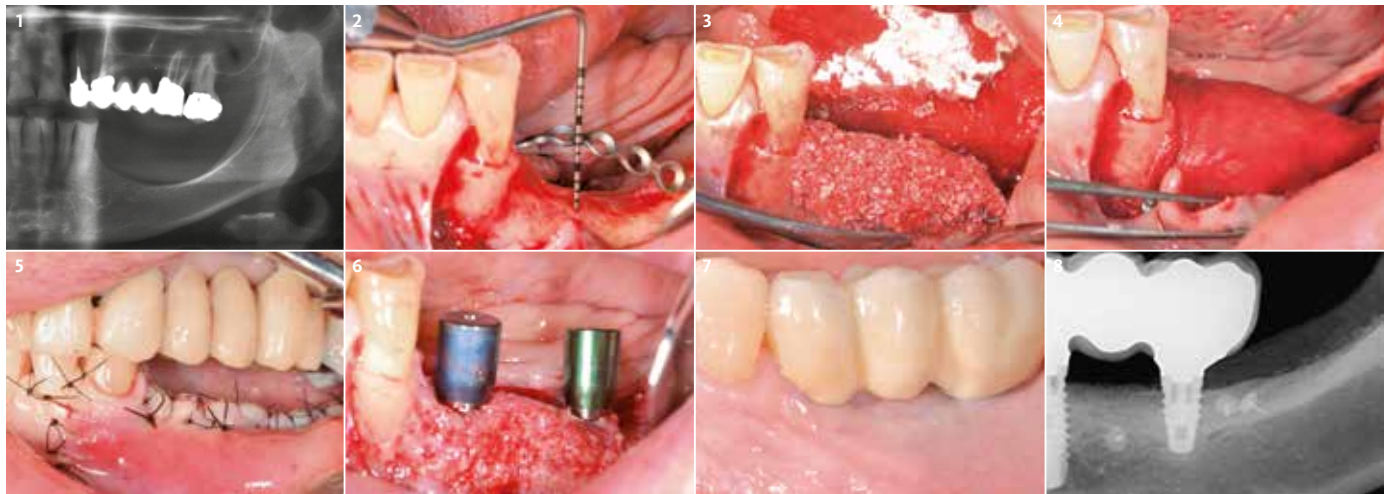
- › Severely atrophied alveolar ridge with insufficient bone volume for implant placement
- › High complication rates and patient discomfort associated with large augmentations when using autologous bone grafts

## Aim / Approach:

- › 3-dimensional augmentation of alveolar ridge by the fence technique for implant placement
- › At the same time reducing complication rates and patient discomfort

Defect	Region	Autologous bone	Additional means
<input type="radio"/> horizontal	<input type="radio"/> anterior <input type="radio"/> maxilla	<input checked="" type="radio"/> particulate	<input checked="" type="radio"/> osteosynthesis plates
<input checked="" type="radio"/> vertical	<input checked="" type="radio"/> posterior <input checked="" type="radio"/> mandible	<input type="radio"/> block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide®



**1** Preoperative radiograph depicting the severe bony atrophy in the posterior mandible.

**2** Fixation of the pre-formed osteosynthesis plate with miniscrews.

**3** Augmentation with autologous bone harvested from the angular region of the mandible and mixed with Geistlich Bio-Oss®.

**4** 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 covered and stabilized.

**5** In order to obtain primary wound closure, a double-layered suturing technique is used by combining a horizontal internal mattress and a coronal single stitch technique.

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

**7** Lateral view of the final prosthetic restoration 6 months after implant placement.

**8** Intraoral radiograph 15 months after augmentation procedure showing a stable bony situation.

## Conclusion:

The innovative fence technique is relatively simple and can provide excellent results. The osteosynthesis plate, as a rigid element, stabilizes the collagen membrane and keeps the space for the particulate grafting material. The use of Geistlich Bio-Oss® reduces the amount of required autologous bone, the extent of resorption, and patient morbidity. In addition, the collagen membrane Geistlich Bio-Gide® allows vascularization of the graft and minimizes postoperative complications.



