mucoderm®

3D-Regenerative Tissue Graft

Handling, Clinical Application and Cases

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Author and co-author of more than 80 scientific publications within the field of periodontology and biomaterials; numerous national and international courses and lectures in the fields of regenerative periodontal therapy and plastic periodontal surgery.

Curriculum Vitae

1994-2000  School of Dental Medicine, Zagreb, Croatia

2000-2001  Dentist in a private practice in Neustadt/Weinstrasse, Germany

2001-2009  Research associate at the Department of Operative Dentistry and Periodontology at the University of Mainz

2001  Dr. med. dent., Department of Operative Dentistry and Periodontology, University of Mainz

2002-2005  Postgraduate Education in Periodontology at the Department of Operative Dentistry and Periodontology at the University of Mainz

2006  Specialist in Periodontology of the German Society of Periodontology (DGP/EFP)

2007  Specialist in Periodontology of the European Dental Association (EDA)

2009  Habilitation (PD) at the Department of Operative Dentistry and Periodontology, University of Mainz

2009  Docent (Associate Professor) degree at the Department of Operative Dentistry and Periodontology at the University of Mainz
mucoderm® is a 3D collagen tissue matrix derived from porcine dermis that passes through a multi-step cleaning process which removes all potential tissue rejection components from the dermis. This results into a three-dimensional stable matrix consisting of collagen and elastin. mucoderm® supports revascularization, fast soft tissue integration, and is a valid alternative for the patients own soft or connective tissue grafts.

After placement, the patient’s blood infiltrates the mucoderm® graft through the three-dimensional soft tissue network, bringing host cells to the soft tissue graft surface and starting the revascularization process. Significant revascularization can begin after implantation, depending on health condition of the patient as well as other biological and non-biological factors.

Natural 3D collagen tissue structure

mucoderm® matrix is made of pure porcine collagen without artificial cross-linking or additional chemical treatment. SEM pictures of mucoderm® show its rough and open-porous collagen structure that guide soft tissue cells and blood vessels.

Properties & Advantages

- Native collagen matrix
- Guided vascularization and integration
- Soft tissue graft without the need for autograft harvesting
- Complete remodeling into patient’s own tissue in ~6-9 months
- Thickness ~1.2 - 1.7 mm
- Rapid rehydration
- Easy handling, application and fixation

Product Specifications

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Histology of mucoderm® 6 months after implantation: optimal integration and no inflammatory reaction

Porous structure of mucoderm® surface enables ingrowth of micro vessels and soft tissue cells

Corrosion preparation showing vascular network running through the mucoderm® matrix

Compact collagen structure

Histology of mucoderm® 6 months after implantation: optimal integration and no inflammatory reaction

mucoderm® available sizes
Scientific Results

Biocompatibility proved by MTT in vitro viability assay testing*

The viability assay proved high biocompatibility of the mucoderm® 3D collagen matrix.

Beginning with day 6, the MTT viability assay demonstrated a significantly higher viability of gingival fibroblasts, endothelial cells and osteoblasts on mucoderm® in comparison with the control group (p<0.05).

Gingival fibroblasts on mucoderm®

HLVEC cells on mucoderm®

Osteoblasts on mucoderm®

Subcutaneous implantation into mice demonstrated good tissue integration and revascularization of mucoderm®*

Microvessel staining revealed good revascularization with many in-sprouting blood vessels (lower left image). In addition, specific staining of cells undergoing mitosis, indicated a high proliferation and migration of cells within the matrix (lower middle and right image). Ingrowth of blood vessel and cells is a prerequisite for incorporation and remodelling of mucoderm®.

SEM examination of mucoderm® shows the monolayered matrix and its homogenous and open porous collagen structure that facilitate flow of nutrients and migration of cells, and subsequent integration of the mucoderm®.

Application of mucoderm® for the treatment of gingival recession defects

Gingival recession defects are not only an aesthetic problem, but can also lead to clinical problems such as root hypersensitivity, cervical root caries and root abrasion. Today, autologous connective tissue transplants are considered the “gold standard” for treatment of periodontal recessions, although harvesting is often painful for the patient. The application of a regenerative tissue graft saves the patient from autologous connective tissue harvesting, thereby enhancing patient acceptance of the surgical procedure.

