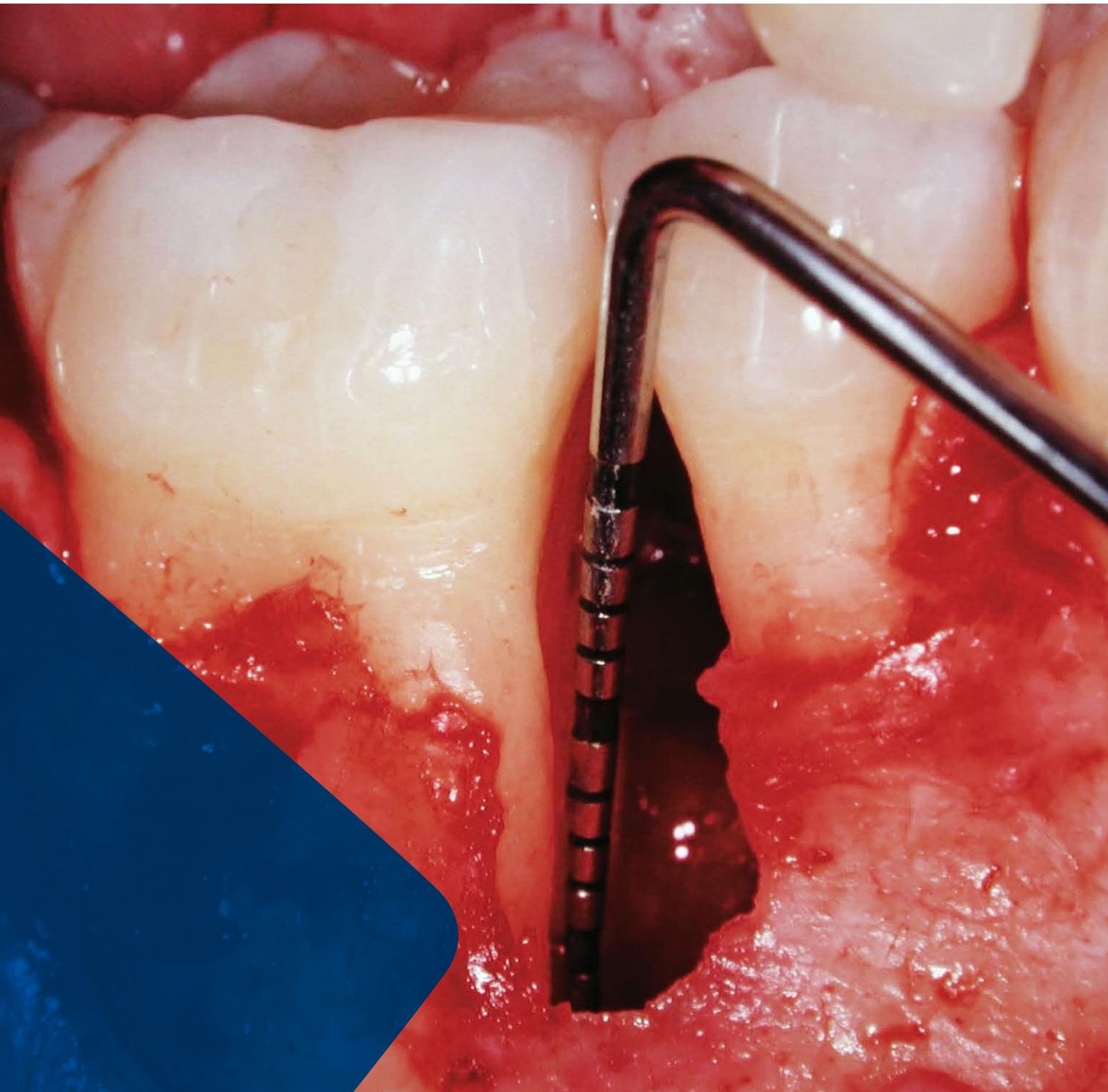


LEADING REGENERATION

**Geistlich**  
Biomaterials

# Periodontal Regenerative Surgery

Treatment Concepts





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# Why periodontal regeneration?

Helping patients affected by periodontitis to create and maintain good oral health, function, and aesthetics is the goal of every dentist. To accomplish this, various therapeutic approaches have been developed in response to the grades of severity of periodontitis. The role of biomaterials in treating periodontal disease has gained in significance and is now an integral part of many protocols. Carefully selected biomaterials used with proven treatment protocols may not only stop progression of periodontal disease, but effectively regenerate both hard and soft tissue.<sup>1,2</sup>

The present treatment concept serves to summarise proven Guided Bone Regeneration (GBR) and Guided Tissue Regeneration (GTR) techniques for the successful treatment of common periodontal defects. It provides scientific evidence and presents step-by-step clinical cases, demonstrating stable favorable outcomes. This guide is intended for the clinician and highlights reliable treatment options with the highest quality biomaterials. It aims to present techniques and tools used for oral tissue regeneration to offer optimised therapy, leading to greater patient long-term satisfaction.<sup>2</sup>

**TAB. 1:** Prognosis of periodontally affected teeth: For classification at least one of the parameters (respectively two for hopeless teeth) has to be met.<sup>6-8</sup>

Good	Questionable	Hopeless
teeth with < 50% bone loss	<ul style="list-style-type: none"> <li>&gt; teeth with 50-75% bone loss or</li> <li>&gt; 6-8 mm PD or</li> <li>&gt; class 2 furcation or</li> <li>&gt; angular defect</li> </ul>	<ul style="list-style-type: none"> <li>&gt; teeth with &gt; 75% bone loss or</li> <li>&gt; more than 8mm PD or</li> <li>&gt; Class 3 furcation or</li> <li>&gt; Class 3 mobility or</li> <li>&gt; at least 2 characteristics of questionable category</li> </ul>

## Tooth preservation or implant?

Teeth will last for life, unless they are affected by oral diseases, trauma, or service interventions. Many retained teeth therefore may be an indicator of positive oral health throughout the life course. Tooth longevity is largely dependent on the health status of the periodontium, the pulp or periapical region and the extent of reconstructions.<sup>3</sup> Multiple risks lead to a critical appraisal of the value of a tooth. Choosing between periodontal regeneration to support tooth preservation and tooth extraction has been called one of the most complex and debatable decisions a dentist is confronted with in daily clinical practice.<sup>4</sup>

Assigning a questionable prognosis – where the tooth requires advanced treat-

ment to maybe preserve it – or a hopeless prognosis, where the tooth needs to be extracted as soon as possible, is often a delicate situation. This decision significantly impacts both treatment planning and patient lifestyle. Accordingly, it has been argued that periodontally compromised teeth should be treated for as long as possible, and only being extracted when periodontal and endodontic treatment is no longer possible.<sup>4,5</sup>

Regardless of whether the tooth is preserved or extracted, biomaterials are often required to reach the therapeutic goal. Criteria to categorize the prognosis of periodontally affected teeth are summarised in Table 1.

# Regenerative therapy: getting to the root of the problem

## Good – Questionable – Hopeless ... now what?

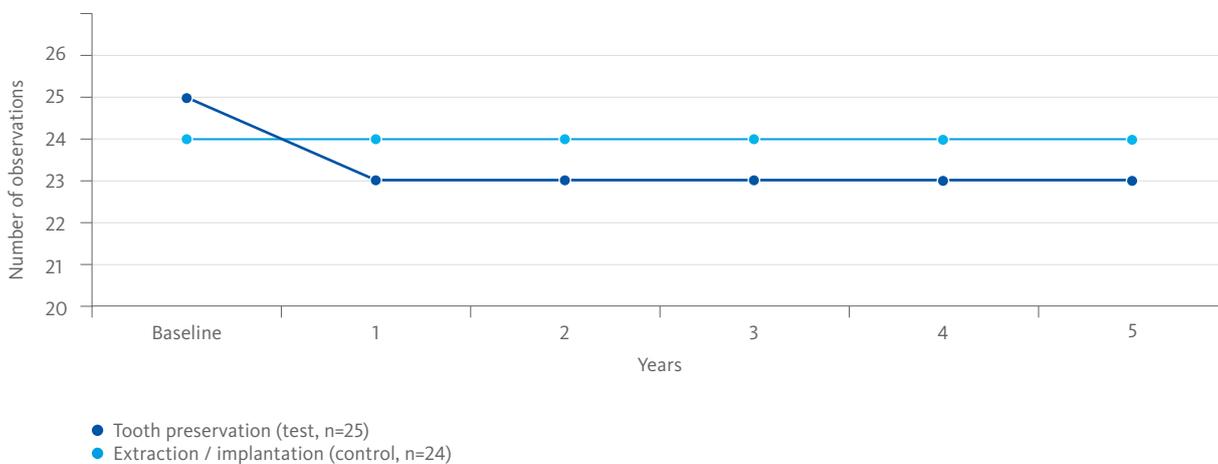
In advance of any regenerative therapy, an initial nonsurgical hygienic phase is crucial. This may include patient education on oral hygiene, scaling and root planing, antibacterial therapy, and removal of plaque retentive factors – all aimed to yield a good tissue response by eliminating infection and alleviating inflammation. When these methods fail to prevent bone loss, surgical or even regenerative therapy for periodontally compromised teeth is the recommended next-line therapy (Figure 2).<sup>9-11</sup>

In questionable cases, regenerative therapy may be favored over tooth extraction. This because extracting periodontitis-affected teeth will not resolve the underlying host response-related problems contributing to the disease. Moreover, periodontally compromised but treated teeth are known to have survival rates equal to the survival rates of implants in well-maintained patients.<sup>12</sup> A growing amount of evidence indicates that periodontal regeneration can result in long-term retention of teeth originally presenting with deep pockets associated with intra-bony defects.<sup>12-15</sup> A ran-

domised, long-term clinical trial in 50 patients comparing periodontal regeneration with extraction and prosthetic replacement of hopeless teeth showed that regenerative therapy enabled retention of 92% “hopeless” teeth scheduled for extraction.<sup>7</sup> The retained teeth had clinically stable periodontal parameters, comfort and function for the follow-up period of 5-years (Figure 1).<sup>12</sup>

