Treatment of Extraction Sockets
A new classification

TYPE I
soft tissue height
hard tissue
Inflammation damage
Special attention to
intact (CEJ)
intact
limited to apical area
immediate implant placement is possible,
fill-the-gap using biomaterials is necessary

TYPE II
soft tissue height
hard tissue
Inflammation damage
Special attention to
intact (CEJ)
loss of 1 wall either buccal or lingual
buccal/lingual wall destruction
mostly buccal wall destruction

TYPE III
soft tissue height
hard tissue
Inflammation damage
Special attention to
recession
distal defect
mostly buccal wall destruction
ridge augmentation combined with simultaneous
soft tissue augmentation needed

TYPE IV-A
soft tissue height
hard tissue
Inflammation damage
Special attention to
intact (CEJ)
bucco-lingual destruction ≤ 50%
mostly buccal and lingual wall destruction
the flap serves as barrier to preserve and augment
simultaneously

TYPE IV-B
soft tissue height
hard tissue
Inflammation damage
Special attention to
intact (CEJ)
bucco-lingual destruction > 50%
mostly buccal and lingual wall destruction
the flap serves as barrier, more augmentation than
preservation due to destruction

TYPE V
soft tissue height
hard tissue
Inflammation damage
Special attention to
recession
bucco-lingual destruction
mostly buccal and lingual wall destruction
additional vertical augmentation may be necessary
to achieve desired crestal height
Type I

<table>
<thead>
<tr>
<th>Defect configuration</th>
<th>4-wall defect / No loss of soft tissue</th>
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</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Endodontic origin / Fracture / Severe caries</td>
</tr>
<tr>
<td>Bone graft</td>
<td>Geistlich Bio-Oss® or Geistlich Bio-Oss® Collagen</td>
</tr>
<tr>
<td>Membrane / matrix</td>
<td>Geistlich Mucograft® Seal</td>
</tr>
<tr>
<td>Time of implant placement</td>
<td>Immediate or delayed</td>
</tr>
<tr>
<td>Predictability</td>
<td>Highly predictable</td>
</tr>
<tr>
<td>Ridge preservation potential</td>
<td>Good</td>
</tr>
</tbody>
</table>

Fig. 1 Classical type I defect in region 21. The predictability of the treatment is good.

Fig. 2 Application of Geistlich Bio-Oss® Collagen after debridement.

Fig. 3 Geistlich Mucograft® Seal is applied and secured with a cross-suture.

Fig. 4 The surgery site shows good healing by secondary intention at 2 weeks post-op.

Fig. 5 Placement of the implant at 4 months, the bony width of the ridge is preserved.

Fig. 6 Follow-up at 1 year after prosthesis delivery shows good esthetic results. Radiographic control 1 year after prosthesis delivery shows stable bony situation.

Type II

<table>
<thead>
<tr>
<th>Defect configuration</th>
<th>3-wall defect / No loss of soft tissue</th>
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</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Periodontal origin/Periodontal-Endodontic combined</td>
</tr>
<tr>
<td>Bone graft</td>
<td>Geistlich Bio-Oss® or Geistlich Bio-Oss® Collagen</td>
</tr>
<tr>
<td>Membrane / matrix</td>
<td>Geistlich Bio-Gide® or Geistlich Bio-Gide® Shape</td>
</tr>
<tr>
<td>Time of implant placement</td>
<td>Immediate or delayed</td>
</tr>
<tr>
<td>Predictability</td>
<td>Slightly compromised</td>
</tr>
<tr>
<td>Ridge preservation potential</td>
<td>Good</td>
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</tbody>
</table>

Fig. 1 Radiographic and clinical situation of the defect. Main medical conditions include swelling, acute pain and pus formation in region 36.

Fig. 2 Situation after extraction. Note the buccal bone resorption and granulation tissue at the bottom of the socket. Application of Geistlich Bio-Oss® Collagen after debridement of the socket.

Fig. 3 Covering of the grafted area with Geistlich Bio-Gide® in two layers. The flap margin is fixed across the membrane without tension.

Fig. 4 Good healing by secondary intention at 2 weeks.

Fig. 5 Situation prior to implant placement at 9 months shows good bony situation.

