

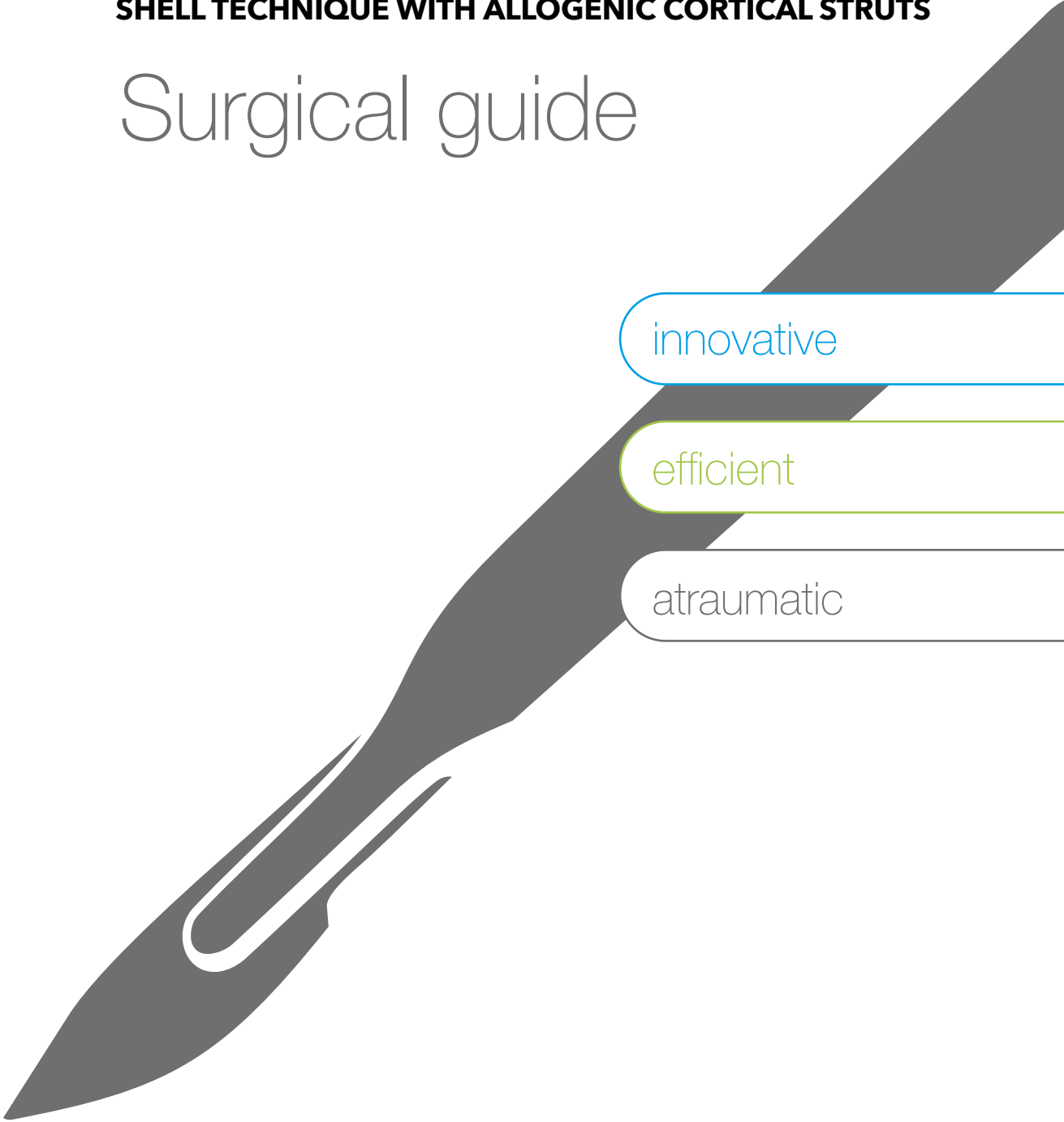


maxgraft[®] cortico

SHELL TECHNIQUE WITH ALLOGENIC CORTICAL STRUTS

Surgical guide

hard tissue



innovative

efficient

atraumatic

Introduction

This surgical guide provides clinically-based information for the correct handling and application of maxgraft® cortico. It was created with the support of renowned clinical experts to assist you in achieving the best possible results.