### Aims of Regenerative Treatment

- > Restoration of the complete tooth attachment apparatus with bone, cementum, and ligament
- > Prevention of long junctional epithelial down growth as a risk factor for recurrence of periodontitis
- > Long-term tooth retention
- > Aesthetic appearance



**FIG. 1:** Survival analysis. Comparison between hopeless teeth (test group) treated with periodontal regeneration and implant supported teeth at extraction sites of hopeless teeth (control group). Survival at 5 years was 100% in the control group versus 92% in the test group.<sup>12</sup>

# Suggested treatment concept for periodontally compromised teeth

The following treatment plan outlines a possible clinical methodology:

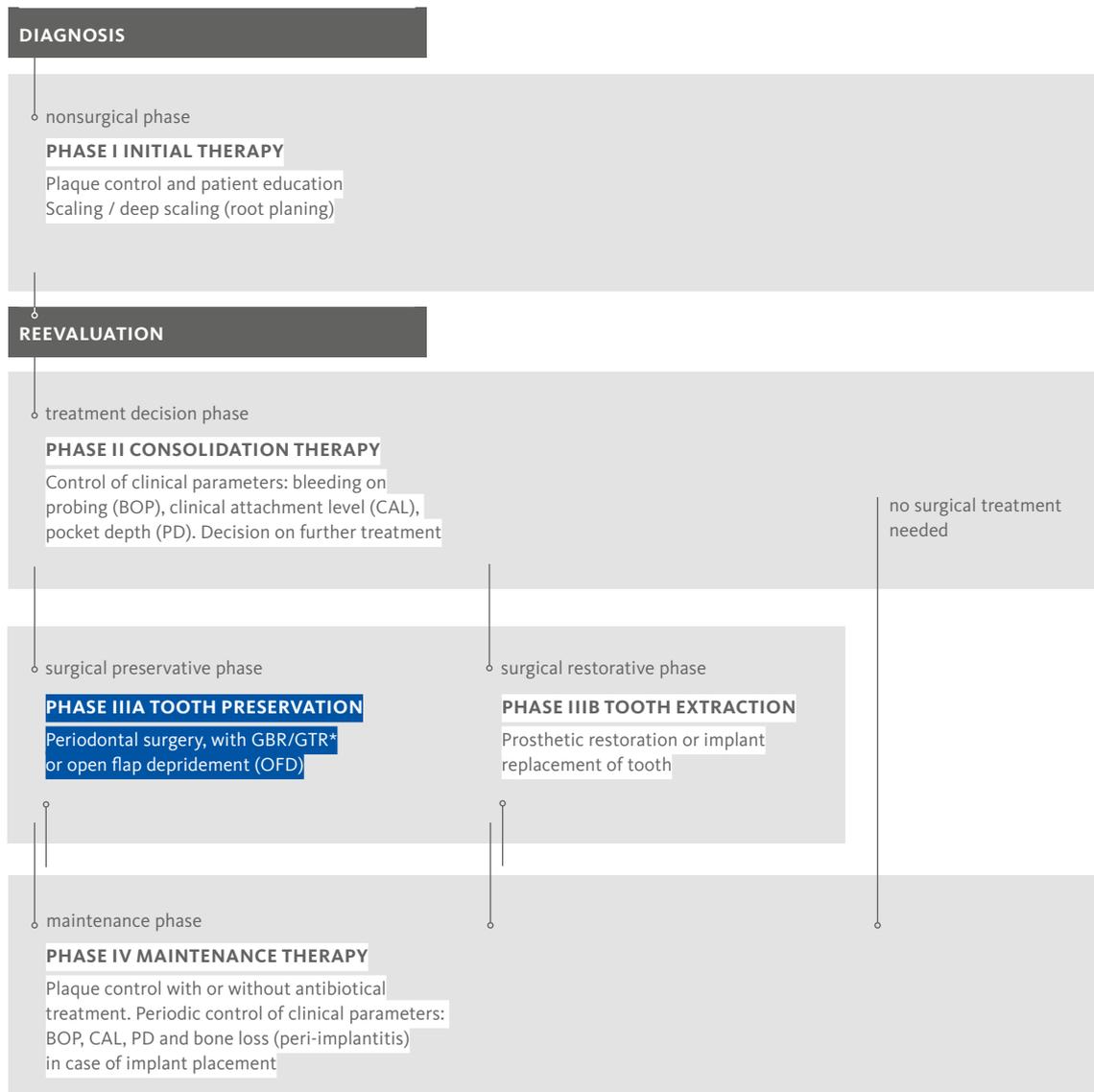


FIG. 2: Suggested Treatment Concept (Adapted from Newman<sup>9</sup>, Lindhe<sup>10</sup>, Rateitschak<sup>11</sup>)

# Defect morphology influences outcome of regenerative therapy

There is a wide range of general factors that are known or assumed to influence periodontal healing (e.g., age, smoking, concomitant medication, postsurgical care, periodontal maintenance, oral hygiene, nutrition, stress).

Furthermore, defect morphology is a key factor for the therapy outcome.<sup>16</sup> Each periodontal osseous lesion presents a unique anatomy. A first level of classification differentiates between horizontal, infrabony, and furcation defects as represented in Figure 3.<sup>17</sup>

Horizontal defects are defined when the base of the pocket is located coronal to the alveolar crest whereas infrabony defects are apical (vertical defects).

Regenerative therapy (GBR, GTR) is indicated in bony defects with three, two or at least one remaining walls. To some extent also Class II furcation defects can be treated with GTR.<sup>18</sup> There is evidence, that 2- and 3 wall intrabony defects respond better to GTR therapy than 1-wall defects. However, the deeper the infrabony defect, the more attachment gain

and bony fill may be expected.<sup>16</sup> Other defect characteristics influencing outcomes of regenerative therapy are presented in Table 2.

The present Treatment Concept shows different cases that have been appointed to a classification system combining the remaining walls and the vertical dimension of the bony defect (Figure 4).

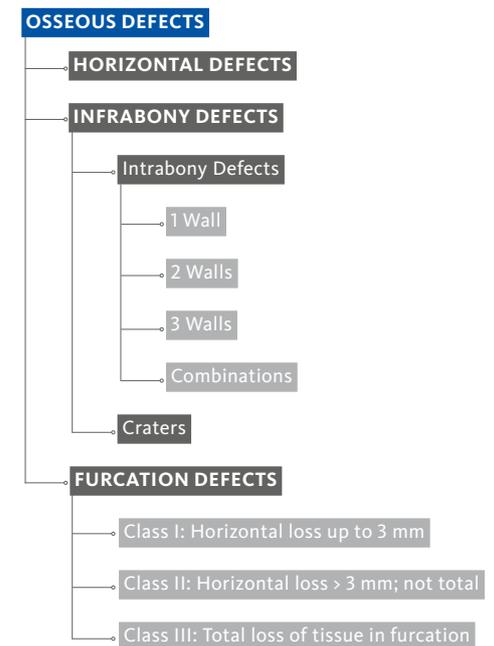
**TAB. 2:** Positive and negative defect characteristics<sup>16</sup>

Positive Influence	Negative Influence
Deep infrabony component (> 3 mm)	Shallow infrabony component (≤ 3 mm)
Narrow radiographic defect angle	Wide radiographic defect angle
Deep baseline pocket depth	Tooth motility

**FIG. 4:** Infrabony defects (modified from Papapanou et al. 2000)<sup>17</sup>



**FIG. 3:** Classification of periodontal osseous defects (modified from Papapanou et al. 2000)<sup>17</sup>



# Scientific and clinical evidence for the surgical preservative phase

Upon decision to preserve the tooth, the next step is to decide for a surgical therapy: Leading treatment methods often utilise a combination of a slowly resorbing osteoconductive bone substitute and a membrane.<sup>19</sup>

## Guided Tissue Regeneration

Some evidence shows, that Guided Tissue Regeneration (GTR) is superior to Open Flap Debridement (OFD) for the treatment of periodontal intrabony and furcation defects.<sup>20-22</sup> Overall, GTR is consistently more effective than OFD in reducing:

- > open horizontal furcation depths,
- > horizontal and vertical attachment levels, and
- > pocket depths for mandibular or maxillary class II furcation defects.

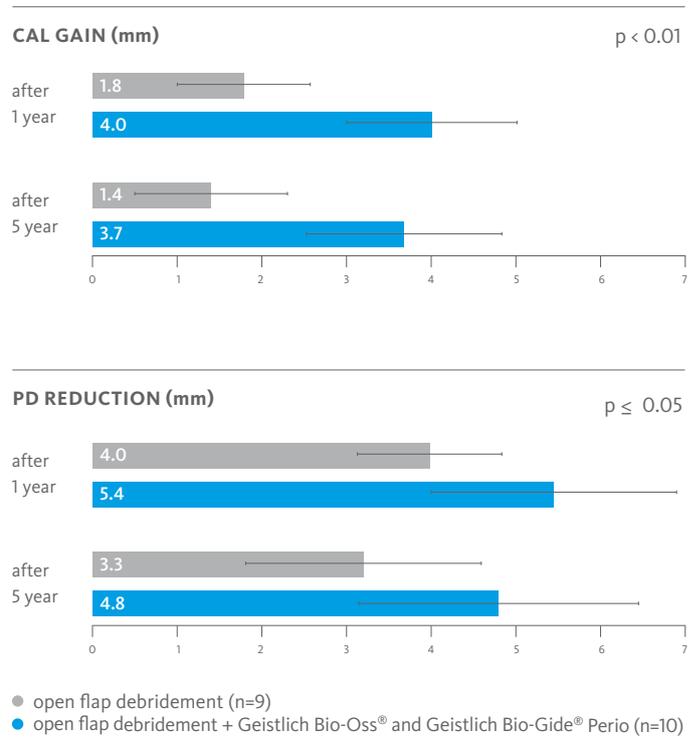
With the use of Geistlich Bio-Oss® orthodontic movement is possible in patients after GTR therapy.<sup>23</sup> Moreover, resorbable membranes have proven superior to non-resorbable membranes in generating vertical bone fill.<sup>15</sup>