# Interpositional grafting with Geistlich Bio-Oss® Block

Dr. Pietro Felice, Prof. Dr. Luigi Checchi, Prof. Dr. Claudio Marchetti | Italy

## Clinical challenge:

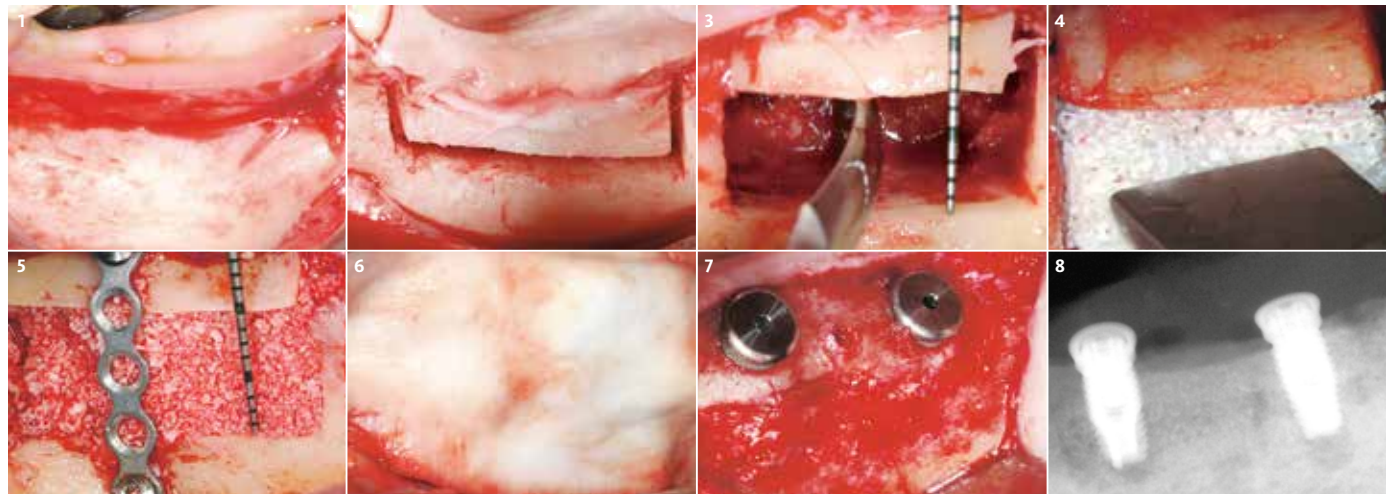
- › Insufficient alveolar ridge height for implant placement and proximity to the alveolar nerve
- › Autologous bone harvesting is associated with patient discomfort

## Aim / Approach:

- › Interpositional grafting with Geistlich Bio-Oss® Block for vertical augmentation
- › Alveolar ridge volume preservation and minimizing patient morbidity

Defect	Region	Autologous bone	Additional means
<input type="radio"/> horizontal	<input type="radio"/> anterior <input type="radio"/> maxilla	<input type="radio"/> particulate	<input checked="" type="radio"/> osteosynthesis plates
<input checked="" type="radio"/> vertical	<input checked="" type="radio"/> posterior <input checked="" type="radio"/> mandible	<input type="radio"/> block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® Block | Geistlich Bio-Gide®



1 Exposure of the alveolar ridge and buccal bone.

2 Horizontal and vertical osteotomies of the distracted segment.

3 The upward lift of the transported segment, achieving a height gain of 7 mm.

4 Geistlich Bio-Oss® Block is trimmed in a dry state with a piezo surgical device to the required dimension and shaped to completely fit into the recipient site.

5 The coronally shifted segment is fixed with miniplates and miniscrews and thus immobilizes also the biomaterial block.

6 A resorbable bilayer collagen membrane Geistlich Bio-Gide® is used to cover the grafted area.

7 Intra-operative situation following implants insertion 4 months after interpositional grafting.

8 Periapical X-ray evaluation immediately after implant insertion.

## Conclusion:

The sandwich osteotomy procedure (interpositional grafting) in the posterior mandible yields an optimal vertical gain and provides an adequate amount of bone for implant placement in patients with a minimum of 5 mm of bone above the mandibular canal. Using Geistlich Bio-Oss® Block for interposition avoids a second intervention for harvesting an autologous bone block. Thus, the surgery is simplified and reduces patient discomfort. Geistlich Bio-Gide® enhances wound healing and reduces the risk of complications.

