easy-graft
synthetic bone graft substitutes

guiding ORAL REHABILITATION
GUIDOR® easy-graft

Soft from the syringe.
Hard in the defect.
In their forward thinking 2003 article, Hämmerle & Jung\(^1\) stated: “Developments in bone augmentation procedures can be related either to simplification of the clinical handling or to influencing of biological processes. To simplify clinical handling, new materials should comprise a matrix with optimal cell ingrowth capacities and good mechanical properties, providing space for tissue regeneration. No membrane and no specific procedures for mechanical fixation should be necessary.

This would reduce the technique sensitivity and increase the predictability of bone augmentation. The use of synthetic materials would result in lower surgical risks and lower morbidity in augmentation procedures and would represent an important step forward in simplifying bone regeneration techniques.”…

…with GUIDOR® easy-graft and its easy handling such considerations become reality.
GUIDOR® easy-graft
Mouldable from the Syringe, in situ Hardening

Principle

Fig 1
Each granule is pre-coated with a polylactic-co-glycolic acid (PLGA) polymer layer of 10 μm.

Fig 2
When the supplied BioLinker is added to the syringe contents it softens the polymer coating of the granules creating a sticky yet mouldable mass.

Fig 3
GUIDOR® easy-graft granules are pressure-resistant and should be condensed in the defect.

Fig 4
Depending upon time scale, granules embedded on the surface of new bone will be observed. Excess granules can sometimes be seen in the soft tissue and can easily be removed at re-entry if desired.

Fig 5
Add BioLinker in the syringe.

Fig 6
Pulling back the plug of the syringe slightly facilitates the wetting of the granules, as does moving back and forth the plunger and the plug 1-3 times.

Fig 7
Discard excess of BioLinker.

Fig 8
Direct application of the product into the defect.
GUIDOR® easy-graft
Resorption Process for BioLinker and PLGA Polymer Coating

**Stage 1**
BioLinker is extracted within hours.
BioLinker is extracted by incoming blood, promoting rehardening of the material. More than 90% of BioLinker is removed from the bone graft substitute within three hours \(^{(1)}\) and excreted through the urine within 1-3 days \(^{(2)}\). BioLinker contains N-Methyl-2-pyrrolidone (NMP), a solvent widely used in pharmaceutical and medical devices such as dental membranes, subcutaneous drug-release systems etc.

**Stage 2**
The PLGA polymer coating is resorbed over a few weeks.
In parallel to the healing and regeneration process, the PLGA coating and adhesive connection between the granules gradually weakens (three to six weeks in vitro), exposing the microporous, osteoconductive scaffold.

Resorption of PLGA releases small amounts of lactic and glycolic acid. Lactic acid is degraded by metabolic processes. Glycolic acid can be degraded in the body or be excreted with the urine.

PLGA polymers are widely used in devices such as membranes, screws and plates for maxillofacial surgery, suture anchors, and cages for spinal surgery.

**During resorption**
Colored electron microscope image of GUIDOR® easy-graft CRYSTAL during resorption. The resorption of the PLGA coating (blue) exposes the biphasic calcium phosphate (white).

**Resorption of the PLGA coating**
Electron microscope image from an in vitro degradation experiment.
Choosing between GUIDOR® bone graft substitutes
GUIDOR® Synthesis Bone Graft Substitutes
Resorption and Porosity Profiles

GUIDOR® bone graft substitutes easy-graft are 100 % synthetic, with no elements of animal or human origin. They are biocompatible and osteoconductive. The total porosity of 70% consists of macropores providing space for vascularization and bone regeneration and micropores allowing optimal fluid circulation. Each product also features two distinctly different calcium phosphate forms, offering a choice of resorption profile matched to need: CLASSIC/CLASSIC+ and CRYSTAL/CRYSTAL+.