## Geistlich Bio-Oss® Collagen and Geistlich Bio-Gide® Perio

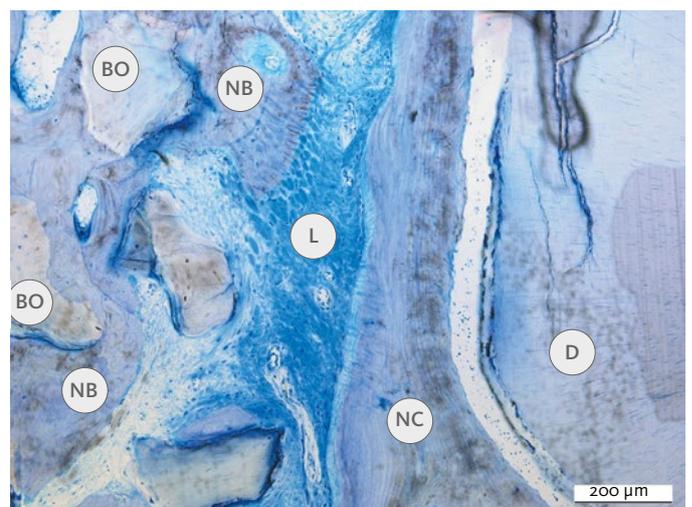
Combined filling of periodontal defects with the graft material Geistlich Bio-Oss® Collagen or Geistlich Bio-Oss® followed by Geistlich Bio-Gide® membrane coverage has a history of proven effectiveness in regenerative periodontal therapy.<sup>24-30</sup>

Treatment of intra-bony defects with Geistlich Bio-Oss® and Geistlich Bio-Gide® Perio resulted in sustained higher clinical attachment level gain as compared to treatment with OFD alone after 5 years (Figure 5).<sup>2</sup>

First clinical and histological results of treatment of endodontic-periodontic lesion with endodontic therapy followed by Guided Tissue Regeneration with Geistlich Bio-Oss® and Geistlich Bio-Gide® demonstrated that the combined approach can promote the formation of new cementum, periodontal ligament, and bone around the apex, as well as the complete bone regeneration of the buccal bone plate (Figure 6).<sup>19</sup>



**FIG. 5:** The gain in clinical attachment level (CAL) and the reduction in pocket depth (PD) are significantly larger in the test group than in the control group, ( $p=0.01$  and  $\leq 0.05$ ) both after one year and after 5 years.<sup>2</sup>



**FIG. 6:** The histologic assessment demonstrates the presence of new periodontal ligament, cementum, and bone. The newly formed woven bone can be observed maturing into bone trabeculae completely surrounding Geistlich Bio-Oss particles. BO=Bio-Oss; NB=new bone L=ligament; NC=new cementum; OC=old cementum; D=dentin<sup>19</sup>

# Intrabony 2-wall defect: interproximal crater



Dr. Frank Bröseler | Germany

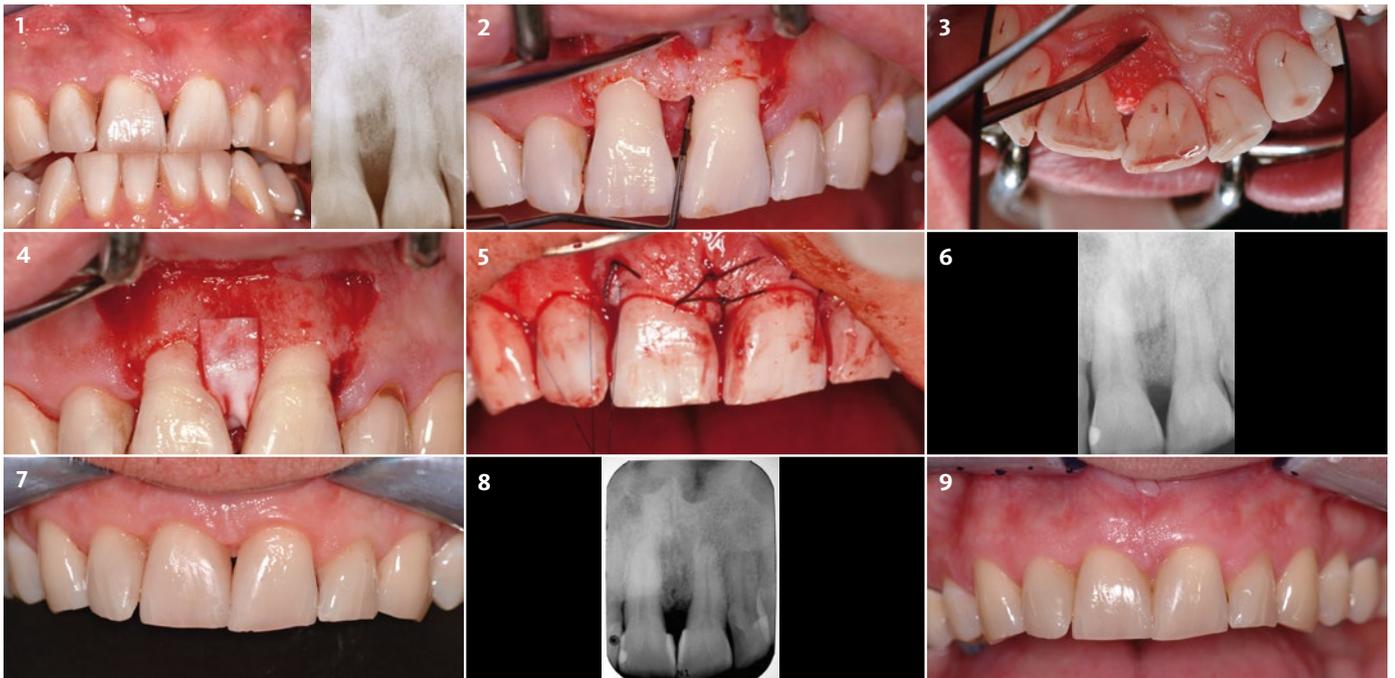
**Aim:** Functional and esthetic reconstruction in chronic periodontitis with deep intrabony defects.

**Conclusion:** After controlling the periodontal disease, this guided tissue regeneration technique leads to a long-term stable bony situation with pleasant soft-tissue appearance.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
11	mesial 10	mesial 10	10	interproximal crater
21	buccal 6, mesial 10	buccal 5, mesial 10	9	

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® Collagen Geistlich Bio-Gide® Perio	4-0 classic and 6-0 monofilament with cutting needle	Full thickness flap, split released, papilla preservation	Patient instruction and plaque control for at least 8 weeks.



**1** Initial situation after anti-infective therapy. Radiographically, the intrabony defect cannot be represented in toto due to palatal bone plate.

**2** Intrasurgical situation after preparation of the mucoperiosteal full-thickness flap reveals deep osseous defect.

**3** Palatal view of the defect after application of Geistlich Bio-Oss® Collagen.

**4** The grafted site is covered with Geistlich Bio-Gide® Perio.

**5** The flap is repositioned and sutured to relieve flap tension and obtain primary closure of the interdental space.

**6** Postoperative x-ray control after regenerative procedure using Geistlich Bio-Oss® Collagen.

**7** Clinical situation at 3 years follow-up

**8** 4.5 years post-op radiograph showing sustained defect fill from Geistlich Bio-Oss® Collagen.

**9** Clinical situation at 7 years follow-up; note the naturally reformed papilla between the central incisors, and no gingival recession.

# 3-wall defect: rapid progression of lesion



Dr. Diego Capri | Italy

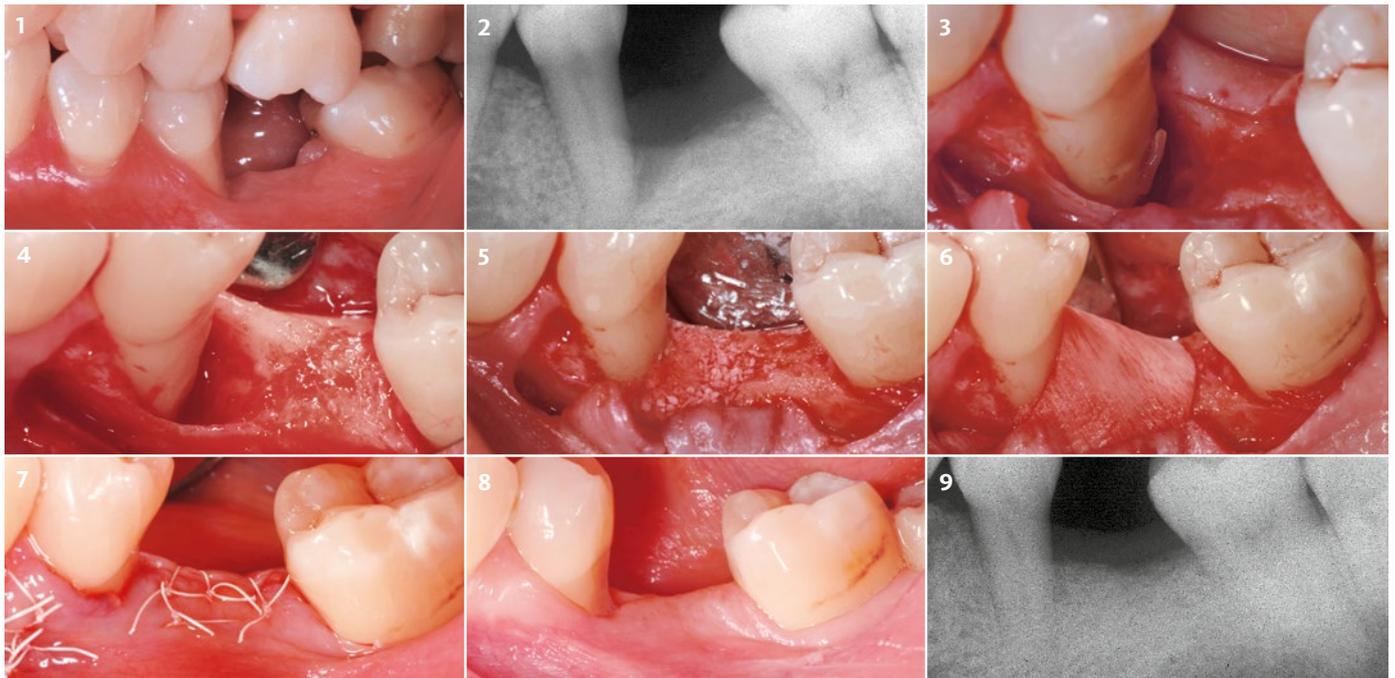
**Aim:** Regeneration of a 2 to 3 wall defect caused by a cemental tear.