The correct application and handling of the graft material is a prerequisite to obtain predictable and optimal aesthetic and clinical results.

The following application guidelines are based on clinical results and were developed together with Dr. Adrian Kasaj, specialist for Periodontology at the Department of Operative Dentistry and Periodontology at the University of Mainz.

Selection of patients
mucoderm® offers a safe and effective alternative for the coverage of recession defects, especially when patients don’t agree with palatal autograft harvesting. Nevertheless, expectations concerning the clinical and aesthetic outcome of the surgery should be considered carefully and discussed with the patient. The patient compliance with the post-operative treatment plan, as well as an unimpaired or controlled state of health, is indispensable for the success of the treatment.

Product Specifications
Independent of the applied technique, the clinical success of the treatment of Miller class I and II defects is more predictable than for class III and IV defects. In principle, a complete recession coverage could only be obtained for Miller class I and II defects. Likewise, predictability and success is better for the treatment of defects in the maxilla as compared to mandibular defects. mucoderm® can be used in combination with all mucogingival surgery techniques including coronally advanced flap and envelope technique.

Post-operative treatment
After surgery it is necessary to avoid any mechanical trauma of the treated site. Patients should be instructed not to brush their teeth at the respective side for 4 weeks following surgery. Plaque prevention can be achieved by mouth rinsing with a 0.2% chlorhexidine solution. Post-operatively, the patient should be seen every week for plaque control and to evaluate healing.
Handling of the mucoderm® matrix

General product handling

Rehydration
A sufficiently long rehydration of the mucoderm® prior to application is necessary. Rehydration should be performed in sterile saline solution or blood for 5-20 minutes maximum, depending on the desired flexibility of the matrix (the flexibility of the mucoderm® graft increases with prolonged rehydration time) and the technique used.

Trimming
The size and shape of the matrix should be adapted to the defect size. After rehydration mucoderm® can easily be trimmed to the desired size with a scalpel or scissors. Cutting or rounding the edges of a mucoderm matrix that has been rehydrated shortly prevent perforations of the gingival tissue during flap closure.

For the coverage of multi-recession defects, an extension of the mucoderm® is possible by cutting the matrix on alternating sides (mesh-graft-technique) and pulling to extend it.

Exposure
When mucoderm® is used for the treatment of gingival recessions an exposure of the matrix should always be avoided. Make sure that the repositioned flap completely covers the mucoderm® matrix. Achieving primary closure over the mucoderm® graft allows blood vessels to penetrate and incorporate the soft tissue graft material. Exposure can lead to soft tissue graft failure.

Fixation
When a split-thickness flap is used, a close contact between the periosteal wound bed and the immobilized mucoderm matrix should be ensured by suturing the matrix to the intact periosteum using single-interrupted- or crossed sutures.

Suturing
Flaps should always be sutured tension free.

Handling Tips

Rehydration
- from 5 to 20 minutes

Trimming
- use of scalpel or scissors to cut the desired shape

Exposure
- for recession coverage exposure of the mucoderm® graft should always be avoided

Fixation
- try to suture the mucoderm® to avoid micro movements

Trimming of mucoderm® with a scalpel

Perfect handling of mucoderm® after rehydration with blood

mucoderm® trimmed for application with the mesh-graft-technique
Indications

Periodontology
mucoderm® is indicated for use in guided tissue regeneration procedures, in periodontal and soft tissue recession defects. The graft can be applied in combination with
- Coronal advanced flap
- Laterally advanced flap
- Envelope technique
- Tunnel technique

Implantology, Oral Surgery & CMF
Further fields of application for mucoderm® are
- Soft tissue augmentation/ thickening
- Augmentation of attached gingiva (substitute for free gingival graft)
- Covering of implants placed in immediate or delayed extraction sockets
- Localized ridge augmentation for later implantation
- Alveolar ridge reconstruction for prosthetic treatment

Application of mucoderm®
by the Mesh-Graft Technique

For multiple recessions where the length of the graft is not sufficient, the mucoderm® matrix can be extended by the mesh-graft-technique. The technique involves cutting the mucoderm® matrix on alternating sides and pulling to elongate it.

