straumann
simply doing more

dental
bone & tissue
regeneration

botiss
biomaterials

mucoderm®

3D-Regenerative Tissue Graft

Handling, Clinical Application and Cases

by PD Dr. med. dent. Adrian Kasaj

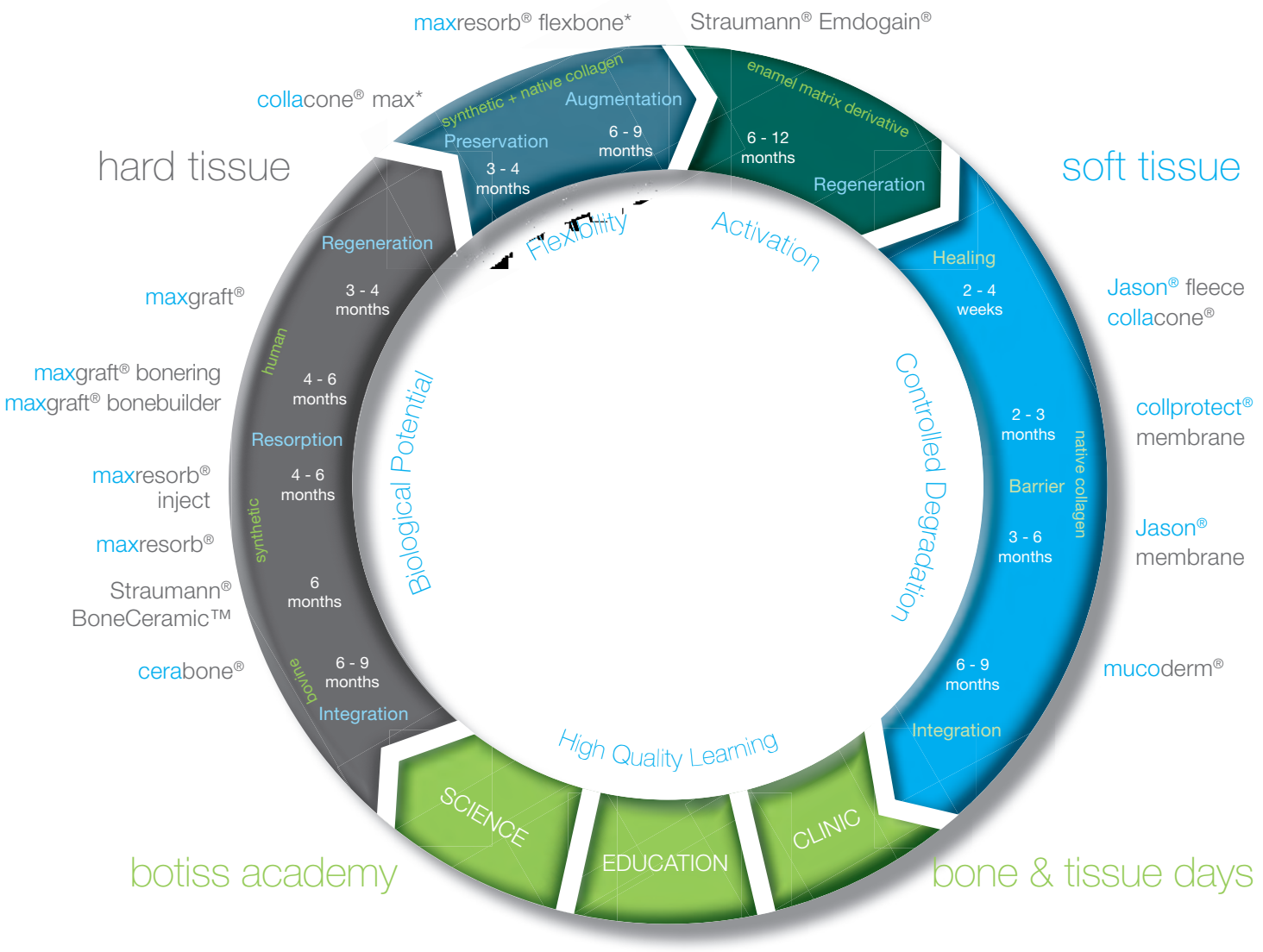
soft tissue

native

stable

3-dimensional

botiss regeneration system



cerabone®

Natural bovine bone graft

Straumann® BoneCeramic™

Synthetic biphasic calcium phosphate

maxresorb®

Synthetic biphasic calcium phosphate

maxresorb® inject

Synthetic injectable bone paste

maxgraft® bonebuilder

Patient matched allogenic bone implant

maxgraft® bonering

Processed allogenic bone ring

maxgraft®

Processed allogenic bone graft

collacone® max*

Cone (CaP / Collagen composite)

maxresorb® flexbone*

Flexible block (CaP / Collagen composite)

Straumann® Emdogain®

Enamel matrix derivative

Jason® fleece / collacone®

Collagenic haemostypt (Sponge / Cone)

collprotect® membrane

Native collagen membrane

Jason® membrane

Native pericardium GBR / GTR membrane

mucoderm®

3D-stable soft tissue (Collagen) graft

* Coming soon

PD Dr. med. dent.
Adrian Kasaj

Specialist in Periodontology
Department of Operative Dentistry and Periodontology
at the University of Mainz

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.

