bone & tissue regeneration

botiss biomaterials

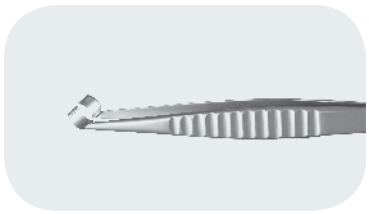
maxgraft®
maxgraft® bonering
maxgraft® bonebuilder
maxgraft® cortico

PROCESSED HUMAN ALLOGRAFT

hard tissue










safe

biologic

successful

botiss regeneration system

Development / Production / Distribution

cerabone®

Natural bovine bone graft

maxgraft® cortico

Processed allogenic bone plate

maxgraft®

Processed allogenic bone graft

maxgraft® bonebuilder

Patient matched allogenic bone implant

maxgraft® bonering

Processed allogenic bone ring

maxresorb® inject

Synthetic injectable bone paste

maxresorb®

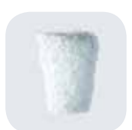
Synthetic biphasic calcium phosphate

maxresorb® flexbone

Flexible blocks (CaP / Collagen composite)

Straumann® Emdogain®

Enamel matrix derivative



collacone® max

Flexible cone (CaP / Collagen composite)

collacone®

Collagenic hemostat (Cone)

Jason® fleece

Collagenic hemostat (Sponge)

mucoderm®

3D-stable soft tissue (Collagen) graft

collprotect® membrane

Native collagen membrane

Jason® membrane

Native pericardium GBR / GTR membrane

permamem®

High-density PTFE barrier membrane

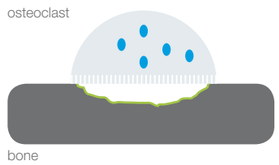
Processed human allograft

INTRODUCTION

Various bone graft materials are available to replace and regenerate bone matrix lost by tooth extraction, cystectomy or bone atrophy following loss of teeth or inflammatory processes.

Of all grafting options autologous bone is considered the „gold standard“, because of its biological activity due to vital cells and growth factors.

Yet, the autologous bone from intra-oral donor sites is of restricted quantities and availability, and the bone tissue obtained from the iliac crest is described to be subject to fast resorption[1]. Moreover, the harvesting of autologous bone often requires a second surgical site associated with an additional bone defect and potential donor site morbidity[2]. Thus, application of processed allogenic bone tissue demonstrates a reliable and predictable alternative.



New bone formation after grafting with allogenic bone tissue begins with an acute inflammatory response, within which granulation tissue gradually accumulates, and by activation of osteoclasts. The incorporation process begins with the vascularization of the allograft. By activation of osteoclasts the immune system facilitates the remodeling of the graft[3]. These large cells completely degrade medullary bone, thereby allowing its substitution by osteoblasts. The immunological compatibility of processed allogenic bone is not different from autologous tissue[4]. In patients who received allogenic bone grafts for ridge augmentation, no circulating antibodies could be detected in blood samples[5].

Moreover, several histological[6,7] and morphological studies[8] have well documented that there was no difference in the final stage of incorporation and new bone formation between allograft and autologous graft.

1. Mertens, C., Decker, C., Seeberger, R., Hoffmann, J., Sander, A., & Freier, K. (2013). Early bone resorption after vertical bone augmentation–a comparison of calvarial and iliac grafts. Clinical oral implants research, 24(7), 820-825.
2. Palmer, W., Crawford-Sykes, A., & Rose, R. E. C. (2008). Donor site morbidity following iliac crest bone graft. West Indian Medical Journal, 57(5), 490-492.
3. Raggatt, L. J., & Partridge, N. C. (2010). Cellular and molecular mechanisms of bone remodelling. Journal of Biological Chemistry, jbc-R109.
4. Turner, D. W., & Mellonig, J. T. (1981). Antigenicity of freeze-dried bone allograft in periodontal osseous defects. Journal of periodontal research, 16(1), 89-99.
5. Quattlebaum, J. B., Mellonig, J. T., & Hensel, N. F. (1988). Antigenicity of freeze-dried cortical bone allograft in human periodontal osseous defects. Journal of periodontology, 59(6), 394-397.
6. Al-Abedalla, K., Torres, J., Cortes, A. R. G., Wu, X., Nader, S. A., Daniel, N., & Tamimi, F. (2015). Bone augmented with allograft onlays for implant placement could be comparable with native bone. Journal of Oral and Maxillofacial Surgery, 73(11), 2108-2122.
7. Laino, L., Iezzi, G., Piattelli, A., Lo Muzio, L., & Cicciù, M. (2014). Vertical ridge augmentation of the atrophic posterior mandible with sandwich technique: bone block from the chin area versus corticocancellous bone block allograft—clinical and histological prospective randomized controlled study. BioMed research international, 2014.
8. Schlee et al.. Esthetic outcome of implant-based reconstructions in augmented bone: comparison of autologous and allogeneic bone block grafting with the pink esthetic score (PES). Head Face Med. 2014 May 28;10(1):21. doi: 10.1186/1746-160X-10-21.

Classification

Autologous:

- Patient‘s own bone, mostly harvested intra-oraly or from the iliac crest
- Intrinsic biological activity

Allogenic:

- Bone from human donors (multi-organ donors or femoral heads of living donors)
- Natural bone composition and structure

Xenogenic:

- From other organisms, mainly bovine origin
- Long-term volume stability

Alloplastic:

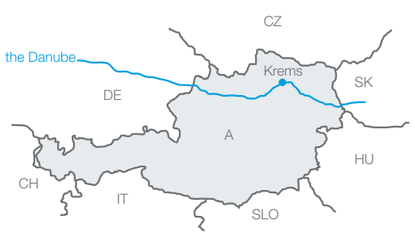
- Synthetically produced, preferably calcium phosphate ceramics
- No risk of disease transmission

Cells+Tissuebank Austria

JOINTLY BUILDING BRIDGES

C+TBA austria

C+TBA is a non-profit organization aiming to maintain continuous medical supply of allografts under pharmaceutical conditions. Serving as a platform for the definition of safety standards and assurance of compliance with defined product qualities, C+TBA focuses on the specifications of human bone tissue as required in a large number of diseases that are associated with the loss of bone tissue.



The quality standards for donor selection, procurement, processing, quality control, storage and distribution of human tissue and cells are mandatory committed in the European Directives 2004/23/EC and 2006/17/EC. In addition, at the national level, the legal requirements are defined by the Austrian Tissue Safety Act (GSG, 2009).

To meet and comply with both European and national requirements, C+TBA has implemented a quality assurance system at pharmaceutical level, which is regularly audited by the competent national authority, the Austrian Federal Office for Safety in Health Care (BASG / AGES).

The C+TBA is certified as a tissue bank according to §19 and §22 of the Austrian Tissue Safety Act.

Tissue donation and procurement

maxgraft® products are predominantly produced from living donor femoral heads after hip replacement surgery. Only cortico-cancellous blocks and cortical struts are produced from multi-organ donors.