maxgraft® cortico is a prefabricated bone strut from the human cortical bone of multi-organ donors, that can be used for the shell technique. The concept of the shell technique is the preparation of a biological container, which creates the necessary space for the full incorporation of particulate bone graft material to rebuild new bone for dental implant placement. The technique is also published as cortical lamina technique¹ or framework technique².

maxgraft® cortico was developed to avoid donor-site morbidity and to prevent the time-consuming harvesting and splitting of autogenous intraoral bone blocks. It acts as cortical strut that is firmly integrated for optimal stabilization of the particulate augmentation material that is filled in the gap.

INDICATIONS

Implantology — Oral Surgery — CMF Surgery

- Vertical augmentation
- Horizontal augmentation
- Complex three-dimensional augmentation
- Single tooth gap
- Fenestration defect

Good success rates have been reported in augmentations of horizontal or vertical defects with a width or height of up to 6 mm.

PRODUCT PROPERTIES

- Acellular cortical bone from the femur diaphysis (multi-organ-donors)
- Fully mineralized for natural stability, no flexibility
- Standardized size of 25 x 10 x 1 mm
- 5 years shelf life at room temperature

SPECIFICATIONS

maxgraft® cortico

Art.-No.	Product	Content
31251	cortical strut*, 25 x 10 x 1 mm	1 x

*: multi-organ donors

cortico trimmer

Art.-No.	Product	Content
34000	cortico trimmer	1 x



USE OF MAXGRAFT® CORTICO IN CONJUNCTION WITH OTHER BIOMATERIALS

maxgraft® cortico creates a container that can be filled with various biomaterials. maxgraft® granules with its preserved human collagen provide excellent osteoconductive properties and are characterized by complete remodeling potential. Mixing with autogenous chips and Emdogain® can support a faster ossification. Also, other mixtures of different materials (e.g., bovine or synthetic biomaterials) can be used to fill the gap. The final decision depends on the defect morphology and preferences of the patient and surgeon.

1. Deepika-Penmetsa, S., Thomas, R., Baron, T., Shah, R., & Mehta, D. (2016). Cortical lamina technique: A therapeutic approach for lateral ridge augmentation using guided bone regeneration. *Journal of Clinical and Experimental Dentistry*, 9(1), e21–26.
2. Wallowy, P., & Dorow, A. (2012). Lateral Augmentation of the Maxilla and Mandible Using Framework Technique With Allogeneic Bone Grafts. *The Journal of Oral Implantology*, 38(6), 661–667.

PREOPERATIVE ASSESSMENT AND PRECAUTIONS

Key elements for an optimal surgical procedure and the long-term success of the treatment include:

- Careful patient selection
- Consideration of patient-related factors that may affect bone healing (e.g., diabetes, smokers)
- Consideration of the soft tissue, preoperative soft tissue management may be necessary
- Treatment of any inflammation and infection prior to surgery
- Antibiotic treatment one day before the operation, if necessary
- Comprehensive information of the patient about the treatment plan and origin of the bone substitute materials

Before initial use, courses or hands-on workshops should be attended. Preferably the surgeon has experience in harvesting autogenous bone grafts. The difficulty of the shell technique is increased when the contact to the local bone is diminished or when a second cortical plate is fixed on the opposite side of the ridge.

Surgical procedure

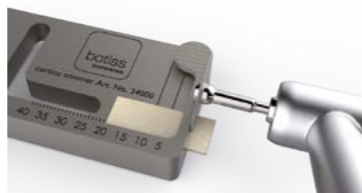
Step 1 FLAP PREPARATION

A flap large enough to allow full access to the entire defect should be raised. Also, adequate revascularization of the particulate bone grafting material is crucial and needs to be ensured. The required size and position of the bone plate can be determined either during the digital planning of the operation or in situ following flap elevation.