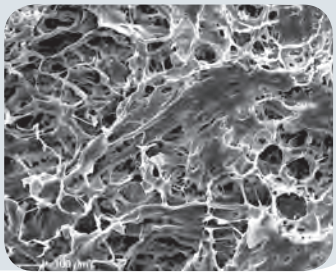
PD Dr. med. dent. Adrian Kasaj

Curriculum Vitae

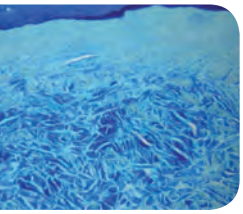
1994-2000	School of Dental Medicine, Zagreb, Croatia
2000-2001	Dentist in a private practice in Neustadt/Weinstrasse, Germany
2001-2009	Research associate at the Department of Operative Dentistry and Periodontology at the University of Mainz
2001	Dr. med. dent., Department of Operative Dentistry and 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®
Soft Tissue Graft

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.

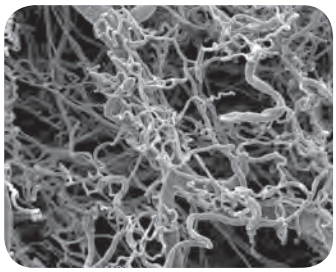


Porous structure of mucoderm® surface enables ingrowth of micro vessels and soft tissue cells



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

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.

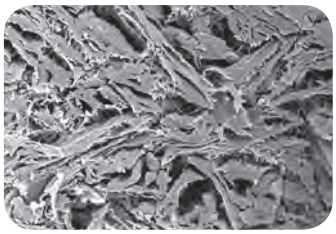


Corrosion preparation showing vascular network running through the mucoderm® matrix

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.

Compact collagen structure



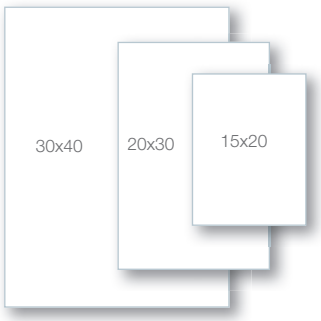
Properties & Advantages

- 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

mucoderm®

Art.-No.	Size	Content
701520	15x20mm	1 x
702030	20x30mm	1 x
703040	30x40mm	1 x

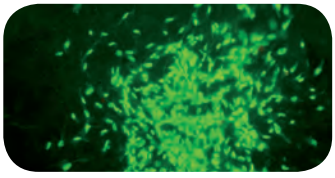


mucoderm® available sizes

Scientific Results

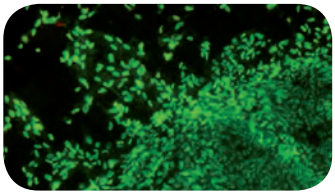
Biocompatibility proved by MTT in vitro viability assay testing*

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

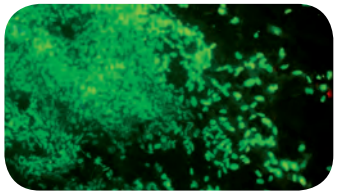


Gingival fibroblasts on mucoderm®

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 ($p<0.05$).