The procurement, standardized by a predefined protocol, is carried out by certified procurement centers according to the European Directives. Tissue donations will only be carried out after the donor's written consent. In addition, the health status of the potential donor is assessed in the context of a risk analysis and the donor is then selected on the basis of strict exclusion criteria. For all multi-organ donors the highest ethical and safety-related requirements are met.

Donor tissue is only approved for processing after having passed a thorough inspection including a strict serological screening protocol

Serological testing

Virus	Test	Specification
Hepatitis B Virus (HBV)	HBsAg,HBcAb, NAT	negative
Hepatitis C Virus (HCV)	Ab, NAT	negative
Human Immunodeficiency Virus (HIV 1/2)	Ab, NAT	negative
Bacteria	**Test**	**Specification**
Treponema pallidum (Lues)	CMIA	negative

After donor acceptance a series of serological testing is performed. In addition to antibody screening (Ab), nucleic acid tests (NAT) are performed. By using this method infections can be identified before antibodies are detected in the blood.

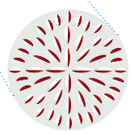
Blood samples are taken simultaneously to tissue explantation during total hip replacement surgery or within 24h post mortem in case of multi-organ donation

9. Kalus U, Wilkemeyer I, Caspari G, Schroeter J, Pruss A. Validation of the Serological Testing for Anti-HIV-1/2, Anti-HCV, HBsAg, and Anti-HBc from Post-mortem Blood on the Siemens-BEP-III Automatic System. Transfusion Medicine and hemotherapy. 2011;38:365-372

The ALLOTEC® Process

After shaping and crude cleaning, the donor tissue undergoes ultrasonication to remove blood, cells and tissue components, but mainly to promote the removal of fat from the cancellous structure of the bone, improving the penetration of subsequent substances.

During a chemical treatment non-collagenic proteins are denatured, potential viruses are inactivated and bacteria are destroyed. In the subsequent oxidative treatment, persisting soluble proteins are denatured and potential antigenicity is eliminated.

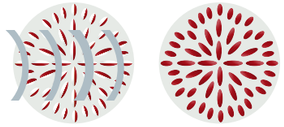


Step 1:
After crude removal of surrounding soft tissue, fat and cartilage, the donor tissue is brought into its final shape.

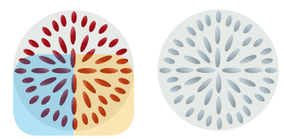
Finally, the tissue undergoes lyophilization, a dehydration technique which facilitates the sublimation of frozen tissue water from solid phase to gas phase, thereby preserving the structural integrity of the material.

The tissue can be reconstituted rapidly due to microscopic pores within the material, which were created by the sublimating ice crystals. It has been well established that the lyophilization process preserves structural properties that improve graft incorporation[4,10].

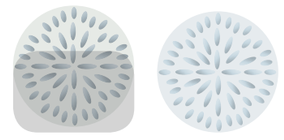
The final sterilization by gamma irradiation guarantees a sterility assurance level (SAL) of 10^{-6} while ensuring structural and functional integrity of the product and its packaging.



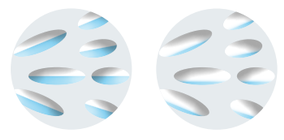
Step 2:
The defatting of the donor tissue allows moderate penetration of solvents during subsequent processing.



Step 3:
A treatment with alternating durations of diethyl ether and ethanol leaches out cellular components and denatures non-collagenic proteins, thereby inactivating potential viruses.

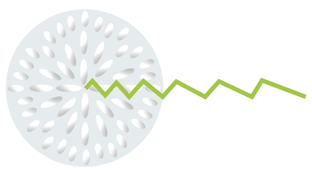


Step 4:
An oxidative treatment further denatures persisting soluble proteins, thereby eliminating potential antigenicity.



Step 5:
Freeze-drying by lyophilization preserves the natural structure of the tissue and maintains a residual moisture of < 5%, allowing quick rehydration and easy handling.

Step 6:
Double packing and final sterilization by gamma-irradiation guarantees a 5-year shelf-life at room temperature.



4. Turner, D. W., & Mellonig, J. T. (1981). Antigenicity of freeze-dried bone allograft in periodontal osseous defects. Journal of periodontal research, 16(1), 89-99.
10. Flosdorf, E. W., & Hyatt, G. W. (1952). The preservation of bone grafts by freeze-drying. Surgery, 31(5), 716-719.

Safety and quality

Thorough donor anamnesis and serological testing combined with chemical and radiological sterilization offer maximal safety.

Reference samples

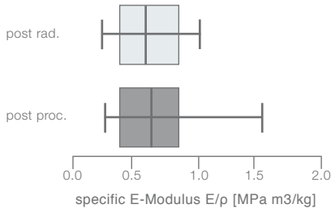
Samples are stored one year after the expiration date of the products, in order to be able to exclude maxgraft® as a source of transmission in case of a doubt. Despite worldwide monitoring, there is no single case of the transmission of a disease, caused by allografts used in dental medicine.

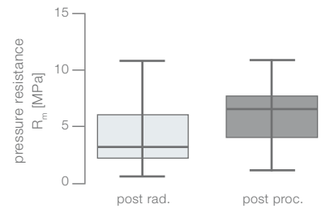
Virus inactivation

The critical viral inactivation steps of the Allotec® process – dynamic immersion in ethanol, hydrogen peroxide and gamma irradiation – have been validated for reliability and reproducibility by an independent test facility. Suspensions of model viruses for non-enveloped and enveloped DNA viruses (HBV), and non-enveloped (HAV) and enveloped RNA viruses (HIV, HCV, HTLV) have been applied. The process shows an overall efficacy in inactivating all test viruses globally > 6 logs (reference value for efficient viral inactivation > 4 logs) and therefore can be considered effective in removing potential viral contaminants.

In an extensive experimental setting virus inactivating capacity of the process was validated and considered effective

Biomechanical properties have recently been analyzed by the Institute of Material Science of the Technical University of Vienna, Austria. After the determination of E-modulus and pressure resistance no significant alterations were detected in irradiated products (post rad.) compared to non-irradiated ones (post proc.).



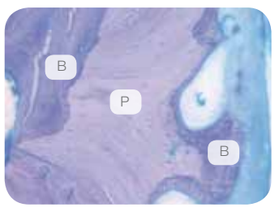


C-TBA's allograft products provide a stable scaffold for revascularization and osteoblast migration. Simultaneously, due to the preserved collagen content, the graft presents high flexibility supporting physiological bone formation and remodeling

maxgraft®

PROCESSED HUMAN ALLOGRAFT

maxgraft® is a sterile, high-safety allograft product, derived from human donor bone, processed by the Cells+Tissuebank Austria.