**Conclusion:** The rapid progression of the lesion was arrested and the bone at the defect side successfully regenerated.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
35	distal 12	distal 7	5	3 wall defect without furcation

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® autogeneous bone Geistlich Bio-Gide®	Gore-Tex® Suture CV7	Periodontal regeneration of the defect by means of GTR	Periodontal defect debridement with hand and ultrasonic instrumentation.



**1** Clinical preoperative view of the affected area showing the lesion.

**2** DIAGNOSIS: Cemental tear – likely caused by a parafunctional habit overlapped to partial edentulism and malocclusion in the area.

**3** After reflection of a mucoperiosteal flap the periodontal defect is de-granulated and the fractured portion of the cementum is visible.

**4** The root surface is thoroughly scaled and planed.

**5** The defect is filled with a mixture of autologous bone and Geistlich Bio-Oss®.

**6** A trimmed Geistlich Bio-Gide® collagen membrane is positioned on the augmented area.

**7** Primary wound closure is achieved, after proper releasing of the flap with internal mattress and single interrupted Gore sutures.

**8** 4 months after periodontal regenerative surgery a probing depth of 3 mm and a clinical attachment loss of 6 mm was measured distally.

**9** Intraoral radiographic aspect of the site showing the healing of the defect.

# Extended 2-wall defect



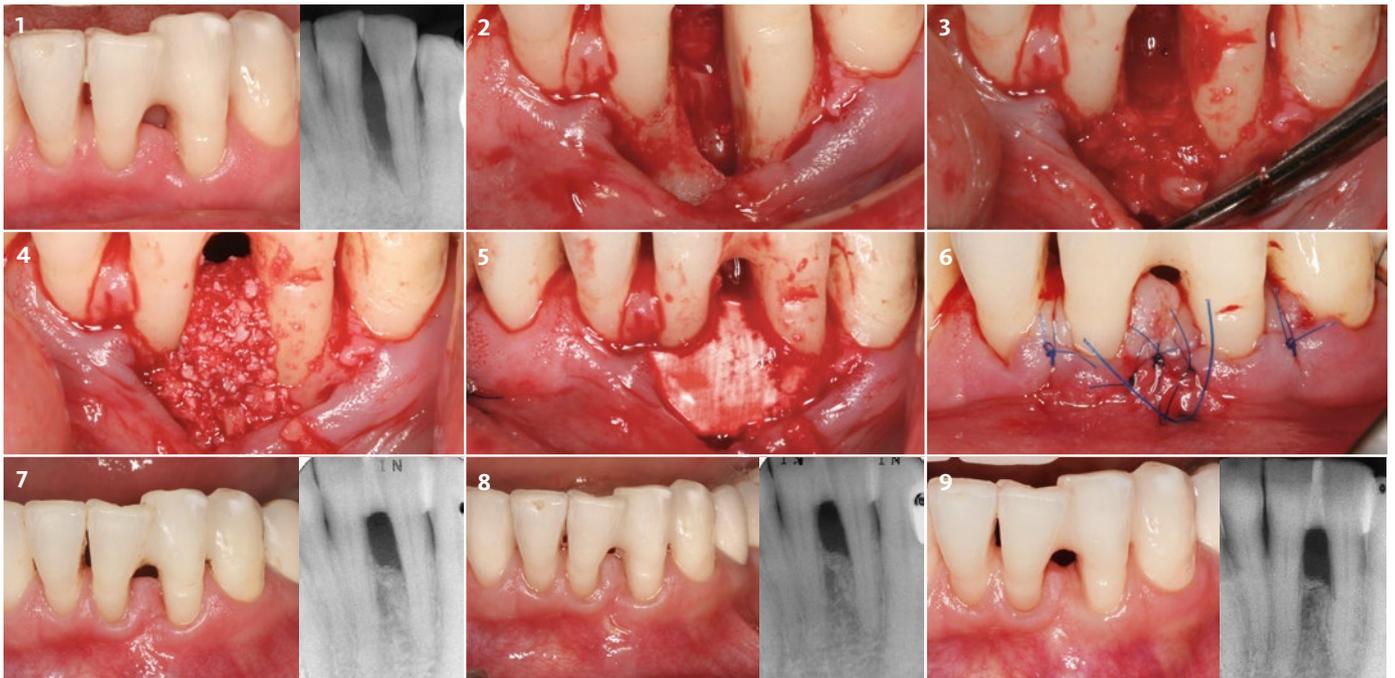
Prof. Dr. Michael Christgau | Germany

**Aim:** Defect resolution of an extended 2-wall defect with regenerative periodontal surgery.

**Conclusion:** Regenerative periodontal surgery with Geistlich Bio-Oss® Collagen and Geistlich Bio-Gide® Perio results in long-term defect resolution.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
32	mesial 14, distal 4 buccal 4, oral 4	mesial 11, distal 2 buccal 1, oral 2	ca. 10	2 wall defect

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® Collagen Geistlich Bio-Gide® Perio autologous bone	Seralene® 5-0 and 6-0	Papilla-Preservation technique, sulcular incision Regio 41-33 without vertical releasing incisions	Semipermanent adhesive tooth splinting with composite material and non-surgical periodontal therapy with additional systemic antibiotic therapy (3 x 400 mg metronidazol, 7 days)



**1** Preoperative clinical and radiological situation showing an inflammation-free gingiva and the bone defect.

**2** Intraoperative view of the extended 2-wall defect.

**3** Basal defect is filled with autologous bone chips after debridement and root planing.

**4** Autogeneous bone covered and defect filled completely with Geistlich Bio-Oss® Collagen.

**5** Coverage with a trimmed Geistlich Bio-Gide® Perio membrane without further fixation.

**6** Coronal flap repositioning and wound closure with horizontal mattress and single sutures.

**7** Clinical and radiological situation after 6 months with clinical attachment gain of 7 mm mesial and vast defect fill.

**8** Clinical and radiological situation at 12 months with clinical attachment gain of 8 mm mesial and considerable defect fill.

**9** Clinical and radiological situation 6 years after surgery showing stable long-term situation.

# Periodontal regenerative surgery

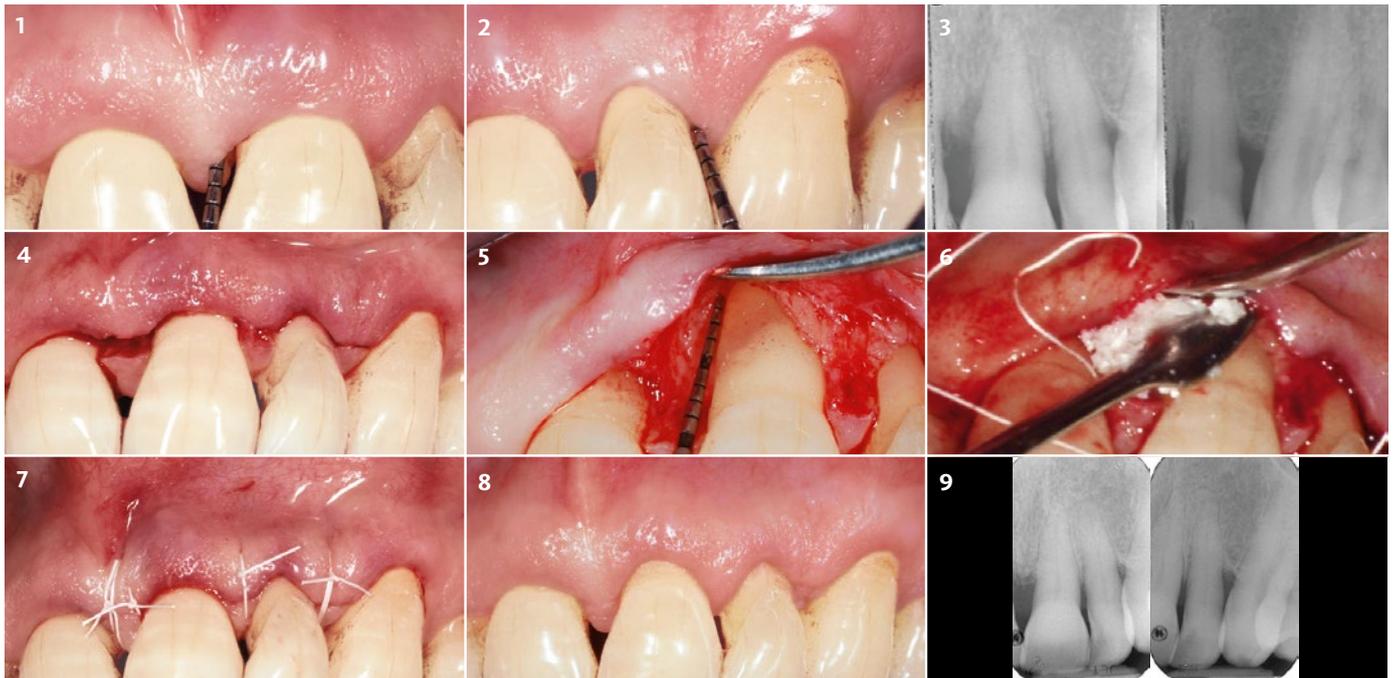


Dr. Pierpaolo Cortellini | Italy\*

**Aim:** Resolution of deep pockets associated with deep intrabony defects and preservation of aesthetics on upper incisors.