Step 2 TRIMMING

By using the cortico trimmer and a rotating diamond disc, maxgraft® cortico is cut to the appropriate size extraorally. The cortico trimmer also facilitates the preparation of the pilot drill holes for the later fixation of the strut to the local bone. By pre-drilling the fixation holes the risk of fracturing maxgraft® cortico can be reduced.



Note: Rehydration of maxgraft® cortico is recommended. It has been shown that rehydration of maxgraft® cortico (10 minutes in saline solution) results in more flexibility and improves the breaking strength of the strut



Step 3 PLACEMENT AND FIXATION

To create a fixed compartment, maxgraft® cortico must be positioned immobile in the adequate distance but still in contact with the local bone. Based on the ideal implant position, the strut should be positioned with at least a 1 mm distance to the implant surface when placed laterally. Tension-free fixation without bending of the strut is highly important.

maxgraft® cortico is completely mineralized and not flexible. When used in the anterior region, the strut can be divided into halves and fixated in two parts.



Note – screws: Pre-drilling is recommended. The drill head must be smaller than the screw diameter (e.g., 1.0 mm drill head with 1.2 mm screw) in order to maintain the stability of the strut. It is recommended to use osteosynthesis screws with a flat head. Titanium screws with a diameter of 1.2 – 1.4 mm and a length of 8 – 11 mm are suitable for most defects.

Self-tapping screws should be avoided as they may result in fracture of the bone plate due to the aggressive thread design. Sinking the screw head into the bone plate should also be avoided as this might result in a loss of stability.



OPTIONAL: GROOVE TECHNIQUE

Experienced surgeons may use the groove technique to improve the primary stability of the strut. An approximately 1 mm wide and straight groove, in which maxgraft® cortico can be positioned before fixation, is cut in the local bone using piezoelectric or rotating instruments.



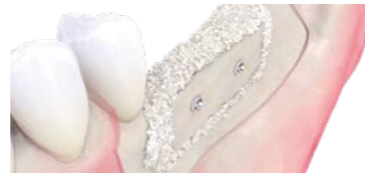
Step 4 ADAPTATION OF THE EDGES

To prevent perforations of the soft tissue, sharp edges need to be removed explicitly, e.g., by using a diamond ball bur. It may also be possible to contour with particulate bone substitute material.



Step 5 **FILLING OF THE DEFECT**

The space between local bone and cortical strut is filled with particulate bone grafting materials. The use of autogenous and allogenic materials is recommended.



Step 6 **COVERAGE BY A BARRIER MEMBRANE**

The augmentation area needs to be covered with a barrier membrane (e.g., Jason® membrane). The barrier membrane prevents the ingrowth of soft tissue into the particulate material.



Step 7 **WOUND CLOSURE**

The suture has to be tension-free and saliva-proof. Proper soft tissue management is crucial for the surgical success. A tension-free wound closure and a sufficient quality of the soft tissue significantly reduce the risk of complications such as dehiscences. An overlapping mobilization of the soft tissue before suturing should be possible.



Tension-free suture technique

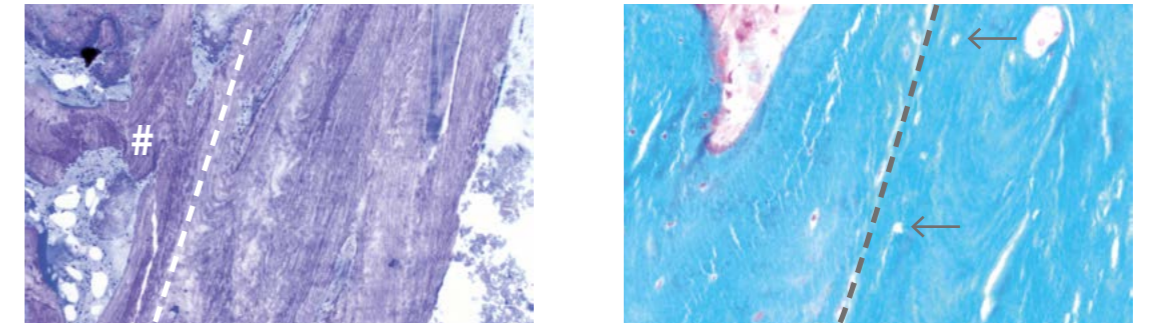
Single knot or continuous (interlocking) sutures should be used for primary closure. Deep apical sutures with elastic Gore-Tex® threads can be used for immobilization of the flaps, eliminating any tension on wound edges, which may lead to dehiscence.