Biopsy of maxgraft® five months after implantation. The allogenic particle (P) can be recognized by the empty cavities of the osteocytes and is strewn with circular resorption lacunae. The particle is embedded into newly formed bone matrix (B)

For experienced oral and maxillofacial surgeons, allograft bone blocks for block augmentation are the only real alternative to harvesting patients' bone. A second surgical site to harvest autologous bone and the associated risk of infection, donor-site morbidity, post-operative pain and loss of bone stability can be avoided. The excellent biological regeneration capability of maxgraft® results in a predictable clinical outcome.

Properties

- Preserved biomechanical properties
- Sterile without antigenic effects
- Storable at room temperature for five years
- Osteoconductive properties supporting natural and controlled tissue remodeling

The trabecular structure of cancellous bone allows optimal graft revascularization, rapid formation of new bone tissue and complete bone remodeling

Indications:

Implantology, Periodontology and Oral and CMF Surgery

Granules

- Localized augmentation of the ridge for future implant placement
- Reconstruction of the ridge for prosthetic therapy
- Filling of osseous defects, such as extraction sockets
- Elevation of maxillary sinus floor
- Repair of intrabony periodontal defects

Blocks

- A predictable and highly effective alternative to traditional block grafting
- Ridge augmentation

Product Specifications

maxgraft® cancellous granules

Art.-No.	Particle Size	Content
30005	< 2.0 mm	1 × 0.5 ml
30010	< 2.0 mm	1 × 1.0 ml
30020	< 2.0 mm	1 × 2.0 ml
30040	< 2.0 mm	1 × 4.0 ml
30030	2.0-5.0 mm	1 × 3.0 ml

maxgraft® cortico-cancellous granules

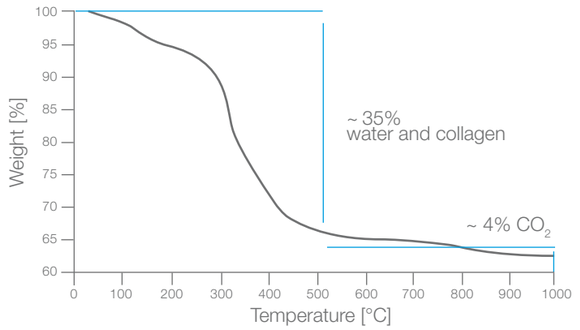
Art.-No.	Particle Size	Content
31005	< 2.0 mm	1 × 0.5 ml
31010	< 2.0 mm	1 × 1.0 ml
31020	< 2.0 mm	1 × 2.0 ml
31040	< 2.0 mm	1 × 4.0 ml

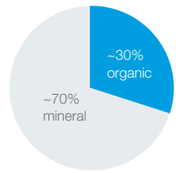
maxgraft® blocks

Art.-No.	Dimension	Content
31111	uni-cortical, 10 × 10 × 10 mm	1 × block*
31112	uni-cortical, 20 × 10 × 10 mm	1 × block*
32111	cancellous, 10 × 10 × 10 mm	1 × block
32112	cancellous, 20 × 10 × 10 mm	1 × block

Living donors
*: Organdonors
Tissuebank: Cells+Tissuebank Austria, Krems, Austria

Structure and tissue composition





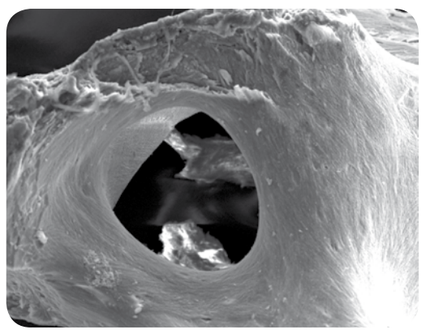
Thermogravimetric curve of maxgraft® showing the staged mass reduction that indicates the chemical composition

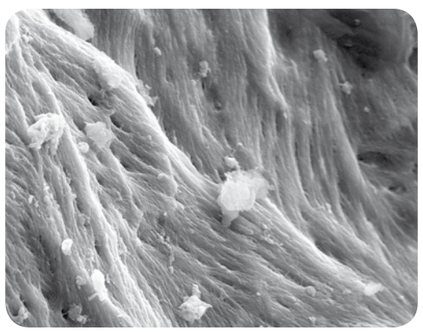
Mineralized collagen

The thermogravimetric analysis shows the mass reduction following heating and helps to determine the content of water and organic components like collagen. Heating from room temperature up to 1000°C results in a staged mass reduction. The first reduction of ~ 35% can be attributed to the vaporization of water and the combustion of collagen, the second (~ 4%) to the vaporization of carbon dioxide.

Surface

SEM pictures of maxgraft® illustrate the structure of the processed bone. Processing does not affect structural features and with its interconnecting macroporosity, maxgraft® is a natural human bone matrix. Because of the Allotec® process without sintering, maxgraft® retains its collagen matrix. At a higher magnification the structure of the mineralized collagen fibers can be recognized.





SEM pictures of maxgraft® at a 100-fold and 5000-fold magnification, showing the macroporous structure and surface of the mineralized collagen matrix

maxgraft® bonering

PROCESSED ALLOGENIC BONE RING

maxgraft® bonering is a pre-fabricated cancellous ring of human donor bone, which is placed press-fit into a trephine drill-prepared ring bed. At the same time, an implant is inserted into the ring. The bony integration of both, maxgraft® bonering and the implant, occurs via the surrounding vital bone.

Preparation of ring bed

After determination of the position of the implant by the planator tip and the pilot drill, the ring bed is prepared with the trephine. Subsequently, the planator allows even paving of the local bone for optimal contact with maxgraft® bonering and in addition, removes the cortical layer for improved graft revascularization.

Indications: Implantology

- Vertical augmentation (in combination with horizontal augmentation)
- Single tooth gap
- Edentulous space
- Sinus lift

The maxgraft® bonering technique allows bone augmentation and implantation in a one-stage procedure. The technique is applicable for almost all indications, including sinus lift with limited maxillary bone height.

The height of maxgraft® bonering is adjustable to the defect

The maxgraft® bonering technique enables vertical bone augmentation and direct implantation

Immediate implant insertion through maxgraft® bonering ensures primary stability of implant and graft

Compared to the classical, two-stage augmentation with i.e. bone blocks, this technique reduces the entire treatment period by several months and saves the re-entry.

The maxgraft® bonering allows vertical and horizontal augmentation and new bone formation, therefore simplifying the surgical treatment.

Advantages

- Simultaneous implant placement and bone augmentation
- No second surgical procedure
- Significant reduction of treatment time

One-stage bone augmentation and implant placement

Smooting

Sharp edges should be smoothened to avoid soft tissue perforation and to support wound healing. Moreover, maxgraft® bonering should be covered with a slowly resorbable bone regeneration material (e.g. cerabone®) to fill the residual defect volume and to avoid potential adaption resorption of the graft

Soft tissue management

After covering of the graft with a collagen membrane (Jason® membrane) a tension-free suturing of the operation site must be assured to avoid tissue perforation and graft exposure

maxgraft® bonering surgical kit

With this surgical kit, botiss provides all necessary instruments to apply the maxgraft® bonering technique. The kit includes two convenient sizes of trephines, which precisely fit together with the maxgraft® bonering diameters.