Fig. 6 Stable clinical/radiographic situation at 3 years after loading.
### Type III

<table>
<thead>
<tr>
<th>Defect configuration</th>
<th>3-wall defect / Loss of soft tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Periodontal origin / Periodontal-Endodontic combined</td>
</tr>
<tr>
<td>Bone graft</td>
<td>Geistlich Bio-Oss® Collagen</td>
</tr>
<tr>
<td>Membrane / matrix</td>
<td>Geistlich Bio-Gide®</td>
</tr>
<tr>
<td>Time of implant placement</td>
<td>Delayed</td>
</tr>
<tr>
<td>Predictability</td>
<td>Highly compromised, soft tissue augmentation necessary</td>
</tr>
<tr>
<td>Ridge preservation potential</td>
<td>Poor</td>
</tr>
</tbody>
</table>

![Fig. 1 Type III defect in region 14 with both soft and hard tissue deficiency. Radiographic view of the defect prior to extraction.](image1)

![Fig. 2 Situation after atraumatic extraction of tooth 14.](image2)

![Fig. 3 Application of Geistlich Bio-Oss® Collagen after debridement. Geistlich Bio-Oss® Collagen is trimmed to shape to fit the defect.](image3)

![Fig. 4 Adaptation of Geistlich Bio-Gide® over Geistlich Bio-Oss® Collagen.](image4)

![Fig. 5 A connective tissue graft from the palate is added to the defect to compensate for the soft tissue loss.](image5)

![Fig. 6 Stable clinical situation and radiographic view at 1 year follow-up after loading.](image6)

### Type IV-A

<table>
<thead>
<tr>
<th>Defect configuration</th>
<th>4-wall defect / No loss of soft tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Periodontal origin / Periodontal-Endodontic combined</td>
</tr>
<tr>
<td>Bone graft</td>
<td>Geistlich Bio-Oss® or Geistlich Bio-Oss® Collagen</td>
</tr>
<tr>
<td>Membrane / matrix</td>
<td>Geistlich Bio-Gide®</td>
</tr>
<tr>
<td>Time of implant placement</td>
<td>Delayed</td>
</tr>
<tr>
<td>Predictability</td>
<td>Compromised</td>
</tr>
<tr>
<td>Ridge preservation potential</td>
<td>Poor</td>
</tr>
</tbody>
</table>

![Fig. 1 Type IV-A defect in region 26. Radiographic view of region 26 prior to extraction displays extended bone defect.](image7)

![Fig. 2 Extraction site immediately after tooth extraction.](image8)

![Fig. 3 Application of Geistlich Bio-Oss® Collagen after debridement. The augmented site is covered with a Geistlich Bio-Gide® membrane.](image9)

![Fig. 4 Slightly resorbed ridge contour with healed soft tissue situation after 3 months of healing.](image10)

![Fig. 5 Sufficient ridge width for implant placement after 4 months of healing.](image11)

![Fig. 6 Prosthesis delivery 4 months after implant placement. Stable radiographic situation after 1 year of loading.](image12)
Type IV-B

<table>
<thead>
<tr>
<th>Defect configuration</th>
<th>2-wall defect / No loss of soft tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Periodontal origin / Periodontal-Endodontic combined</td>
</tr>
<tr>
<td>Bone graft</td>
<td>Geistlich Bio-Oss® or Geistlich Bio-Oss® Collagen</td>
</tr>
<tr>
<td>Membrane / matrix</td>
<td>Geistlich Bio-Gide®</td>
</tr>
<tr>
<td>Time of implant placement</td>
<td>Delayed</td>
</tr>
<tr>
<td>Predictability</td>
<td>Highly compromised, vertical augmentation might be necessary</td>
</tr>
<tr>
<td>Ridge preservation potential</td>
<td>Very poor</td>
</tr>
</tbody>
</table>

Fig. 1 Radiographic view in region 37. Clinical situation after tooth extraction. Buccal and lingual bone walls are missing, only the soft tissue remains in normal position.

Fig. 2 Application of Geistlich Bio-Oss® Collagen after debridement of the socket.

Fig. 3 Fixation of the Geistlich Bio-Gide® with cross-suture and healing with secondary intention.

Fig. 4 Good soft tissue healing at 3 months post-op.

Fig. 5 Clinical and radiographic control during implant placement at 4 months show sufficient crestal ridge width.

Fig. 6 Stable clinical situation 1 year after prosthesis delivery.