**Conclusion:** The combination of the modified minimally invasive surgical technique with Geistlich Bio-Oss® was effective in treating multiple intrabony defects associated with deep pockets in the upper incisors.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
21 (22)	mesial 7 (4), distal 2 (7) buccal 4 (4), lingual 3 (4)	mesial 6 (2), distal 2 (6) buccal 4 (2), lingual 3 (3)	max. 10 (8)	2 wall defect without furcation
Biomaterials	Suture material	Technique	Periodontal treatment	
Geistlich Bio-Oss®	Gore-Tex® Suture 6-0	Modified minimally invasive surgical procedure (M-MIST) with a Microblade USM 6900	Root planing was performed before surgery.	



1 Preoperative probing at tooth 21 showing probing depth of 6 mm.

2 Preoperative probing at tooth 22 with probing depth of 6 mm.

3 Preoperative radiograph showing the intrabony defects mesial to tooth 21 and distal to tooth 22.

4 Buccal incision design.

5 Intraoperative probing at tooth 21. Note the absence of the interdental bone peak between teeth 11 and 21 and the severe buccal dehiscence. Geistlich Bio-Oss® was used to prevent the postoperative shrinkage of the soft tissues.

6 Geistlich Bio-Oss® is positioned to fill the intrabony components of the defects. In larger and/or less contained defects, the additional use of a collagen membrane, such as Geistlich Bio-Gide®, is recommended.

7 The flap is sealed over Geistlich Bio-Oss® with internal modified mattress sutures.

8 1 year clinical situation showing healthy condition and a minimal gingival recession relative to baseline.

9 1 year radiographs showing the resolution of the intrabony components of the defects.

\* Cortellini P, Tonetti MS. J Clin Periodontol. 2009 Feb;36(2):157-63. (Clinical study)  
Cortellini P, Tonetti MS. J Clin Periodontol. 2011 Apr;38(4):365-73. (Clinical study)

# Treatment of infrabony 1-wall defect



Dr. Daniel Etienne | France  
Non Surgical Periodontal Therapy: Dr. Sofia Aroca | France

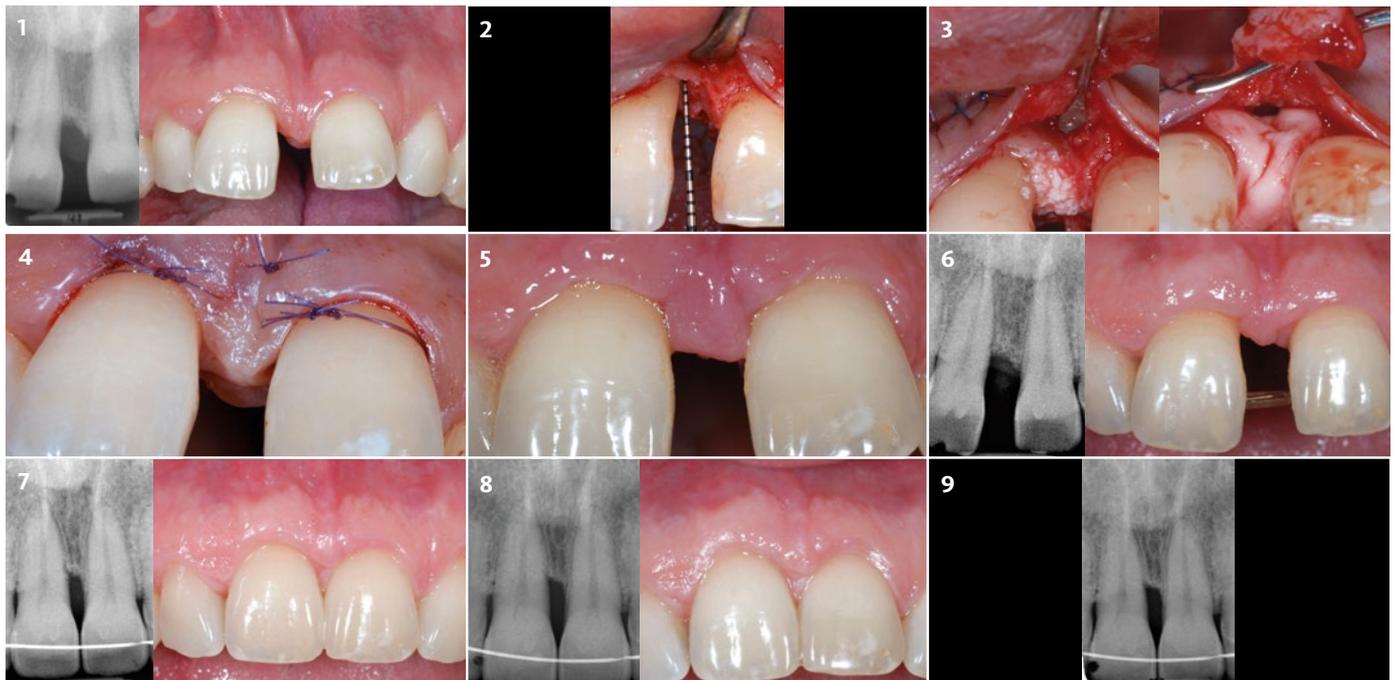
**Aim:** 1 wall periodontal defect treatment before orthodontic tooth intrusion and diastema closure.

**Conclusion:** Slight crestal bone remodelling on the mesial aspect of tooth 11 was observed after orthodontic treatment, with 5 mm probing after papilla remodeling. Clinical attachment stability is observed during maintenance.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
11 buccal	mesial 6, distal 5	mesial 6, distal 5	6	1-wall defect
11 lingual	mesial 6, distal 3	mesial 6, distal 3		without furcation

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® small granules Geistlich Bio-Gide® 25x25mm Emdogain	6-0 Ethicon PDS-II	Remote palatal papilla incision and Guided Tissue Regeneration (GTR)	1. Plaque control 2. GTR 3. Orthodontic treatment by Dr. Catherine Galletti (Paris)



**1** Preoperative clinical and radiological situation showing an angular bony defect at the mesial aspect of tooth 11. No inflammation of the soft tissue is observed. Presence of a diastema and a small papilla collapse mesial of 11.

**2** 1 wall defect of 6 mm CAL on mesio-buccal and mesio-lingual of 11.

**3** After debridement and root planing, root of tooth 11 is covered with Emdogain. Defect fill with Emdogain and Geistlich Bio-Oss® granules. The augmented site is covered with a Geistlich Bio-Gide® membrane.

**4** Repositioning and suturing of the flap using 6-0 Ethicon PD-S II sutures.

**5** Clinical situation 1 week after surgery and suture removal. No inflammation is observed.

**6** Clinical situation and x-ray of the augmented site just before start of orthodontic treatment 10 months after surgery.

**7** Clinical and radiological situation after orthodontic treatment (intrusion of 11 and diastema closure) and 3 years after surgery.

**8** Clinical and radiological images with stable tissue conditions 4 years after surgery.

**9** X-ray 5 years after surgery showing a slight and stable crestal bone remodelling in the mesial aspect of tooth 11.

# Combination defect

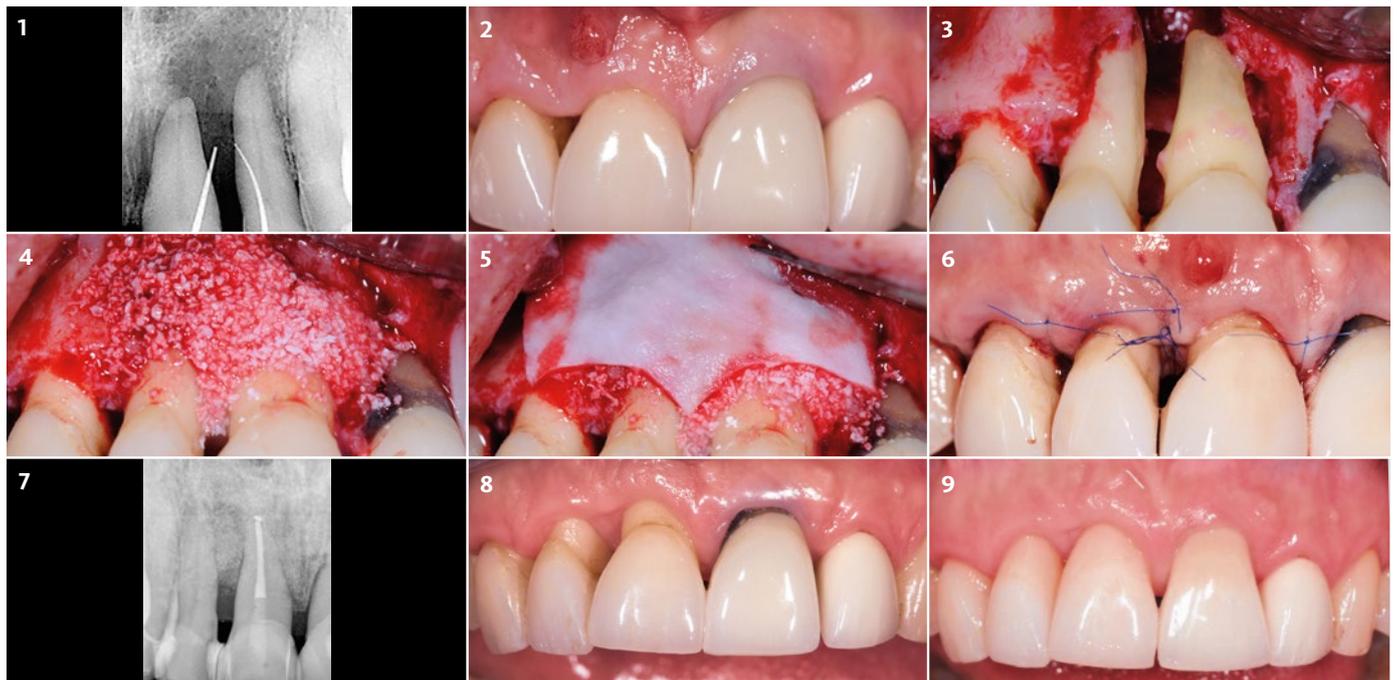


Prof. Dr. Markus Hürzeler | Germany

**Aim:** Periodontal regeneration of two teeth severely compromised by attachment loss at the apex.

**Conclusion:** Successful preservation of two “hopeless” teeth with periodontal regenerative therapy.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
21, 11, 12	mesial 6, 10, 11, distal 6, 10, 7 buccal 5, 8, 9, lingual 5, 6, 7	mesial 6, 10, 11, distal 6, 10, 7 buccal 5, 8, 9, lingual 5, 6, 7	max 10	
Biomaterials	Suture material	Technique	Periodontal treatment	
Geistlich Bio-Oss® Geistlich Bio-Gide® Amelogenin	Seralene® suture, DS 12, 15 / 7.0	Microsurgical access flap with modified papilla incision technique	Anti-infectious therapy, Doxycyclin (Ligosan® Heraeus), DH (24 hours scaling), reevaluation, 11 + 21 Ca(OH) <sub>2</sub> and root canal filling 21, recall.	