The planators allow paving of the local bone to create a congruent and fresh contact surface of the implant area. The diamond disc and the diamond tulip help to shape the maxgraft® bonering for excellent adjustment to the local bone and for improved soft tissue healing. Altogether, these instruments allow optimal preconditions for the bony ingrowth of maxgraft® bonering.

All instruments are made of high quality surgical steel.

trephine 7 mm | trephine 6 mm | planator 7 mm | planator 6 mm | diamond disc 10 mm | diamond tulip 3 mm

Product Specifications

maxgraft® bonering 3.3

(Height 10 mm, recommended for implant diameters from 3.3 - 3.6 mm)

Art.-No.	Dimension	Content
33160	cancellous ring, Ø 6 mm	1 x
33170	cancellous ring, Ø 7 mm	1 x

maxgraft® bonering 4.1

(Height 10 mm, recommended for implant diameters from 4.1 mm)

Art.-No.	Dimension	Content
33174	cancellous ring, Ø 7 mm	1 x

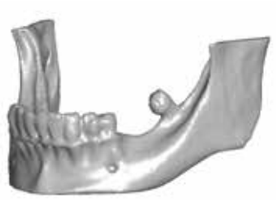
33000	maxgraft® bonering surgical kit	1 set
33010	bonering fix	1 x

bonering fix

maxgraft® bonebuilder

CUSTOMIZED ALLOGENIC BONE BLOCK

maxgraft® bonebuilder is a customized allogenic bone block, which is individually adjusted to the bone defect. With maxgraft® bonebuilder, harvesting of autologous bone and manual adjustment of the obtained transplant is no longer required for the treatment of extensive defects. Donor site morbidity, operation time and costs can be significantly reduced.



The CT/CBCT-data of the bone defect is transfered into a 3D model

The maxgraft® bonebuilder technology

In-house planning

botiss virtually designs the patient customized allogenic bone block based on the CT/CBCT-scan of the bone defect. The design of the bone block undergoes a final inspection by the clinical user and is, by individual order, released for production. The botiss partner Cells+Tissuebank Austria receives a *.stl milling file and the patient matched allogenic bone block is produced under cleanroom conditions. The resulting bone block is ready for insertion into the defect with only minor adjustments.

Indications

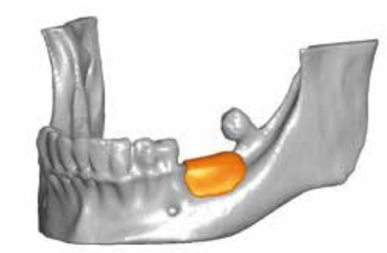
- Extensive bone defects
- Atrophic maxilla/mandibula
- Horizontal/vertical augmentation

Advantages

- Individualized allogenic bone block
- Significantly reduced operation time
- Improved wound healing

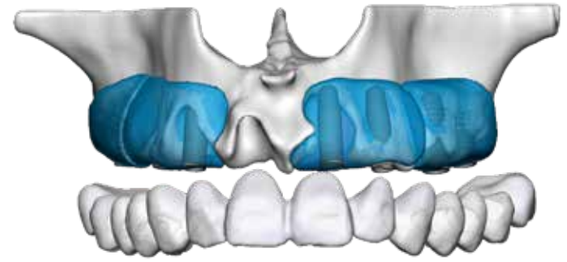
After placement, the maxgraft® bonebuilder block is fixed with osteosynthesis screws. Residual defect volume should be filled with bone regeneration material and the augmentation site should be covered with a collagen membrane.
The strong capillary action of the three-dimensional, porous trabecular bone network enables fast and efficient penetration of nutrients and blood, resulting in excellent handling, as well as reliable and predictable outcomes.

Based on this model botiss designs a virtual block, which matches the surface structure of the defect and allows stable implant insertion after augmentation



The customized maxgraft® bonebuilder block allows precise horizontal and vertical reconstruction of the atrophic ridge

The maxgraft® bonebuilder technology



The maxgraft® bonebuilder technology allows complex reconstruction in cases of extensive jaw atrophy

1. Upload of CT/CBCT-data on
www.botiss-bonebuilder.com

After registration, CT/CBCT-data of the patient can be uploaded on the botiss server. All radiological data have to single-frame data images. The only data type suitable for 3D planning is DICOM (*.dcm).

2. Block design

botiss designers create a three-dimensional model of the radiological images and design a virtual bone block in consultation with the clinical user.

3. Design quality check

The clinical user receives a 3D PDF file containing the virtually constructed maxgraft® bonebuilder block and has to confirm its design.

Each block is designed individually according to the defect and the desired dimension of the augmentation

4. Individual order

The production of the block starts after the clinical user fills in the patient based order form for the bone block to the attention of botiss biomaterials.

5. Production of the individual bone block

At C+TBA the *.stl data of the design is imported into a milling machine and a block of maximally 23 x 13 x 13 mm is produced.

Product Specifications

maxgraft® bonebuilder

Art.-No.	Content
PMIa	Individual planning and production of a bone block max. dimensions 23 x 13 x 13 mm
PMIa 2	additional block(s) for this patient

bonebuilder dummy

Art.-No.	Content
32100	Individual 3D printed model of the patient's defect including the planned maxgraft® bonebuilder block(s) for demonstration purposes, material: synthetic filament

www.botiss-bonebuilder.com

maxgraft® cortico

SHELL TECHNIQUE WITH ALLOGENIC BONE PLATES

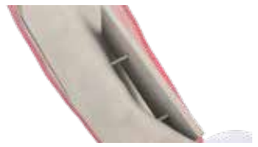
maxgraft® cortico is a prefabricated plate made of processed allogenic bone. Similarly to the autogenous bone, it can be used for the shell technique.

maxgraft® cortico was developed to avoid the donor-site morbidity and to prevent the time-consuming harvesting and splitting of autologous cortico-cancellous bone blocks.

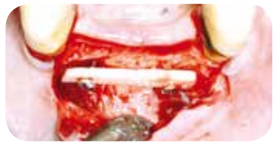
Preparation of the augmentation area

The proper size of the plate is estimated after the elevation of the mucosal flap or preoperatively using a digital planning software. Using a diamond disc, the plate is then cut extraorally.

Fixation and adaption



The plate is positioned with a distance by predrilling through plate and local bone and fixation with osteosynthesis screws to create a fixed compartment. It is pivotal to drill threated holes into the cortical plates, which prevent the plates from gliding on screw threats. Therefore, a drilling head with 0.2 mm smaller diameter than that of the applied screws is recommeded for drilling (e. g. use a 1 mm drilling head for 1.2 mm screws). To prevent perforations of the soft tissue, sharp edges need to be removed, e.g. by using a diamond ball.