# Interpositional grafting for Le Fort I and sandwich osteotomies

Prof. Dr. Dr. Hendrik Terheyden | Germany

## Clinical challenge:

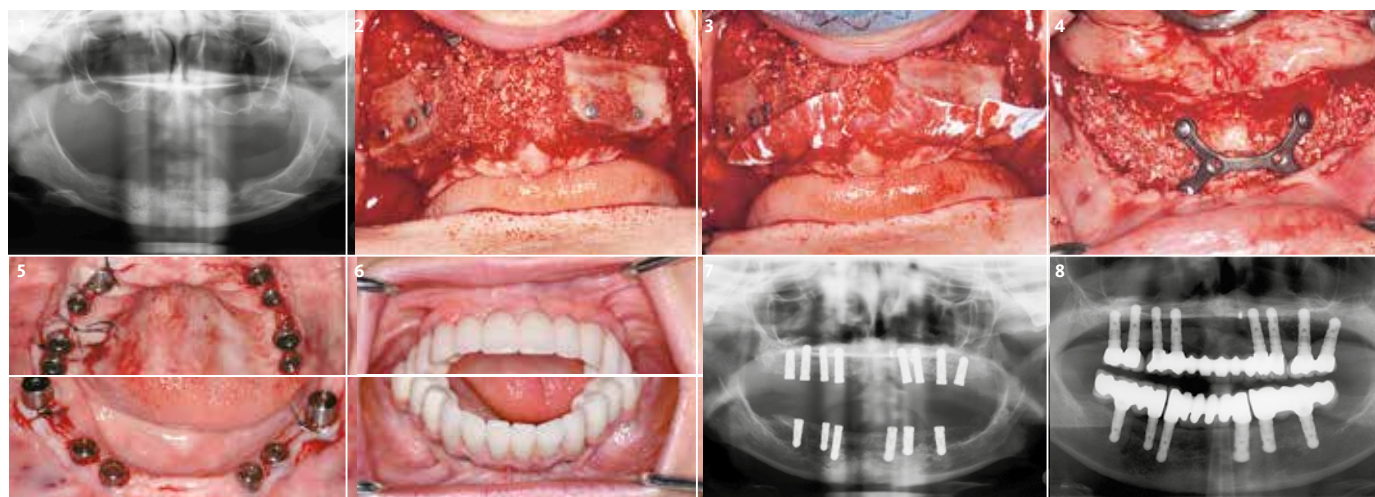
- › Functional and esthetic impairments
- › Insufficient amount of bone for implant placement due to extreme mandibular and maxillary ridge atrophy
- › Harvesting of large amount of autologous bone increases the risk of patient morbidity

## Aim / Approach:

- › Extensive horizontal and vertical ridge augmentation by interpositional bone grafting after maxillary and mandibular osteotomies
- › Use of Geistlich Bio-Oss® to reduce the amount of autologous bone harvesting and the associated donor site morbidity
- › Application of Geistlich Bio-Gide® for graft containment and minimizing complication during wound healing

Defect	Region	Autologous bone	Additional means
● horizontal	● maxilla	● particulate	● osteosynthesis plates
● vertical	● mandible	● block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® | Geistlich Bio-Gide®



**1** Preoperative radiographic findings showing severely atrophied mandibular and maxillary ridges.

**2** The gap after Le Fort I osteotomy is stabilized with iliac-bone blocks and filled with a 1:3 mixture of particulate autologous bone from iliac crest and Geistlich Bio-Oss®.

**3** The interpositional graft in the maxilla is covered with Geistlich Bio-Gide®.

**4** Filling of the mandibular sandwich osteotomy with a mixture of particulate iliac crest and Geistlich Bio-Oss® (1:3).

**5** Implant placement after 4 months in the regenerated bone of the mandible and maxilla.

**6** Optimal final restoration with fixed prosthetic supply (prosthetics by Dr. B. Simon, Germany).

**7** Panoramic X-ray after implant placement.

**8** 8 year follow-up showing stable peri-implant bone levels and preserved vertically augmented bone.

## Conclusion:

Interpositional bone graft procedures after maxillary and mandibular osteotomies provide several advantages to edentulous patients with severe bone loss: (i) sagittal and vertical movement of the ridges with compensation of the bone loss, (ii) conservation of the attached mucosal tissues on top of the ridge, (iii) less resorption than with onlay grafts, (iv) good wound healing of the bony defect. The use of Geistlich biomaterials contributes to reduced patient morbidity, uneventful healing, and stable bone augmentation over the long-term.