Multiple gingival recessions at teeth 21, 22 and 23 before treatment with mucoderm®
mucoderm® is cut on alternating sides to extend the matrix for covering of all recessed roots
A partial-thickness flap is prepared and the cut-to-size mucoderm® is placed over the denuded roots; the flap is repositioned over the graft and sutured

Good soft tissue situation and coverage of the tooth roots 10 days after surgery
3 months post-op: significant coverage of tooth roots and increased thickness of the marginal tissue
Clinical Cases mucoderm®

Recession Coverage with the Coronally Advanced Flap Technique

Schematic drawing of the application of mucoderm® by Coronally Advanced Flap Technique

Clinical view of root recession before mucoderm® placement
Preparation of a split flap by a sulcular and two vertical releasing incisions
mucoderm® cut-to-shape and placed over the root
Gingival tissue coronally repositioned, fully covering the mucoderm®, and sutured in place

Treatment of a single recession with mucoderm® by Coronally Advanced Flap Technique

Gingival recession at tooth 43 before the treatment with mucoderm® matrix
Preparation of a split flap with two vertical releasing incisions and placement of the mucoderm® over the denuded root
The flap is coronally repositioned and sutured over the mucoderm and the underlying tooth root
Clinical situation 6 weeks post-op showing significant root coverage and thickening of the marginal tissue

Treatment of multiple recessions and soft tissue thickening with mucoderm® by Coronally Advanced Flap Technique

Gingival recessions at teeth 23, 24 and 25 before treatment with mucoderm®
Preparation of a coronally advanced flap
Placement of mucoderm® over the denuded roots
Situation 12 weeks post-op: coverage of roots and clear thickening of the marginal tissue
Recession Coverage with the modified Coronally Advanced Flap Technique (Zucchelli technique)

**Clinical view of root recession before mucoderm® placement**

**Papillary incisions approximately 3mm apical to the tip of the papilla**

**Graft is inserted under the intact papilla**

**Flap positioned completely over the graft and held in place with individual sling sutures**

Multiple gingival recessions at teeth 12, 13 and 14 before treatment with mucoderm®

A sulcular incision from tooth 11 to 15 is made and a split-thickness flap is raised

mucoderm® is rehydrated, trimmed and placed over the denuded roots

The flap is coronally repositioned over the root surfaces and the mucoderm® matrix

3 months post-op: significant coverage of roots and increased thickness of marginal tissue

Clinical situation 18 months post-op

**Handling Tips**

- Contact of mucoderm® with the periosteal wound bed and immobilization should be ensured by suturing the matrix to the periosteum using single-interrupted- or all-crossed sutures

- Cutting the edges of a shortly rehydrated matrix prevent damage of the gingival tissue during flap closure
Recession coverage with mucoderm® by tunneling techniques

Recession Coverage with the Envelope Technique

Clinical situation 3 months after mucoderm® treatment showing significant root coverage and increased thickness of the marginal tissue

A subepithelial pouch is prepared by a partial thickness incision; mucoderm® is placed under the pouch

Handling Tips
- For the tunnel technique a prolonged, 10-20 min, rehydration time of the mucoderm® is recommended.
- Fixation of the matrix by single-interrupted- or all-crossed sutures is required

Covering of multiple recessions with mucoderm® by the Tunnel Technique

Clinical view before treatment with mucoderm®; gingival recessions at teeth 23 and 24

Preparation of roots by scaling and planning with sonic scaler

Conditioning of roots with 24% EDTA gel for 2 min

Sulcular incisions around teeth 22 to 25 are made and a partial-thickness dissection is performed by undermining the papillae using tunneling instruments

Rehydrated and trimmed mucoderm® is checked to fit into the defect; mucoderm® is placed over the roots by pulling it through the tissue tunnel

The flap is repositioned over the mucoderm® matrix and sutured

3 months post-op: previously exposed roots are significantly covered, in addition the thickness of the marginal tissue has increased

Clinical situation 12 months post-op
Innovation.
Regeneration.
Aesthetics.

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