Augmentation of a frontal mandibular defect

Indications:

- Vertical augmentation
- Horizontal augmentation
- Complex three-dimensional augmentations
- Single tooth gaps
- Fenestration defects

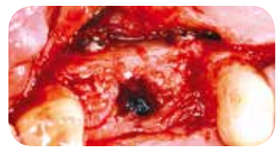
More details on the surgical procedure on:

BOTISS-DENTAL.COM

The shell technique with maxgraft® cortico

Filling and wound closure

The space between local bone and cortical plate can be filled with a variety of different particulated bone grafting materials. Then, the augmentation area needs to be covered with a barrier membrane (Jason® membrane, collprotect® membrane) and a tension-free and saliva-proof closure must be applied.



Six months after transplantation, a superficial resorption of the plate can be seen; the stability, however, is maintained

Natural bone regeneration

To facilitate osteogenesis, allogenic particles can be used to fill the defect. The preserved human collagen provides an excellent osteoconductivity and enables a complete remodelling. Mixing with autologous chips or particulated PRF matrices can support the ossification.

Advantages

- Established augmentation technique with new material
- Significant reduction of operation time
- No donor-site morbidity
- No limitation of augmentation material

Properties

- Osteoconductive
- Natural and controlled remodeling
- Conserved biomechanical parameters

Product Specifications

maxgraft® cortico

Art.-No.	Dimension	Content
31251	cortical strut, 25 x 10 x 1 mm*	1 x
31253	cortical strut, 25 x 10 x 1 mm*	3 x 1

*: Organdonors

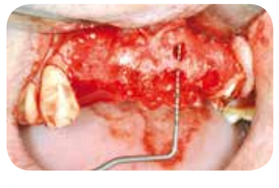
cortico trimmer

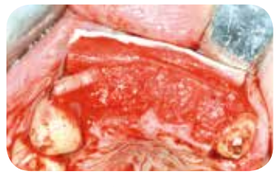
Art.-No.	Content
34000	cortico trimmer 1 x

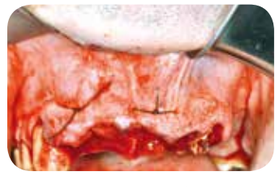
CLINICAL CASE BY
Dr. Fernando Rojas-Vizcaya, Castellón, Spain

SOCKET PRESERVATION WITH MAXGRAFT® GRANULES

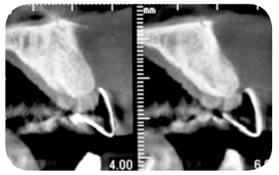

Clinical situation in the maxilla before extraction


Situation after tooth extraction and mobilization of mucosal flap


Augmentation of the maxillary ridge and filling of extraction sockets with maxgraft® granules. Placement of mucoderm® to improve soft tissue situation and Jason® membrane to cover surgical site

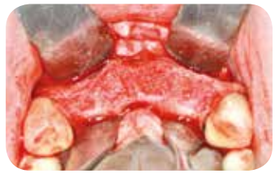

Mobilization and pre-fixation of the surrounding soft tissue

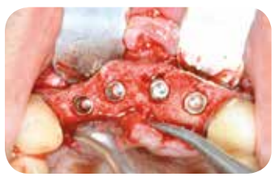

Tension-free wound closure

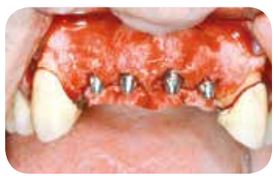


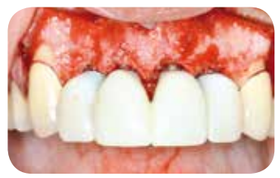
Four months post-operative: bone is at the level of the planned crowns

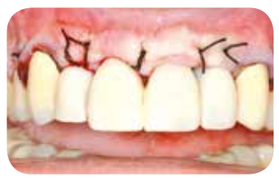

Clinical situation four months post-operative


Maxillary ridge *in situ* after preparation of mucosal flap


Insertion of four implants


Placement of abutments


Positioning of prosthesis


Closure of mucosal flap

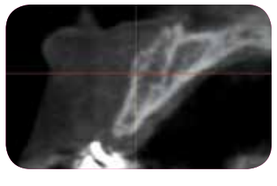

After immediate loading protocol: prosthesis will guide soft tissue during healing process

Antibiotics
When performing hard tissue augmentation, the patient should be treated with a sufficient dose of antibiotics to minimize the risk of infection and related possible graft loss. A potential treatment plan could include starting the antibiosis one day prior or at least one hour before surgery by ingestion of a full daily dose. In case of extensive jaw reconstruction a bacteriological screening (saliva sample) should be considered.

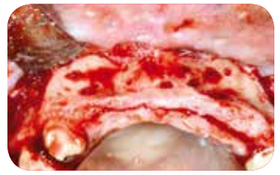
CLINICAL CASE BY
Dr. Damir Jelušić, Opatija, Croatia

RIDGE AUGMENTATION WITH MAXGRAFT® CANCELLOUS BLOCKS


X-ray and CAD/CAM-based 3D image of maxillary ridge before surgery


Manual adjustment of maxgraft® blocks on a CAD/CAM-based model

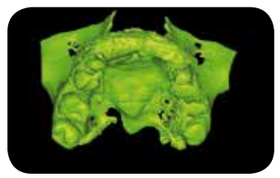

Clinical situation


Atrophic maxillary ridge after preparation of mucosal flap

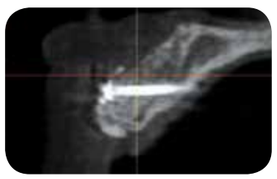

Fixation of the prepared maxgraft® blocks

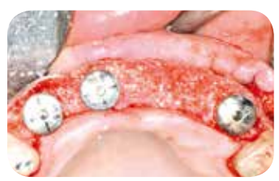

Filling of residual gaps with cerabone® and covering with Jason® membrane

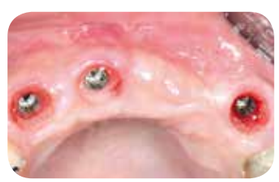

Tension-free closure of mucosal flap


CAD/CAM-based 3D image three days post-operative


Clinical situation five months post-operative


X-ray five months post-operative


Insertion of three implants and gingiva formers

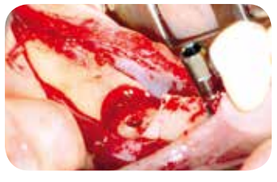

Six months after re-entry: patient is ready for final prosthesis

GBR/GTR
Resorbable collagen membranes act as a temporary barrier against ingrowth of fast proliferating fibroblasts and epithelium into the defect, and maintain the space for controlled regeneration of bone. The Jason® membrane is a pericardium membrane providing a long-lasting barrier function for ~three to six months. mucoderm®, a three-dimensional collagen matrix, supports revascularization and fast soft tissue integration and thus, is a valid alternative to patients' own connective tissue. When applying mucoderm® simultaneously with a bone graft material please assure adequate mobilization of the surrounding soft tissue.