1 Pre-operative radiological view of the extended bone loss.

2 Clinical situation preoperatively after Doxycyclin antibiotic treatment.

3 Surgical site after debridement and root planing.

4 Defect fill with Geistlich Bio-Oss® after treatment with amelogenin derivative matrix.

5 Coverage with Geistlich Bio-Gide® to stabilise the augmented area.

6 Situation after wound closure.

7 1 month after surgery an improvement of the bony situation is visible.

8 Clinical situation after 5 months before closing the inter-approximate defect with composite.

9 Final restoration 10 months after surgery.

# Regenerative surgery 11 – perio-endo



Dr. Syed Mahnaz | Australia

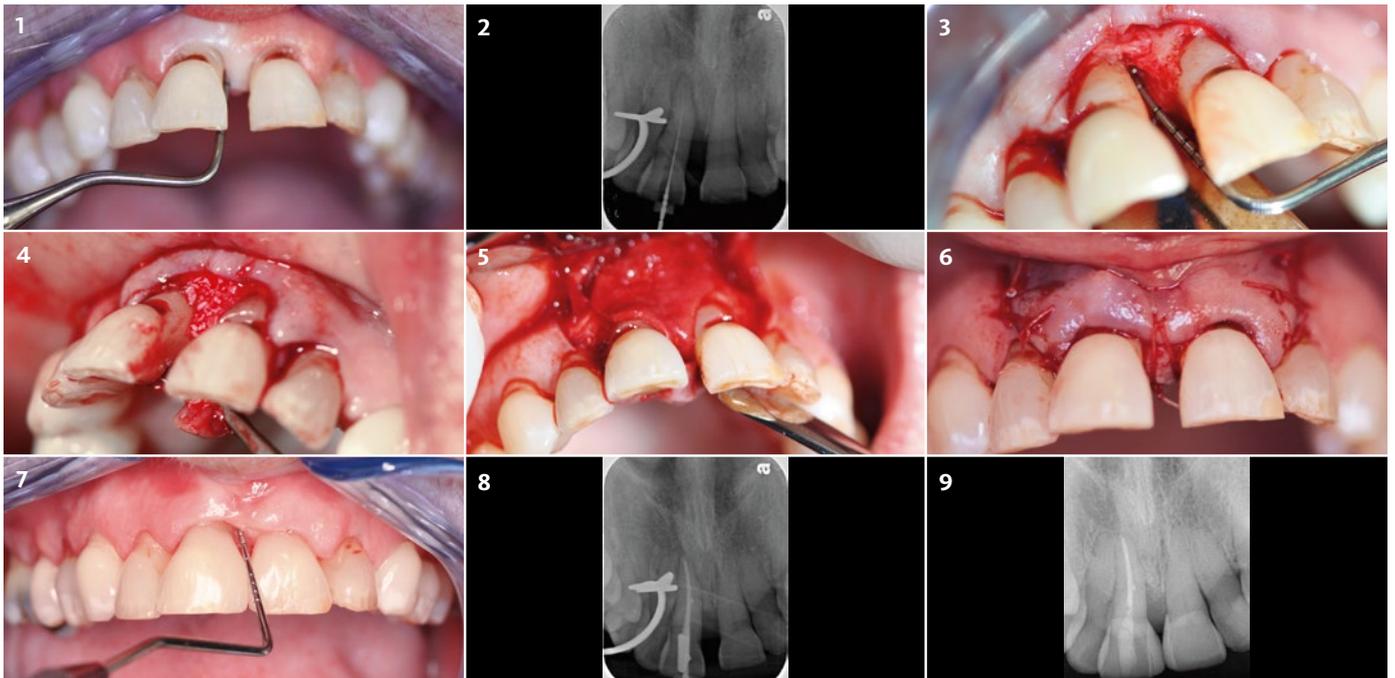
**Aim:** Retention of the central incisor and improvement of its mobility.

**Conclusion:** Predictable treatment outcomes were achieved to help retain teeth in situations where perio-endo problems exist. Regenerative surgery offers sustainable options for treatment of advanced periodontal disease.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
11	mesial 9, distal 5 buccal 5, lingual 5	mesial 7, distal 4 buccal 3, lingual 3	4	2 wall defect

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® Geistlich Bio-Gide®	Vicryl 5.0 suture materials	Endodontic treatment followed by non-surgical debridement and a modified papilla preservation technique	Nonsurgical periodontal debridement therapy under local anaesthesia with endodontic treatment was undertaken.



- 1 Non-responding residual pocket associated with a perio-endo involved tooth 11.
- 2 Radiograph of infrabony angular defect on tooth 11 with subsequent endodontic treatment.
- 3 Elevation of flap with papilla preservation to access the infrabony pocket.
- 4 Geistlich Bio-Oss® granules in the defect.
- 5 Geistlich Bio-Gide® membrane trimmed and placed in the interproximal region.
- 6 Immediate post-op passive closure and coronal repositioning of the mucosa.
- 7 Improved pocketing and mobility 8 months after surgery and additional composite bonding to improve the aesthetics.
- 8 Geistlich Bio-Oss® mesial of tooth 11 is well integrated after 8 months.
- 9 Follow up 2 years post surgery showing good bone stability and improved clinical status of this tooth.

## 2-wall defect in the non-aesthetic region



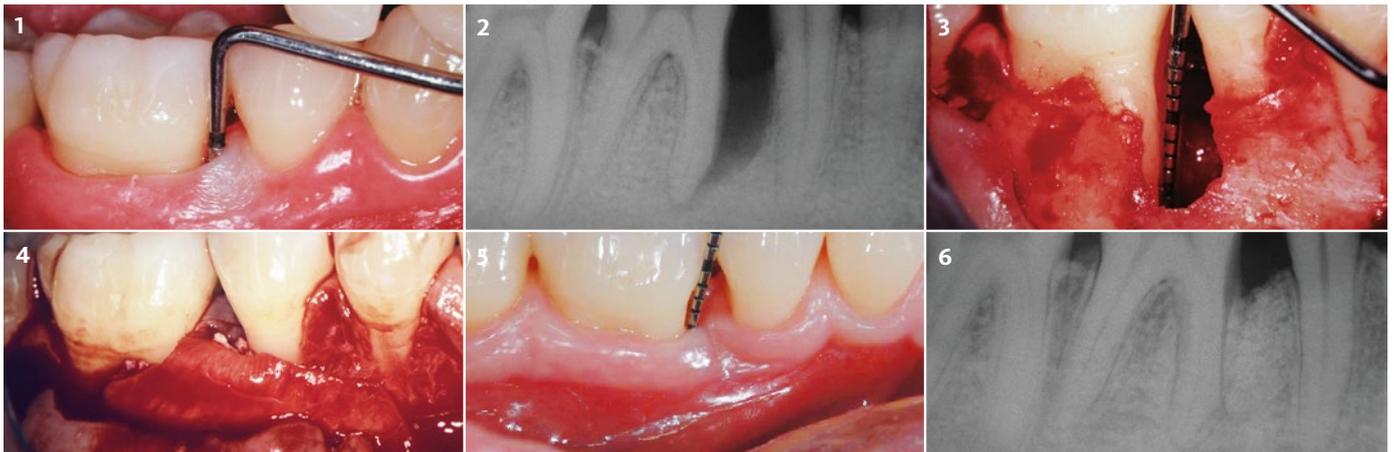
Prof. Dr. Giulio Rasperini | Italy

**Aim:** Periodontal regeneration to reduce probing depth by increasing bone and periodontal attachment with a minimal gingival recession, to change the prognosis of the tooth # 46 and preserve its function.

**Conclusion:** 2 months after conclusion of presurgical, cause-related therapy, the patient reported the complete resolution of inflammation, resulting in a decrease of the full mouth plaque and bleeding scores. 1 year after the surgery, the soft-tissue was well preserved and represented with a sufficient width of keratinised gingiva. Radiographs after 1 year show a stable situation with an almost complete bone fill.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
46	mesial 14, distal 3	mesial 14, distal 3	max 10	2 wall defect without furcation

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® Geistlich Bio-Gide®	Gore-Tex® Suture 5-0	Periodontal regeneration procedure with preservation of the interdental tissue and mesial releasing incision.	Cause related periodontal therapy, including motivation and instructions for home care; professional supra-gingival debridement and sub-gingival root planing. Re-evaluation for potential additional therapy.



1 Baseline situation showing the 14 mm pocket depth mesial to tooth 46.

2 Baseline radiograph showing the presence of an angular bony defect involving the mesial site of tooth 46.

3 Elevation of a full-thickness buccal and lingual flap with papilla preservation. The 10 mm deep, 2-wall intrabony defect mesial to tooth 46 is evident after careful debridement.

4 The Geistlich Bio-Oss® fills the defect and is protected by a Geistlich Bio-Gide® membrane. After flap release, the wound is closed without tension.

5 Re-evaluation at 1 year. A residual 5 mm probing depth is present with a 9 mm probing depth loss as compared to baseline measurements.