# Interpositional grafting in Le Fort I osteotomies using Geistlich Bio-Oss® Collagen

PD Dr. Dr. Dennis Rohner | Switzerland

## Clinical challenge:

- › Skeletal prognathism with malocclusion
- › Maxillary advancement with risk of insufficient bony union and relapse of the advanced segment

## Aim / Approach:

- › Correction of skeletal discrepancy performing Le Fort I osteotomy
- › Osteoplasty within maxillary gaps using Geistlich Bio-Oss® Collagen for interpositional grafting

Defect	Region	Autologous bone	Additional means
● prognathism	○ maxilla	○ particulate	● osteosynthesis plates
○ retrognathism	● mandible	○ block	

**Regenerative Geistlich biomaterials:** Geistlich Bio-Oss® Collagen



1 Facial profile showing prognathism.

2 Clinical picture showing the class III malocclusion.

3 Advanced and stabilized maxillary osteotomy using bilateral 2.0 locking plates.

4 Geistlich Bio-Oss® Collagen 500 mg is placed in the osteotomy gap and is moulded to the desired form during surgery.

5 Intraoperative view of maxillary gap at 6 months before removal of osteosynthesis material. Complete bone formation at the grafted site was achieved.

6 CBCT scans showing complete bony union at the grafted site.

7 Clinical picture showing final occlusion at the end of treatment.

8 Esthetic facial profile at the final visit.

## Conclusion:

Successful outcome and long-term stability in orthognathic surgery is dependent on sufficient bony union of the segments after maxillary or mandibular osteotomies. Interpositional grafts are often mandatory. Due to its properties, Geistlich Bio-Oss® Collagen is easy to place and handle within the gap and supports bony union. This application might help to reduce relapse rates in extended maxillary advancements and thus contribute to a stable functional outcome.

Solving Complexity  
is Your Art



# Recommended indication-specific material combinations

	Horizontal augmentation			Vertical augmentation				Orthognathic surgery
	Contouring	Onlay grafting	Inlay grafting	Contouring	Onlay grafting	Inlay grafting	Oral soft tissue regeneration	
<b>GEISTLICH BIO-OSS®</b>								
<b>Geistlich Bio-Oss®</b> Granules 0.25–1 mm 0.5 g ~ 1.0 cm³								
<b>Geistlich Bio-Oss®</b> Granules 0.25–1 mm 2.0 g ~ 4.0 cm³								
<b>Geistlich Bio-Oss®</b> Granules 1–2 mm 0.5 g~1.5 cm³/2.0 g~6.0 cm³								
<b>Geistlich Bio-Oss Pen®</b> Granules 0.25–1 mm 0.5 g ~ 1.0 cm³								
<b>Geistlich Bio-Oss® Block</b> Spongius Block 1 × 1 × 2 cm (~2 cm³)								
<b>Geistlich Bio-Oss® Collagen</b> 250 mg ~ 0.4–0.6 cm³ 500 mg ~ 0.9–1.1 cm³								
<b>GEISTLICH BIO-GIDE®</b>								
<b>Geistlich Bio-Gide®</b> 25 × 25 mm 30 × 40 mm								
<b>GEISTLICH MUCOGRAFT®</b>								
<b>Geistlich Mucograft®</b> 15 × 20 mm 20 × 30 mm								

# Selected product range\*

---

## Geistlich Bio-Oss®

---

Small granules (0.25–1 mm) | Quantities: 0.25 g, 0.5 g, 1.0 g, 2.0 g



The small Geistlich Bio-Oss® particles allow close contact with the surrounding bone wall. They are recommended for smaller 1–2 socket defects and for contouring autologous block grafts.

---

## Geistlich Bio-Oss®

---

Large granules (1–2 mm) | Quantities: 0.5 g, 1.0 g, 2.0 g



The large Geistlich Bio-Oss® granules have more space between the particles than the small granules. Particularly in large defects, this enables improved regeneration over large distances and provides enough space for the ingrowing bone.

---

## Geistlich Bio-Oss Pen®

---

Small granules (0.25–1 mm) | Quantities: 0.25 g ≈ 0.5 cm<sup>3</sup>, 0.5 g ≈ 1.0 cm<sup>3</sup>  
Large granules (1–2 mm) Quantities: 0.5 g ≈ 1.5 cm<sup>3</sup>



Geistlich Bio-Oss® granules are available in an applicator. It allows the bone substitute material to be applied faster and more precisely to the surgical site. The Geistlich Bio-Oss Pen® is available containing both the small granules and the large granules.