CLINICAL CASE BY

Dres. Bernhard Giesenhagen and Orcan Yüksel, Frankfurt, Germany

PART I: VERTICAL AUGMENTATION WITH MAXGRAFT® BONERING

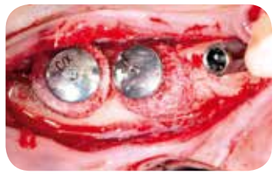


Preparation of the ring bed in an atrophic mandibula (third quadrant)

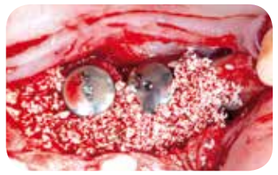
Vertical augmentation by placing a maxgraft® bonering

Simultaneous horizontal augmentation

Stable implant insertion



Insertion of second maxgraft® bonering and implant



Filling of the residual defect volume with cerabone® and covering the operation site with a Jason® membrane

Tension-free soft tissue management

Vertical augmentation with maxgraft® bonering

For the reconstruction in an atrophic jaw a vertical augmentation of up to 3 mm above local bone level can easily be achieved. If more vertical height is desired, enhancing additives such as bone morphogenic proteins (BMP) or growth factors are in discussion to be beneficial. For vertical and horizontal augmentation of a severely atrophic mandibular, the width of the ridge (in case of parallel-walled ridge) has to be at least 4 mm for successful application of maxgraft® bonering.

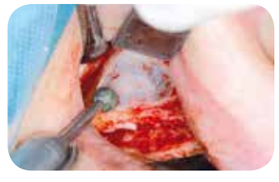
The maxgraft® bonering allows for direct implant insertion during sinus lift by providing the necessary primary stability. The sinus cavity should be filled with an additional grafting material (e.g. cerabone®, maxresorb® or maxresorb® inject).

CLINICAL APPLICATION OF **MAXGRAFT® BONERING**

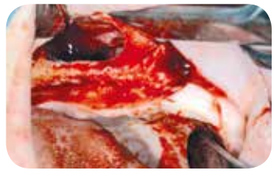
Rehydration

The processing of maxgraft® products preserves the natural collagen content of the bone tissue and a residual moisture of ~5%. Thus, the products don‘t have to be re-hydrated but are ready for instant use. Be aware that excessive hydration can result in the loss of structural integrity!

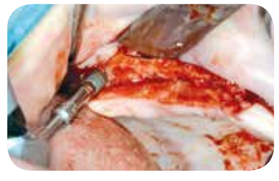
PART II: SINUS LIFT WITH MAXGRAFT® BONERING



Preparation of a lateral window for sinus floor elevation in the first quadrant

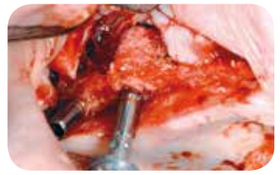


Mobilization of the Schneiderian membrane

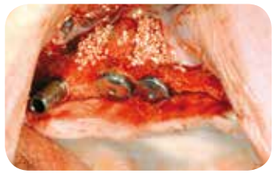


Insertion of the first implant

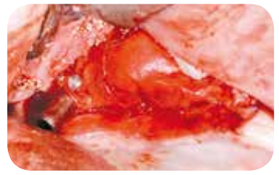
Placement of maxgraft® bonering



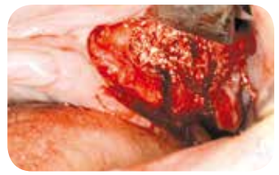
Implant insertion in maxgraft® bonering from the crestal side



Filling of the residual sinus cavity with cerabone®

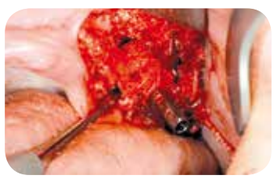


Placement of Jason® membrane



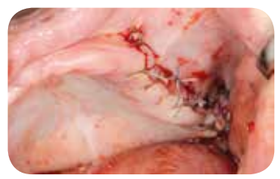
Clinical situation in the second quadrant: vertical and horizontal defect in the maxillary ridge; sinus cavity is filled with cerabone®

Preparation of the defect with a trephine

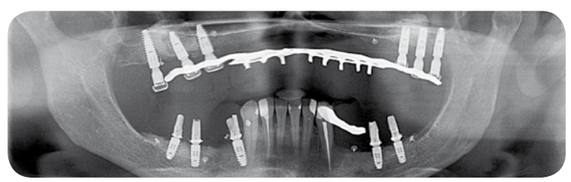


Press-fit placement of maxgraft® bonering into the defect

Direct implantation in the cancellous ring



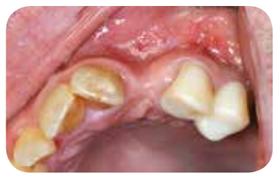
Tension-free suturing after placement of Jason® membrane

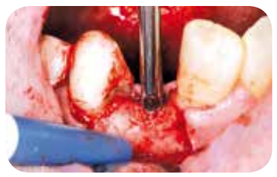


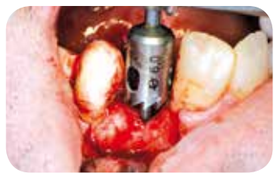
X-ray nine months post-operative: full integration of maxgraft® bonering and implants and proceeding remodeling of the grafts

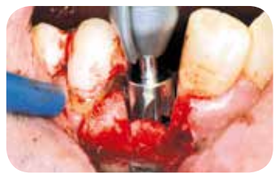
CLINICAL CASE BY
Dr. Darius Pocebutas, Kaunas, Lithuania

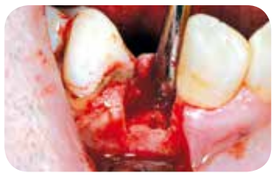
HORIZONTAL AUGMENTATION IN A SINGLE TOOTH GAP WITH MAXGRAFT® BONERING


Clinical situation preoperative

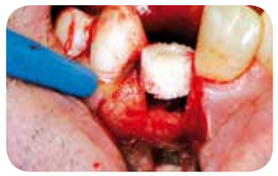

Pilot drill in the recipient site

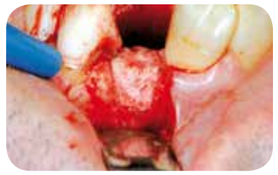

Preparation of the ring bed with the trephine

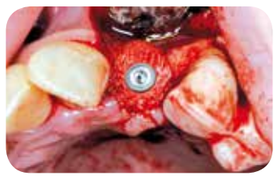

Paving of the local bone using the planator from maxgraft® bonering surgical kit

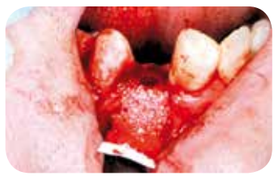

Measurement of the defect

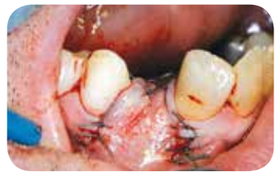

Adjustment of maxgraft® bonering to desired height


Placement of the ring into the ring bed


Due to its structure the ring is instantly soaked with blood


Implant insertion in maxgraft® bonering; the shape of the ring mimics the anatomic structure of the ridge