CLASSIC/CLASSIC+ - 100 % resorbable, more space for new bone

CLASSIC/CLASSIC+ consists of a phase-pure β-TCP. Material resorption and bone regeneration proceed in parallel. CLASSIC/CLASSIC+ profile is fully resorbed within 5 to 15 months. In clinical practice, resorption of phase-pure β-TCP is observed after shorter healing periods. No foreign material remains in the body.

The resorption process can be clearly seen by the irregular shape of the previously spherical easy-graft CLASSIC granule.

Human histology, 4 months after easy-graft CLASSIC application.
Courtesy Dr. Minas Leventis, Athens, Greece and Dr. Heiner Nagursky, University of Freiburg in Breisgau, Germany.

CRYSTAL/CRYSTAL+ - Partially resorbable, integration into bone

CRYSTAL/CRYSTAL+ consists of a biphasic calcium phosphate (BCP) compound formed in the ratio of 60% Hydroxyapatite and 40 % β-TCP. The BCP serves as a stable scaffold for long-term volume preservation and HA gets embedded into new bone.

easy-graft CRYSTAL granules remain incorporated into newly formed bone.

Human histology, 8 months after easy-graft CRYSTAL application.
Courtesy Dr. Antonio Flichy, Valencia, Spain and Dr. Heiner Nagursky, University of Freiburg in Breisgau, Germany.

Comparison between CLASSIC and CRYSTAL

An animal study from Valdivia and al1 shows that both, easy-graft CLASSIC/ and easy-graft CRYSTAL are able to maintain volume and support the formation of new bone under physiological pressure. Percentage of new bone was higher using easy-graft CLASSIC providing more space for bone ingrowth while resorbing. On the other hand, the augmented volume was better preserved and the amount of lamellar bone was increased using easy-graft CRYSTAL.

Animal histology, 3 months after easy-graft CLASSIC (β-TCP, right) and easy-graft CRYSTAL (BCP, left) application.
Your choice of sphere shape

*easy-graft* CLASSIC/CRYSTAL granules  *easy-graft* CLASSIC+ /CRYSTAL+ granules

Improved granules morphology

Histologies NAMSA – sheep study

Our recommendation between CLASSIC/CLASSIC+ and CRYSTAL/CRYSTAL+

If timing of implant placement after augmentation is > 6 months, it is recommended to use *easy-graft* CRYSTAL/CRYSTAL+ to provide better volume preservation in the meantime.
Indications and Guidance

<table>
<thead>
<tr>
<th><strong>easy-graft CLASSIC/CLASSIC</strong></th>
<th><strong>easy-graft CRYSTAL/CRYSTAL</strong></th>
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<tbody>
<tr>
<td>easy-graft CLASSIC/CLASSIC and other ß-TCP materials are documented in:</td>
<td>easy-graft CRYSTAL/CRYSTAL and other BCP (60% hydroxyapatite / 40% ß-TCP) materials are documented in:</td>
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<tr>
<td>• Sinus floor elevation (1)</td>
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<td>• Periodontal defects (2)</td>
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<td>• Defects after removal of bone cysts (3)</td>
<td>• Defects after removal of bone cysts (4)</td>
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<tr>
<td>• Augmentation of alveolar crest (5)</td>
<td>• Augmentation of alveolar crest (5)</td>
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<tr>
<td>• Extraction defects (5)</td>
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Our Indication Guides
For more detailed recommendations on how to apply our products in a specific indication, please ask for our indication guides.

Ridge Preservation
Peri-implant Augmentation
Sinus Floor Augmentation

Before use, carefully read the instructions for use.
For more information, please contact our local affiliate to receive these indication guides and also check www.guidor.com
## Product References

<table>
<thead>
<tr>
<th>Product</th>
<th>GUIDOR® easy-graft CLASSIC</th>
<th>GUIDOR® easy-graft CRYSTAL</th>
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<tbody>
<tr>
<td>Reference no.</td>
<td>C11-012  C11-072  C11-002</td>
<td>C15-012  C15-072  C15-002</td>
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<td>Granule size</td>
<td>500 – 630 μm  500 – 1000 μm  500 – 1000 μm</td>
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<td>Material</td>
<td>Phase-pure β-tricalcium phosphate (&gt; 99%)</td>
<td>Biphasic calcium phosphate (60% hydroxyapatite / 40% β-TCP)</td>
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<thead>
<tr>
<th>Product</th>
<th>GUIDOR® easy-graft CLASSIC+</th>
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Clinical cases