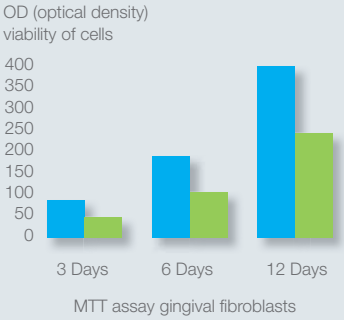


HUVEC cells on mucoderm®

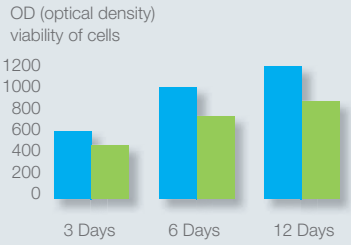


Osteoblasts on mucoderm®

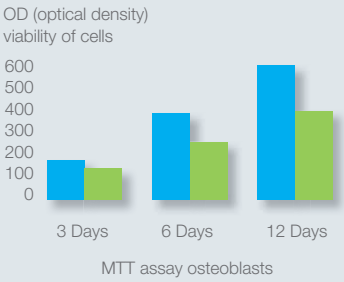
In vitro testing



MTT assay gingival fibroblasts

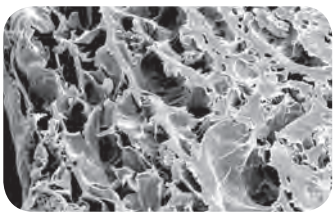


MTT assay endothelial cells



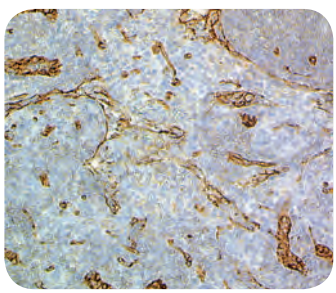
MTT assay osteoblasts

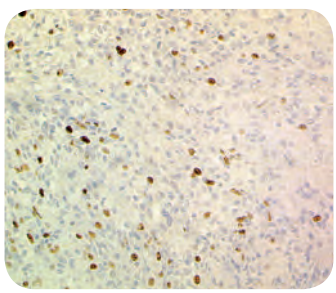
Subcutaneous implantation into mice demonstrated good tissue integration and revascularization of mucoderm®*

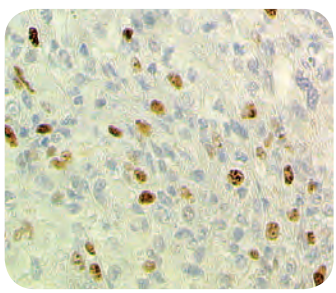


SEM examination of mucoderm® shows the monolayered matrix and its homogenous and open porous collagen structure that facilitate flow of nutrients and migration of cells, and subsequent integration of the mucoderm®.

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®.



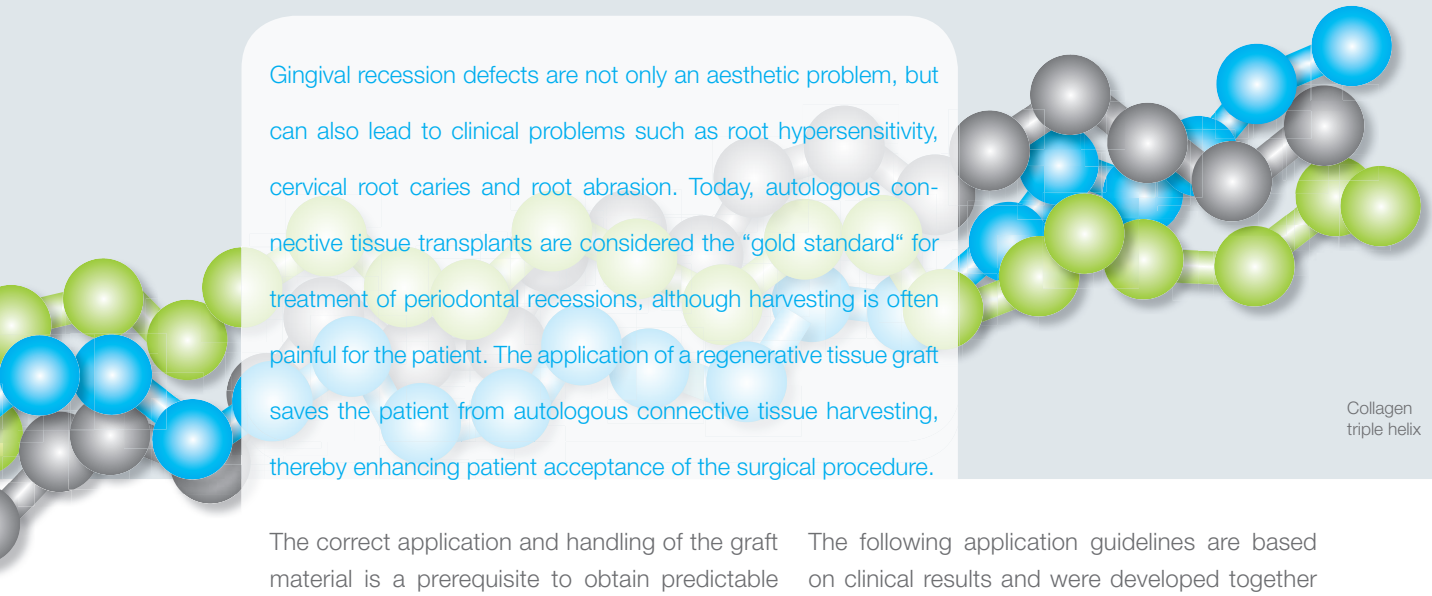




* Pabst AM, Happe A, Callaway A, Ziebart T, Stratul SI, Ackermann M, Konerding MA, Willershausen B, Kasaj A.
In vitro and in vivo characterization of porcine acellular dermal matrix for gingival augmentation procedures. J Periodontal Res. 2013 Jul 1.