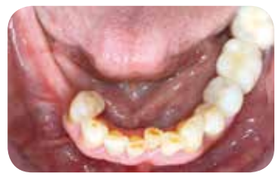

Gaps are filled with cerabone® and the augmentation site is covered with a Jason® membrane

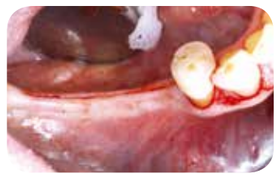

Tension-free wound closure

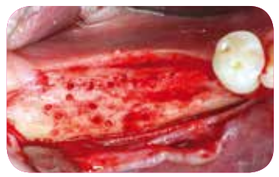
Graft exposure
Wound dehiscence and graft exposure can be complications of block augmentation.
After removal of necrotic soft tissue and infected hard tissue (use rotating instruments if necessary) the augmented area should be rinsed with chlor-hexidine. Subsequently, the graft has to be covered again, if necessary, by harvesting a palatal soft tissue transplant.

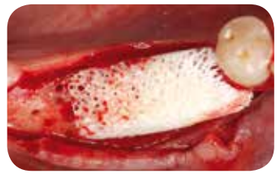
CLINICAL CASE BY
Dr. Anke Isser, Frankfurt, Germany

RIDGE AUGMENTATION WITH MAXGRAFT® BONEBUILDER


Clinical situation preoperative

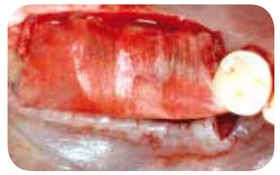

Midcrestal incision line


Lingual mobilization and cortical perforation


Perfect fit of maxgraft® bonebuilder


Fixation of the blocks with screws for osteosynthesis


Contouring with cerabone®


Covering of the block with Jason® membrane


Horizontal matress suture and tension-free wound closure

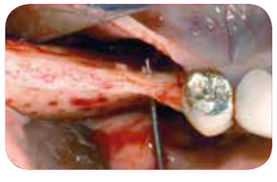
Design quality check
The design of maxgraft® bonebuilder has to be checked very carefully before it is released for production. Only the surgeon himself can assess the patients‘ soft tissue situation and therefore, the required dimensions of the block. The botiss construction team will adjust the design of the block until it perfectly meets the expectations of the clinician.

CLINICAL CASE BY
Dr. Michele Jacotti, Brescia, Italy

RIDGE AUGMENTATION WITH MAXGRAFT® BONEBUILDER

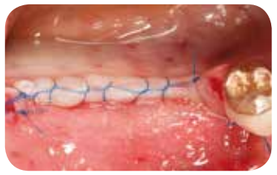

Virtual planning of the block

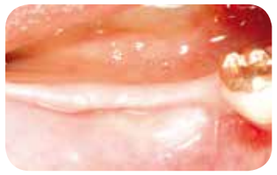

Patient matched maxgraft® bonebuilder

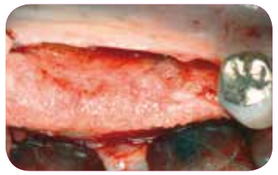

Situation after mucosal flap preparation and perforation of the cortical layer

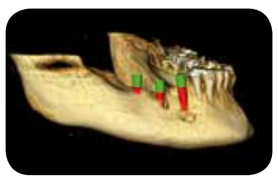

Exact positioning of the maxgraft® bonebuilder block


Fixation of the block with screws for osteosynthesis

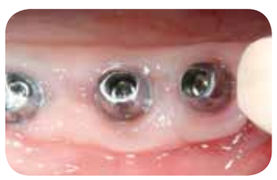

Careful wound closure

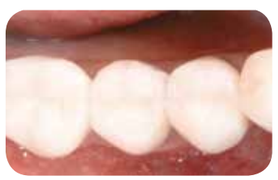

Clinical situation at re-entry five months post-operative


Full bony ingrowth of the block


3D implant positioning


Stable implant insertion

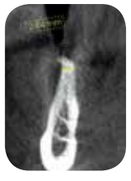
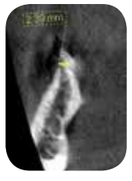

Abutment placement after ingrowth of the implants


Final prosthesis

CLINICAL CASE BY
Dr. Viktor Kalenchuk, Chernivtsi, Ukraine

RIDGE AUGMENTATION WITH MAXGRAFT® BONEBUILDER

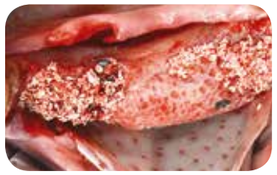

Clinical situation before augmentation

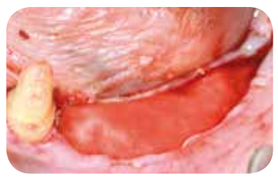


CT scan of region 36, 37 before surgery


Situation after tooth extraction and mobilization of mucosal flap

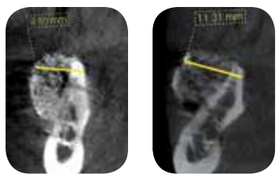

maxgraft® bonebuilder


Immediate implant insertion in regio 34, 35; positioning and fixation of maxgraft® bonebuilder


Filling of residual volume with cerabone®


Covering of the augmentation site with collprotect® membrane

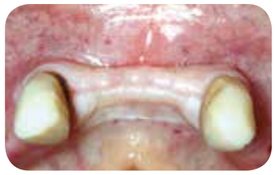

Wound closure and suturing


CT scan of region 36, 37 after surgery

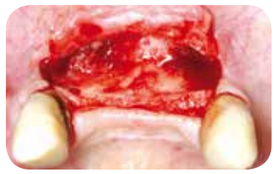
Fixation
maxgraft® blocks are fixed with screws for osteosynthesis, preferably with flat-headed screws to avoid perforation of the surrounding soft tissue.

CLINICAL CASE BY
Jan Kielhorn, Oehringen, Germany

FRONTAL DEFECT TREATED WITH MAXGRAFT® CORTICO



Severe atrophy in the aesthetic region

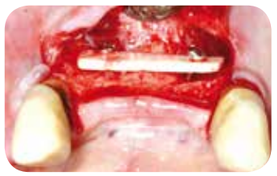


Preparation of the defect

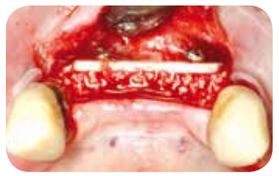
maxgraft® cortico in preparation

Rehydration

The processing of the C⁺TBA products preserves the natural collagen and maintains a residual moisture of <5%. According to our clinical users rehydration is not necessary and the products are ready for immediate use.