**Dr. Minas Leventis**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Ridge preservation</th>
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<tbody>
<tr>
<td>Patient</td>
<td>Female, 23 years old</td>
</tr>
<tr>
<td>Position</td>
<td>Maxillary right second premolar (15)</td>
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<tr>
<td>Material used</td>
<td>GUIDOR® easy-graft CLASSIC</td>
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</tbody>
</table>

**Fig. 1** Maxillary right second premolar (tooth 15) with caries.

**Fig. 2** Ridge preservation with easy-graft CLASSIC, after atraumatic extraction.

**Fig. 3** Situation at re-entry 4 months post-op. easy-graft CLASSIC granules are well integrated in new bone.

**Fig. 4** Final radiograph 16 months post-op.

**Dr. Minas Leventis**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Peri-implant bone regeneration, immediate implantation</th>
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</thead>
<tbody>
<tr>
<td>Patient</td>
<td>Female, 45 years old</td>
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<tr>
<td>Position</td>
<td>Maxillary right central incisor (11)</td>
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<td>Material used</td>
<td>GUIDOR® easy-graft CRYSTAL</td>
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</tbody>
</table>

**Fig. 1** X-ray of initial situation.

**Fig. 2** Immediate implant placement and grafting.

**Fig. 3** Immediate provisional restoration.

**Fig. 4** 5 months post-op, excellent preservation of the architecture of the ridge.

**Dr. Antonio Flichy-Fernández**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Lateral sinus floor augmentation</th>
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<tbody>
<tr>
<td>Patient</td>
<td>Case series of 20 sinus floor augmentations 1</td>
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<tr>
<td>Position</td>
<td>Maxillary molar teeth</td>
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<tr>
<td>Material used</td>
<td>GUIDOR® easy-graft CRYSTAL, GUIDOR calc-i-oss CRYSTAL</td>
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</tbody>
</table>

**Fig. 1** Lateral sinus floor augmentation with easy-graft CRYSTAL.

**Fig. 2** Control CBCT at 6 months. 13 30 mm.

**Fig. 3** Implantation at 6 months. (position 16, 17).

**Fig. 4** Histology showing easy-graft CRYSTAL embedded in newly formed bone.
Frequently Asked Questions

MATERIAL PROPERTIES

What is the difference between GUIDOR® easy-graft CLASSIC and GUIDOR® easy-graft CRYSTAL?
GUIDOR® easy-graft CLASSIC contains phase-pure β-tricalcium phosphate (β-TCP) and is resorbed over a period of 5-15 months. GUIDOR® easy-graft CRYSTAL contains biphasic calcium phosphate (60% hydroxyapatite, 40% β-TCP). It is partially resorbable. The BCP serves as a stable scaffold for long-term volume preservation and gets embedded into new bone.

GUIDOR® easy-graft CLASSIC and GUIDOR® easy-graft CRYSTAL - How do I decide which material is suitable in a specific case?
The topic of material selection is a matter of clinician and surgical planning preference. See timing/staging of dental implant.

GUIDOR® easy-graft CRYSTAL: Are there two types of granules (HA and β-TCP) in GUIDOR® easy-graft CRYSTAL?
No, every single granule consists of a compound of 60% hydroxyapatite and 40% β-TCP.

APPLICATION

Mixing with BioLinker: How long should GUIDOR® easy-graft granules be in contact with the BioLinker in the syringe?
The granules must be completely wetted with BioLinker. A complete wetting can be achieved by moving back and forth the plunger and the plug 1 - 3 times. Typically this takes around 20 - 40 seconds.

Should defects be overfilled?
No, overfilling is not recommended.