POST-OPERATIVE CARE

- The patient should be instructed not to mechanically irritate the surgical site, e.g., by tooth brushing or chewing hard food, and to report any suspicious events such as soft tissue perforations and wound dehiscence immediately. A post-operative CBCT or X-ray should be considered.
- Sutures should be removed ten days after surgery.
- Arrange further review visits to monitor early wound healing.

HEALING, REMODELING, AND INTEGRATION

Post-operatively, maxgraft® cortico usually gets primarily integrated. Since the bone plate consists of cortical bone, it acts as a resorption protection and is gradually remodeled. Resorption mainly takes place in areas that are located outside the contour. New vital bone is formed directly adjacent to the allogenic plate at the side facing the local bone. When compared to autogenous grafts, maxgraft® cortico shows enduring stability.



The histological images show an integrated maxgraft® cortico bone plate (right side of dashed line) with allogeneic particles (#) stabilized in the container after five months of healing time. maxgraft® cortico is characterized by empty osteocyte lacunae (arrows), whereas the newly generated bone shows a large number of vital osteocytes.

Biopsy provided by Jan Kielhorn (Öhringen, Germany) processed by Prof. Smeets (UKE Hamburg, Germany).

RE-ENTRY AND IMPLANT PLACEMENT

Depending on the location, type, and extent of the defect, the entire healing time is four to six months when using a mixture of allogenic and autogenous bone particles. However, the right time for the re-entry needs to be assessed individually by the surgeon.



The implant has to be anchored securely in the cancellous bone and should not have any contact with the plate.

Complication management

Fracture of the bone plate

maxgraft® cortico is a highly stable bone plate. It has to be fixated free of any movement without excessive pressure or tension. In the unlikely event of a fracture, it must be fixated with an additional screw or replaced by a new bone plate. The use of the cortico trimmer (Art.No. 34000) reduces the risk of a fracture during cutting and extraoral drilling and is ideal for precise adaptation.

Wound dehiscence

maxgraft® cortico is acellular; even exposed maxgraft® cortico is resistant to bacterial degradation. In absence of any kind of signs of infection rinsing with ethacridine lactate (Rinavol®)/H₂O₂ once a week for approximately four to six weeks. Smoothing sharp edges or reducing free-standing parts of the strut below tissue level if possible. Filling the dehiscence gap with Socketol® or, if too shallow, with Solcoceryl® may be beneficial. Continue treatment until secondary wound closure is complete or until healthy tissue conditions are achieved.

Soft tissue perforations

Late soft tissue perforations after normal wound healing: In absence of any signs of infection, reduce sharp edges or remove free-standing parts of the bone plate. maxgraft® cortico does not have to be removed completely. Free parts of the strut may be covered using Solcoceryl®. In the case of irritations of surrounding soft tissue, use rinsing protocol as described above. Soft tissue management may be performed earliest after six weeks if necessary.

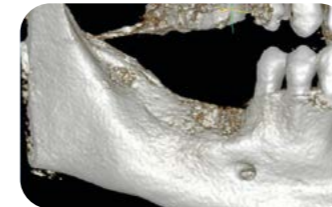
Detached maxgraft®cortico at the time of re-entry

In rare cases, it can occur that the plate is not connected to the bony site and must therefore be removed. The augmentation site is usually fully regenerated.