6 Nearly complete bone fill of the angular defect at 1 year.

# Deep intrabony 2-wall defect



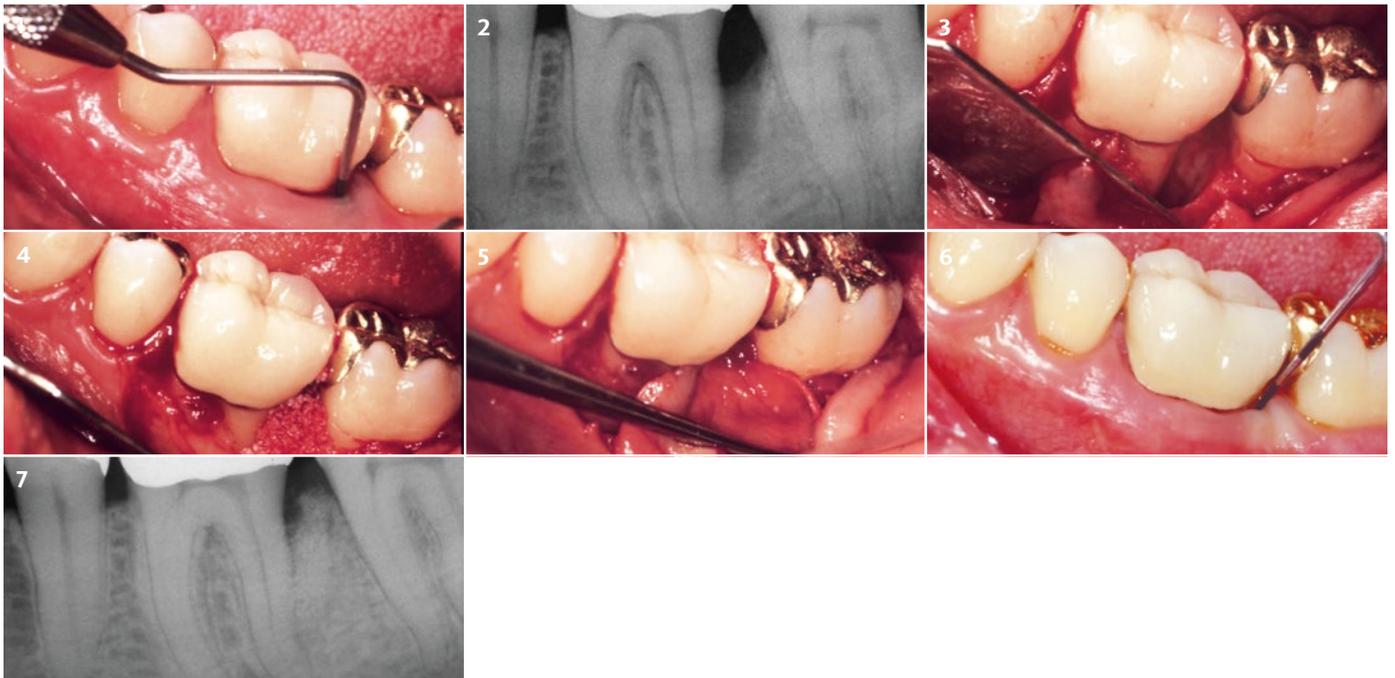
Prof. Dr. Anton Sculean | Switzerland

**Aim:** Treatment of intrabony defect with a complicated, noncontained morphology using a combination of collagen barrier membrane and a natural bone mineral.

**Conclusion:** Good appearance of soft tissue and sufficient bone fill at 1 year after regeneration of a deep non-contained bony defect.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
36	distal 11	distal 11	5	2 wall, large non-contained defect

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Gide® Perio Geistlich Bio-Oss®	4-0 silk	Periodontal regeneration of a large non-contained defect through GTR with the use of grafting material.	Hygienic phase 3 months before regenerative surgery consisting of patient instruction for oral hygiene, and full-mouth scaling and root planing in conjunction with systemically administered antibiotic therapy (3 x 375 mg Amoxicillin and 3 x 250 mg Metronidazol) for one week.



1 Preoperative probing indicating the presence of a deep pocket distal to the mandibular left molar.

2 Preoperative radiograph demonstrating the extent of bone loss.

3 Intraoperative view revealing a deep non-contained intrabony defect.

4 Following removal of granulation tissue and root planing, the defect is filled with Geistlich Bio-Oss®.

5 The grafting material and the surrounding alveolar bone are covered with a Geistlich Bio-Gide® Perio.

6 Minimal recession of the soft tissues and attachment gain and reduced PD measured 6mm and 7 mm respectively at 1 year.

7 Postoperative radiograph at 1 year reveals an almost complete fill of the intrabony defect.

## 2-wall defect in the aesthetic zone



Dr. Beat Walkkamm | Switzerland

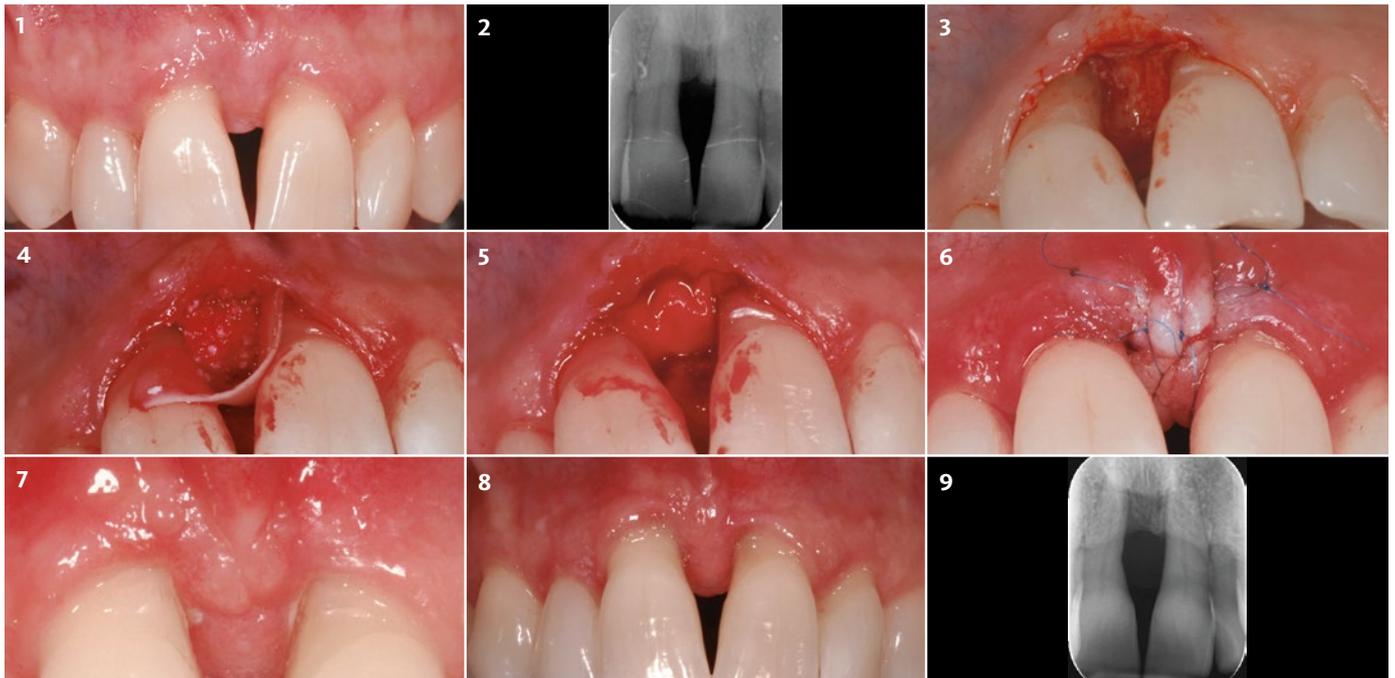
**Aim:** Periodontal regeneration with a minimally invasive surgical technique in combination with Geistlich Bio-Oss® Collagen and Geistlich Bio-Gide® Perio.

**Conclusion:** The minimally invasive surgical technique in combination with Geistlich Bio-Oss® Collagen and Geistlich Bio-Gide® Perio resulted in markedly improved clinical and radiographic outcome.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
11	mesial 11, distal 4 buccal 4, lingual 4	mesial 8, distal 3 buccal 2, lingual 3	5	2 wall defect

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® Collagen Geistlich Bio-Gide® Perio	Seralene® 7/0 (PVDF, Serag Wiessner)	Minimal invasive surgical technique (MIST) (Cortellini 2009)*	Initial periodontal treatment (4hrs), 3-months recall



- 1 Tooth 11 presents with a pocket depth of 8 mm and a clinical attachment level of 11 mm with some loss of papillary tissue.
- 2 Baseline radiograph shows the bone loss mesially to the first right incisor reaching the apical third of the root.
- 3 After elevation of a tiny buccal flap and positioning of the interdental papilla slightly to the palatal side, the defect is debrided.
- 4 A trimmed Geistlich Bio-Gide® Perio is inserted lingually and Geistlich Bio-Oss® Collagen is applied into the defect.
- 5 The Geistlich Bio-Gide® Perio is folded over the augmented site and inserted under the buccal full thickness flap.
- 6 Primary closure of the wide interdental papilla is obtained with an internal mattress suture with an external loop and two oblique hang-up mattress sutures.
- 7 6 weeks after surgery the inter-dental soft tissues are well healed.
- 8 Clinical situation after 2 years with a probing pocket depth of 3 mm and a clinical attachment level gain of 5 mm.
- 9 The 2 year radiograph shows a horizontal gain of 3 mm bone in the treated area.