How should GUIDOR® easy-graft material be condensed?
Experienced GUIDOR® easy-graft users use various aids such as flattened stoppers or the plunger of the GUIDOR® easy-graft applicator syringe. Over larger areas the material can be evenly condensed by pressing down a piece of gauze (moistened with physiological saline solution) with the finger for 10 - 30 seconds.

Can GUIDOR® easy-graft products be used in combination with dental membranes?
Yes, it is at the discretion of the practitioner.

When would the use of a membrane be recommended?
GUIDOR® easy-graft products are stable and do not require a membrane for containment in 3 or 4 walled defects. Flat (non-concave defects with limited walls) and defects of a critical size may require the additional support of a barrier membrane. Sites where a full thickness periosteal relieving flap is created may also benefit from a barrier membrane for exclusion of soft tissue ingress. The decision to use a membrane is part of therapy planning and is the responsibility of the practitioner.

Can GUIDOR® easy-graft products be mixed with autogenous bone or bone graft substitutes or with preparations such as BMP-2 and Enamel matrix proteins in the application syringe?
No, mixing GUIDOR® easy-graft products with autogenous bone chips or foreign materials will cause the material to harden prematurely in the syringe, or will prevent the material from hardening in the defect. This means that GUIDOR® easy-graft products will lose their unique handling advantage.
Does GUIDOR® easy-graft adhere to the bone surface?
No. GUIDOR® easy-graft products do not adhere to tissue and do not contain adhesives. The granules adhere to one another and form a mouldable mass because of the coating of the granules with PLGA (“sticky granules”).

Can GUIDOR® easy-graft products be ground down after hardening?
Grinding down is not recommended. The effect of the rotary forces may cause the graft to loosen in the defect, which may endanger the bone regeneration. Excess material should be removed before hardening (e.g. with a curette).

INDICATIONS

Is it necessary to cover the material with soft tissue after socket grafting?
No, the material will also heal in place without a soft-tissue cover. The material surface should be well condensed during socket preservation. The application of retention may be useful depending on the shape of the extraction socket. A temporary restoration serves to protect the graft surface from the tongue and foodstuffs. For examples of applications see the Sunstar GUIDOR® guidebook for ridge preservation.

When can an implant be placed after using GUIDOR® easy-graft products to fill the extraction sockets?
GUIDOR® easy-graft products are osteoconductive bone graft substitutes. The time of implant placement can be selected in accordance with experience with comparable materials (e.g. β-TCP granules, bone replacement materials of bovine origin). A definite answer to this common question cannot be given, because the regeneration of bone depends on the anatomical and physiological conditions at the extraction site, and the time of implant placement depends on the treatment philosophy.

Can an implant be placed immediately with subsequent filling of the defect with GUIDOR easy-graft?
Yes, peri-implant gaps and bone deficiencies around implants with primary stability can be filled with GUIDOR® easy-graft products (See page 10).

Can GUIDOR® easy-graft products be used for fixing implants without primary stability?
No. Implants must be anchored in local bone with primary stability. GUIDOR® easy-graft products are suitable for filling bone deficits around implants anchored in pristine bone.

Are GUIDOR® easy-graft materials radio opaque?
Yes, GUIDOR® easy-graft CLASSIC and GUIDOR® easy-graft CRYSTAL are both opaque to x-rays.

How long do GUIDOR® easy-graft products remain stable in the body?
The adherence of the granules is determined by the PLGA coating. It is resorbed over a period of 3 - 6 weeks. During this period, the strength of the material gradually decreases.

Does the volume of GUIDOR® easy-graft change during the healing process?
During the initial phase of degradation, easy-graft CLASSIC may swell by taking up body fluids, thus supporting a close contact to the surrounding bone tissue. When applied in larger defects, this might result in slight sensation of pressure by the patient.
Publications supporting dental application of GUIDOR® synthetic biomaterials:

**in vivo / preclinical studies**


**Clinical studies**


**Evidence Base**

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