Fixation with osteosynthesis screws

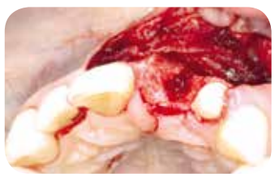


Augmentation with cerabone®

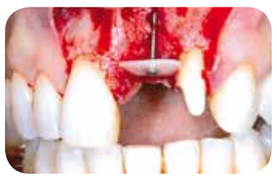
Covering with Jason® membrane and saliva-proof wound closure

CLINICAL CASE BY
Dr. Krzystof Chmielewski, Gdansk, Poland

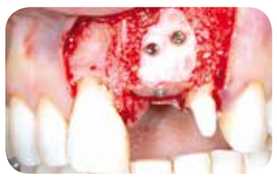
SINGLE TOOTH RESTAURATION WITH MAXGRAFT® CORTICO



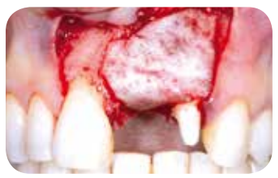
Single tooth defect with severely resorbed vestibular wall



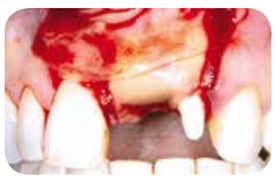
Fixation of maxgraft® cortico using an osteosynthesis screw



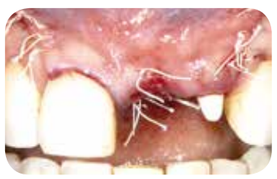
Augmentation with maxgraft®, granules mixed with particulated PRF matrizes and fixation of a second maxgraft® cortico



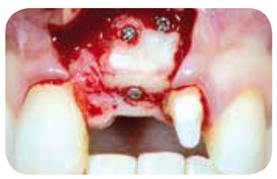
Covering of the augmentation area with Jason® membrane



Covering with a PRF matrix for improved soft tissue healing



Tension-free wound closure

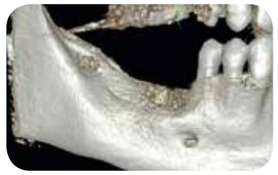


Situation after a healing period of four and a half months

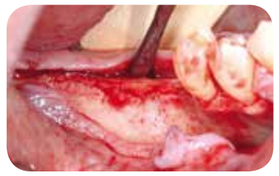
Stable implantation

CLINICAL CASE BY
Dr. Robert Würdinger, Marburg, Germany

THREE-DIMENSIONAL ALLOGENIC BONE AUGMENTATION WITH THE SHELL-TECHNIQUE



Preoperative CBCT-scan; vestibular view

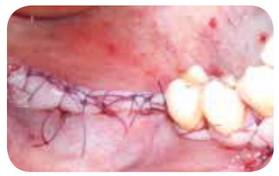


Situation after defect uncovering: careful detachment of the lingual mucosa from the suprahyoid muscles for flap mobilization

Combined horizontal and vertical 3D-bone augmentation with the shell technique. Adaptation of the cortical plates and fixation with 1 mm microscrews

Defect fill and contouring using autologous and allogenic (maxgraft®) particles. Covering of the augmentation site with Jason® membrane

Additional application of L-PRF matrices for improved wound healing



Saliva-tight and tension-free wound closure by a combination of horizontal mattress and single button sutures

Implantation of two Straumann Bone Level Tapered Implants in accordance to the attachment level of the neighboring teeth

Situation after re-entry via stab incision with soft tissue displacement; Straumann Conical Shape 6.5 Height 4 mm

Final dental crowns with provisionary capping of the screw channels

Product Specifications

maxgraft®

Product Specifications

maxgraft® cancellous granules

Art.-No.	Particle Size	Content
30005	< 2.0 mm	1 x 0.5 ml
30010	< 2.0 mm	1 x 1.0 ml
30020	< 2.0 mm	1 x 2.0 ml
30040	< 2.0 mm	1 x 4.0 ml
30030	2.0-5.0 mm	1 x 3.0 ml

maxgraft® blocks

Art.-No.	Dimension	Content
31111	uni-cortical, 10 × 10 × 10 mm	1 × block*
31112	uni-cortical, 20 × 10 × 10 mm	1 × block*
32111	cancellous, 10 × 10 × 10 mm	1 × block
32112	cancellous, 20 × 10 × 10 mm	1 × block

Living donors
*: Organdonors
Tissuebank: Cells+Tissuebank Austria, Krems, Austria

maxgraft® cortico-cancellous granules

Art.-No.	Particle Size	Content
31005	< 2.0 mm	1 x 0.5 ml
31010	< 2.0 mm	1 x 1.0 ml
31020	< 2.0 mm	1 x 2.0 ml
31040	< 2.0 mm	1 x 4.0 ml

Living donors
*: Organdonors

maxgraft® bonebuilder dummy

Art.-No.	Content
32100	Individual 3D-printed model of the patient`s defect and the planned bonebuilder for demonstration purposes made of synthetic filament

maxgraft® bonebuilder

Product Specifications

Art.-No.	Content
PMIa	Individual planning and production of a bone block max. dimensions 23 x 13 x 13 mm
PMIa2	additional block(s) for the same patient

maxgraft® bonering

Product Specifications

maxgraft® bonering 3.3
(Height 10 mm,
recommended for implant diameters from 3.3 - 3.6 mm)

Art.-No.	Dimension	Content
33160	cancellous ring, ø 6 mm	1 x
33170	cancellous ring, ø 7 mm	1 x

maxgraft® bonering 4.1
(Height 10 mm,
recommended for implant diameters from 4.1 mm)

Art.-No.	Dimension	Content
33174	cancellous ring, ø 7 mm	1 x

maxgraft® bonering surgical kit

Product Specifications

Art.-No.	Content
33000	1 x trephine 7 mm 1 x trephine 6 mm 1 x planator 7 mm 1 x planator 6 mm 1 x diamond disc 10 mm 1 x diamond tulip 3 mm

bonering fix

Product Specifications

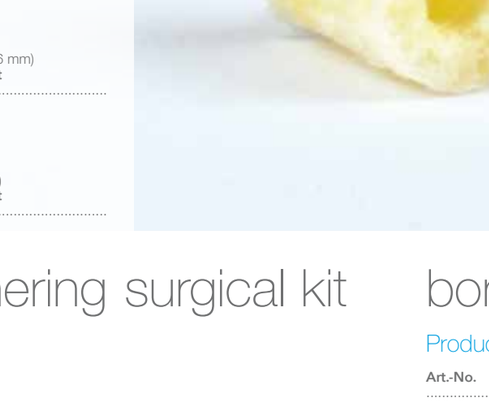
Art.-No.	Content
33010	bonering fix

maxgraft® cortico

Product Specifications

Art.-No.	Dimension	Content
31251	cortical strut, 25 x 10 x 1 mm*	1 x
31253	cortical strut, 25 x 10 x 1 mm*	3 x 1

*: Organdonors



cortico trimmer

Art.-No.	Content
34000	cortico trimmer 1 x

bone & tissue regeneration

botiss biomaterials

Innovation.
Regeneration.
Aesthetics.

soft tissue

education

hard tissue

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Rev.: MGen-07/2018-07