---

## Geistlich Bio-Oss® Collagen

---

Geistlich Bio-Oss® (small granules) + 10% collagen (porcine)  
Sizes: 50 mg (2.5 x 5.0 x 7.5 mm), 100 mg (5.0 x 5.0 x 7.0 mm),  
250 mg (7.0 x 7.0 x 7.0 mm), 500 mg (10.0 x 10.0 x 7.0 mm)



Geistlich Bio-Oss® Collagen is indicated for use in periodontal defects and extraction sockets. The 250 mg and 500 mg quantities are suitable for the treatment of larger size defects. Through the addition of collagen, Geistlich Bio-Oss® Collagen can be tailored to the morphology of the defect and is particularly easy to apply.

---

---

### Geistlich Bio-Oss® Block

---

Spongious bone block substitute | Size: 1 × 1 × 2 cm

---



Geistlich Bio-Oss® Block is a spongious bone block with essentially the same material properties as Geistlich Bio-Oss® granules. Due to its brittle properties it is recommended to use the block only for interpositional grafting of the alveolar ridge.

---

### Geistlich Bio-Gide®

---

Bilayer collagen membrane | Sizes: 25 × 25 mm, 30 × 40 mm

---



Geistlich Bio-Gide® stabilizes the grafted area and protects bone particles from dislocation for optimal bone regeneration.<sup>38</sup> The natural collagen structure allows homogeneous vascularization, supports tissue integration and wound stabilization.<sup>23</sup> The combination of flexibility, good adhesion, and tear resistance contribute to easy handling, in turn saving time, and simplifying the surgical procedure.<sup>39</sup>

---

### Geistlich Combi-Kit Collagen

---

Geistlich Bio-Oss® Collagen 100 mg + Geistlich Bio-Gide® 16 × 22 mm

---



When used in combination, the system has optimized properties for ridge preservation and minor augmentation according to the GBR principle.

---

### Geistlich Mucograft®

---

Collagen matrix Size: 15 × 20 mm, 20 × 30 mm

---



Geistlich Mucograft® is a collagen matrix designed specifically for soft-tissue regeneration in the oral cavity. It is indicated for gaining keratinised tissue and for recession coverage. Geistlich Mucograft® provides an alternative to autologous soft-tissue grafts.

---

\*Product availability may vary from country to country



More details about our  
distribution partners:  
[www.geistlich-biomaterials.com](http://www.geistlich-biomaterials.com)

#### **Manufacturer**

Geistlich Pharma AG  
Business Unit Biomaterials  
Bahnhofstrasse 40  
6110 Wolhusen, Switzerland  
Phone +41 41 492 55 55  
Fax +41 41 492 56 39  
[www.geistlich-biomaterials.com](http://www.geistlich-biomaterials.com)

#### **Affiliate Australia and New Zealand**

Geistlich Pharma Australia Pty Ltd.  
The Zenith – Tower A  
Level 21, Suite 21.01  
821 Pacific Highway  
NSW 2067 Chatswood, Australia  
Phone +61 1800 776 326  
Fax +61 1800 709 698  
[info@geistlich.com.au](mailto:info@geistlich.com.au)  
[www.geistlich.com.au](http://www.geistlich.com.au)

#### **Affiliate Great Britain and Ireland**

Geistlich Sons Limited  
1st Floor, Thorley House  
Bailey Lane  
Manchester Airport  
Manchester M90 4AB, Great Britain  
Phone +44 161 490 2038  
Fax +44 161 498 6988  
[info@geistlich.co.uk](mailto:info@geistlich.co.uk)  
[www.geistlich.co.uk](http://www.geistlich.co.uk)

#### **Affiliate North America**

Geistlich Pharma North America Inc.  
202 Carnegie Center  
Princeton, NJ 08540 USA  
Phone +1 855 799 5500  
[info@geistlich-na.com](mailto:info@geistlich-na.com)  
[www.geistlich-na.com](http://www.geistlich-na.com)

#### **Distribution Canada**

HANSAmEd Ltd.  
2830 Argentia Road  
Unit 5-8  
L5N 8G4 Mississauga, Canada  
Phone +1 800 363 2876  
Fax +1 800 863 3213  
[orders@hansamed.net](mailto:orders@hansamed.net)  
[www.hansamed.net](http://www.hansamed.net)