Type V

<table>
<thead>
<tr>
<th>Defect configuration</th>
<th>4-wall defect / Loss of soft tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Periodontal origin / Periodontal-Endodontic combined</td>
</tr>
<tr>
<td>Bone graft</td>
<td>Geistlich Bio-Oss® or Geistlich Bio-Oss® Collagen</td>
</tr>
<tr>
<td>Membrane / matrix</td>
<td>Geistlich Bio-Gide®</td>
</tr>
<tr>
<td>Time of implant placement</td>
<td>Delayed</td>
</tr>
<tr>
<td>Predictability</td>
<td>Compromised, vertical augmentation necessary</td>
</tr>
<tr>
<td>Ridge preservation potential</td>
<td>Poor</td>
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</table>

Fig. 1 Clinical situation of type V defect in region 16.

Fig. 2 Radiographic view prior to extraction documents extended loss of bone.

Fig. 3 After extraction and debridement the defect is filled with Geistlich Bio-Oss® Collagen. A Geistlich Bio-Gide® is used to protect the grafted area.

Fig. 4 Radiographic view at 4 months after extraction. The ridge preservation is limited to the height of the surrounding soft and hard tissue at the time of extraction. Additional vertical augmentation is indicated to increase the crestal height.

Fig. 5 Clinical view at 1 year after implant loading.

Fig. 6 The radiographic view at 1 year after implant loading documents a stable bony situation.
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 cm³)
Large granules (1–2 mm) | Quantities: 0.5 g, 1.0 g, 2.0 g (1 g = 3.13 cm³)
The small Geistlich Bio-Oss® granules are recommended for smaller 1–2 socket defects and for contouring autogenous block grafts. The large Geistlich Bio-Oss® granules enable improved regeneration over large distances and provide enough space for the ingrowing bone.

Geistlich Bio-Oss® Collagen
Geistlich Bio-Oss® (small granules) + 10% collagen (porcine)
Sizes: 100 mg, 250 mg, 500 mg
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 Bio-Gide®
Bilayer collagen membrane
Sizes: 25 × 25 mm, 30 × 40 mm
Geistlich Bio-Gide® consists of porcine collagen and has a bilayer structure – a rough side that faces the bone and a smooth side that faces the soft tissue. Geistlich Bio-Gide® is easy to handle: it can be positioned easily, adheres well to the defect, and is resistant to tension and tearing.

Geistlich Bio-Gide® Shape
Pre-shaped, bilayer collagen membrane
Size: 14 × 24 mm
Geistlich Bio-Gide® Shape consists of porcine collagen and has a bilayer structure – a rough side that faces the bone and a smooth side that faces the soft tissue. Geistlich Bio-Gide® Shape is pre-shaped for increased application comfort and reduced preparation time.

Geistlich Mucograft® Seal
Collagen matrix
Size: 8 mm diameter
Geistlich Mucograft® Seal consists of a compact structure that gives stability while allowing open healing, and a spongy structure that supports blood clot stabilisation and ingrowth of soft-tissue cells.


**Background information**

Various classification systems for extraction sockets have been proposed thus far, mostly focusing on the anterior teeth. Classifying different types of sockets should not solely be based on defect location. Information regarding to soft and hard tissue breakdown and the number of remaining walls of the socket is crucial for determining the appropriate treatment protocol.

In the following extraction sockets impaired due to chronic pathology are classified into 5 types depending on the residual bone morphology and the level of soft tissue. Mesial and distal proximal bone peaks of single tooth extraction sockets are assumed to be intact if not described otherwise in the case.

**Surgical Procedure**

![Fig. 1 Atraumatic tooth extraction followed by meticulous debridement is mandatory. Inflammatory tissues must be completely removed using the surgical curette or the he- mastost. Inflammatory tissues adhering to the soft tissue should be removed with a blade.](image1)

![Fig. 2 Bone replacement material with slow resorption rate and good biofunctionality (Geistlich Bio-Oss® or Geistlich Bio-Oss® Collagen) is used to fill the socket to counteract bone resorption/increase the bone volume.](image2)

![Fig. 3 A bilayer collagen membrane or collagen matrix with good biofunctionality is used to cover the augmented area for bone graft protection, graft stabilization and supporting early wound healing. The membrane can be applied in single or double layer fashion, the matrix should be applied in one layer.](image3)

![Fig. 4 Suturing the defect without tension to avoid moving the mucogingival line which may narrow the keratinized zone. Hidden X sutures and healing by secondary intention can be used to prevent loss of keratinized tissue.](image4)

**Literature references**


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