CLINICAL CASE BY

Dr. Robert Würdinger, Marburg, Germany

COMPLEX THREE-DIMENSIONAL AUGMENTATION



Preoperative CBCT-scan; vestibular view



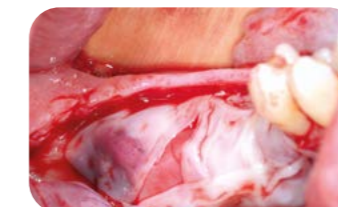
Situation after defect uncovering: careful detachment of the lingual mucosa from the suprahyoid muscles for flap mobilization



Adaptation of the cortical plates and fixation buccally and lingually with 1 mm microscrews



Defect fill and contouring using autogenous 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 knot sutures



Implantation of two implants in accordance to the attachment level of the neighboring teeth



Situation after re-entry via stab incision with soft tissue displacement



Final dental crowns with temporary restoration of the screw channels

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For more clinical cases, videos, and handling tips visit:

INDICATION-MATRIX.COM

CLINICAL CASE BY

Dr. Kai Höckl, Freiburg, Germany

COMBINED DEFECT PALATALLY AND FACIALLY



Clinical situation preoperative



Fixation of maxgraft® cortico facially and palatally



Removal of sharp edges



Filling of the defect with autogenous chips and covering with Jason® membrane



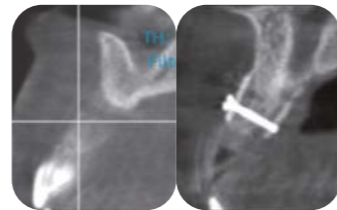
Healing after ten days



Re-entry after five months



Solid integration of maxgraft® cortico and implant placement



Pre- and post-operative CBCT

CLINICAL CASE BY

Dr. Christoph Keller, Stuttgart, Germany

SINGLE TOOTH RESTORATION



Narrow ridge in the molar region



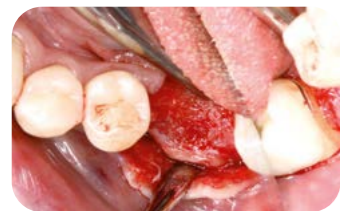
Large buccal bone deficit region



Stable fixation of maxgraft® cortico, note the non-parallel angulation of the screws for improved immobilization



Situation after four months of healing. The defect was previously filled with cancellous allograft particles and covered with a collagen membrane



Solid bone formation

CLINICAL CASE BY

Jan Kielhorn, Öhringen, Germany

FREE-END SITUATION IN THE MANDIBLE



Clinical situation



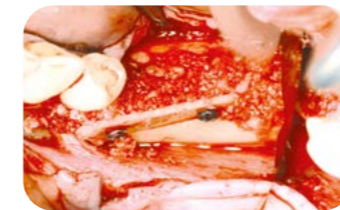
Fixation of maxgraft® cortico, taking into account the bone level of the next tooth and thorough removal of sharp edges



Adequate distance to the local bone, angulated positioning of the screws and application of the groove technique



Mix of allograft and autogenous chips



Filling of the defect



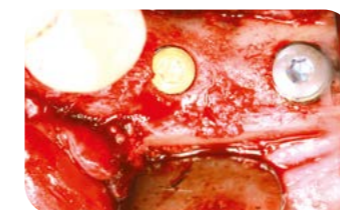
Contouring with particles also outside of maxgraft® cortico to prevent perforations



OPG post-augmentation



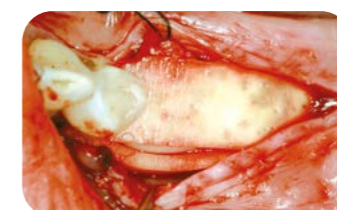
Uneventful soft tissue healing



Implant insertion eight months after augmentation



Covering with PRF matrix



Soft tissue improvement with mucoderm® crestally and laterally



Tension-free wound closure



OPG post-implantation



Emergence profile prior to installation of provisionals



Provisional restoration in place



Innovation.
Regeneration.
Aesthetics.

hard tissue

education

soft tissue

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