\* Cortellini P, Tonetti MS. J Clin Periodontol. 2009 Feb;36(2):157-63. (Clinical study)

# 2-wall wide intrabony defect



Prof. Dr. Giovanni Zucchelli | Italy

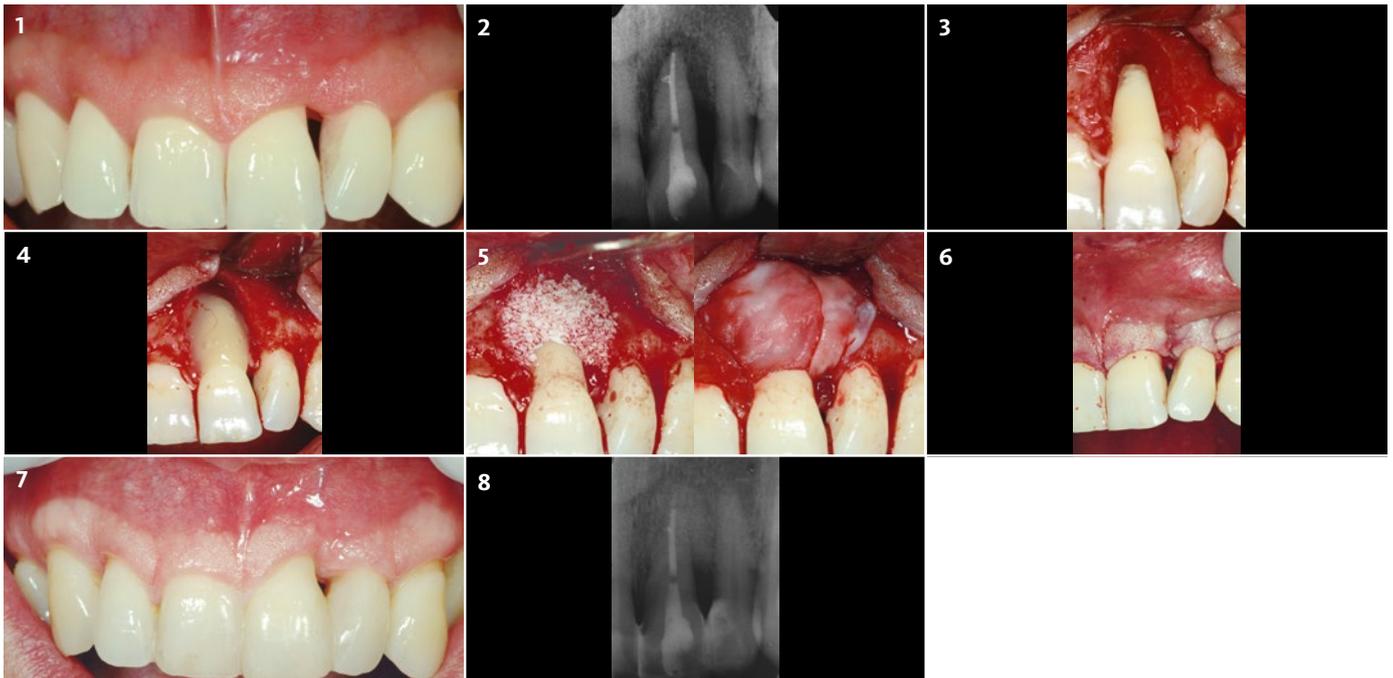
**Aim:** Regenerative surgery of a severely compromised tooth in aesthetic area.

**Conclusion:** Healthy hard- and soft-tissue situation with regrowth of the interdental papilla after 1 year.

Tooth #	CAL (mm)	PD (mm)	Depth of bony defect (mm)	Defect morphology
21	mesial 3, distal 13 buccal 11, lingual 3	mesial 3, distal 11 buccal 11, lingual 3	13	combined intrabony defect

Biomaterials	Suture material	Technique	Periodontal treatment
Geistlich Bio-Oss® Geistlich Bio-Gide® Amelogenin	PGA 7.0 in the papilla / PGA 6.0 in the flap	Regenerative surgery with CAF combined with simplified papilla preservation	Ultrasonic periodontal therapy before the surgery



1 Pre-operative view of the affected upper left incisor.

2 Radiographic situation before treatment. The wide defect reaches the apex of the tooth.

3 The defect after degranulation.

4 EDTA and an amelogenin derivative matrix are applied to condition the root surface .

5 Geistlich Bio-Oss® fills the wide defect and Geistlich Bio-Gide® prevents tissue collapse while stabilizing the site.

6 Post-op view of suturing: note the primary intention closure of the interdental papilla above the defect.

7 Clinical situation at 12 month follow-up. A regrowth of the interdental papilla could be achieved.

8 Follow-up radiograph at 12 months reveals complete bone fill.

# Adding convenience to periodontal treatments!

Simple to handle, simple to shape



## Perio-System Combi-Pack

1 Geistlich Bio-Oss® Collagen 100 mg  
+ 1 Geistlich Bio-Gide® Perio 16 mm x 22 mm  
with sterile templates

## References

- Wang HL et al., J Periodontol. 2005 Sep; 76(9):1601-1622. (Review)
- Sculean A et al., J Clin Periodontol. 2007 Jan;34(1):72-77. (Clinical study)
- Holm-Pederson et al, Clin. Oral Impl. Res. 2007 18 (Suppl. 3):15-19. (Systematic review)
- Donos N et al., Periodontol 2000. 2012 Jun;59(1):89-110. (Review)
- Zitzmann NU et al., Int Endod J. 2009 Sep;42(9):757-774. (Review)
- Checchi L et al., J Clin Periodontol. 2002 Jul; 29(7): 651-656. (Clinical study)
- Samet N et al., Quintessence Int. 2009 May; 40(5):377-387. (Review & Classification system)
- Becker W et al., J Periodontol. 1984 Sep; 55(9):505-509. (Clinical study)
- Newman M et al. CARRANZA'S CLINICAL PERIODONTOLOGY. ISBN 13 978-1-4160-2400-2. (Book)
- Lindhe J et al. Clinical Periodontology and Implant Dentistry. BlackwellMunksgaard. ISBN 1-4051-0236-5. (Book)
- Rateitschak KH, Wolf HF. Farbatlant der Zahnmedizin 1. Parodontologie. Thieme. ISBN 3-13-655601-1. (Book)
- Cortellini P et al., J Clin Periodontol. 2011 Oct;38(10):915-924. (Clinical study)
- Cortellini P, Tonetti MS, J Periodontol. 2004 May;75(5):672-678. (Clinical study)
- Sculean A et al., J Clin Periodontol. 2008 Sep;35(9):817-824. (Clinical study)
- Kinaia BM et al., J Periodontol. 2011 Mar; 82 (3):413-428. (Systematic reviews and meta-analyses)
- Sculean A. Periodontal Regenerative Therapy. Quintessence Publishing. ISBN-13: 9781850971580. (Book)
- Papapanou PN, Tonetti MS, Periodontol 2000. 2000 Feb;22:8-21. (Review)
- Reddy KP et al., J Contemp Dent Pract. 2006 Feb 15;7(1):60-70. (Clinical study)
- Ghezzi C et al., Int J Periodontics Restorative Dent. 2012 Aug;32(4):433-439. (clinical study)
- Murphy KG, Gunsolley JC, Ann Periodontol, Dec, 2003, Vol 8. Number 1, 266-302. (Systematic Review)
- Houser BE et al., Int J Periodontics Restorative Dent., 2001 Apr, 21 (2): 161-169. (Clinical study)
- Paolantonio M et al., J Periodontol. 2010 Nov;81(11):1587-1595. (Clinical study)
- Da Silva VC et al., J Clin Periodontol. 2006 Jun;33(6):440-448. (Pre-clinical study)
- Cosyn J et al., J Clin Periodontol. 2012; Oct;39(10):979-986. (Clinical study)
- Camelo M et al., Int J Periodontics Restorative Dent. 1998 Aug;18(4):321-331. (Clinical study)
- Lundgren D, Slotte C, J Clin Periodontol. 1999 Jan;26(1):56-62. (Clinical study)
- Camargo PM et al., J Clin Periodontol. 2000 Dec;27(12):889-896. (Clinical study)
- Sculean A et al., J Clin Periodontol. 2003 Jan;30(1):73-80. (Clinical study)
- Tonetti MS et al., J Clin Periodontol. 2004 Sep;31(9):770-776. (Clinical study)
- Linares M et al., J Clin Periodontol. 2006 May;33(5):351-358. (Clinical study)
- Data on File. Geistlich Pharma AG, Wolhusen, Switzerland. (Non-clinical)
- Perelman-Karmon M et al. Int J Periodontics Restorative Dent. 2012 Aug;32(4):459-65. (Clinical study)
- Rothamel D et al. Clin. Oral Implants Res. 2005; 16(3): 369-378. (Pre-clinical study)



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#### Geistlich Bio-Gide® Perio



Bilayer collagen membrane with sterile templates  
Available size: 16 mm x 22 mm

Geistlich Bio-Gide® Perio is specifically designed for periodontal regeneration. The Perio-Technology for enhanced stiffness facilitates cutting when dry and eases application during surgery.<sup>31</sup> Geistlich Bio-Gide® Perio comes with sterile templates to make it simple to handle and simple to shape for periodontal defects.<sup>31</sup>

#### Geistlich Bio-Gide®



Bilayer collagen membrane  
Sizes: 13 x 25 mm, 25 x 25 mm, 30 x 40 mm

Geistlich Bio-Gide® stabilizes the grafted area and protects bone particles from dislocation for optimal bone regeneration.<sup>32</sup> The natural collagen structure allows homogeneous vascularization, supports tissue integration and wound stabilization.<sup>33</sup> The combination of flexibility, good adhesion, and tear resistance contribute to easy handling, in turn saving time, and simplifying the surgical procedure.<sup>31</sup>

#### 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. 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 Combi-Kit Collagen



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

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

#### Geistlich Bio-Oss®



Small granules (0.25–1 mm) | Quantities: 0.25 g, 0.5 g, 1.0 g, 2.0 g (1 g ~ 2.05 cm<sup>3</sup>)  
Large granules (1–2 mm) | Quantities: 0.5 g, 1.0 g, 2.0 g (1 g ~ 3.13 cm<sup>3</sup>)

The small Geistlich Bio-Oss® granules are recommended for smaller 1–2 socket defects and for contouring autologous block grafts. The large Geistlich Bio-Oss® granules enable improved regeneration over large distances and provide enough space for the in-growing bone.