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.



Collagen triple helix

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 increase with prolonged rehydration time) and the technique used.

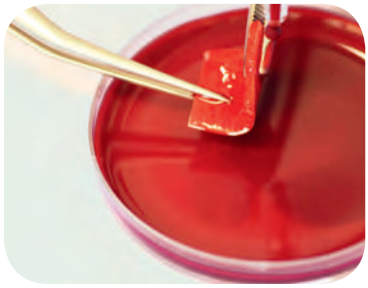
Trimming

Trimming of mucoderm® with a scalpel

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. Eearly exposure can lead to soft tissue graft failure.



Perfect handling of mucoderm® after rehydration with blood

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.

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

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

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

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

- Coronally advanced flap
- Laterally advanced flap
- Envelope technique
- Tunnel technique

Implantology, Oral Surgery & CMF

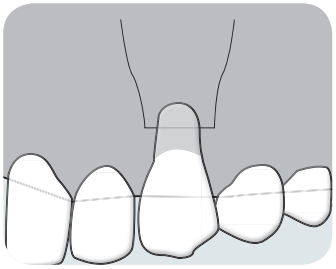
Further fields of application for mucoderm® are

- 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

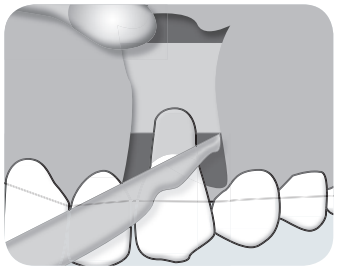
Clinical Cases mucoderm®

Recession Coverage with the Coronally Advanced Flap Technique

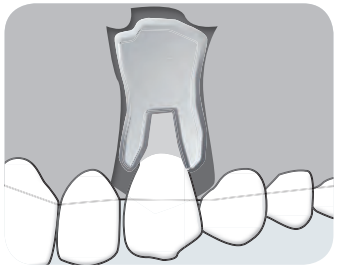
Schematic drawing of the application of mucoderm® by Coronally Advanced Flap Technique



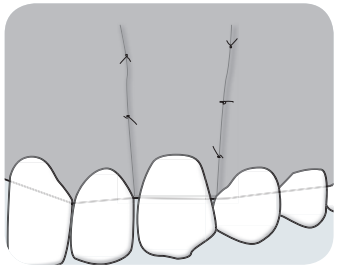
Clinical view of root recession before mucoderm® placement



Preparation of a split flap by a sulcular and two vertical releasing incisions



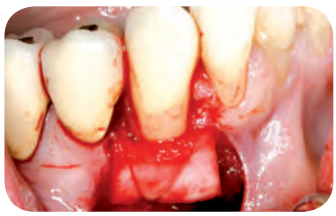
mucoderm® cut-to-shape and placed over the root



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

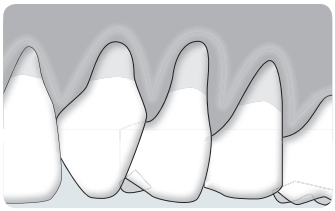
Placement of mucoderm® over the denuded roots

Situation 12 weeks post-op: coverage of roots and clear thickening of the marginal tissue

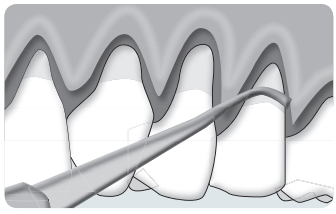
Clinical Cases mucoderm®

Recession Coverage with the modified Coronally Advanced Flap Technique (Zucchelli technique)

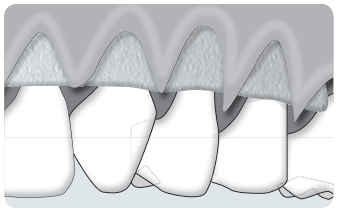
Schematic drawing of the application of mucoderm® by a modified Coronally Advanced Flap Technique



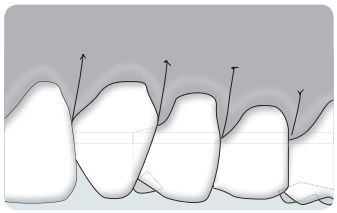
Clinical view of root recession before mucoderm® placement



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

Recession coverage with mucoderm® by a modified Coronally Advanced Flap Technique

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

Clinical Cases mucoderm®

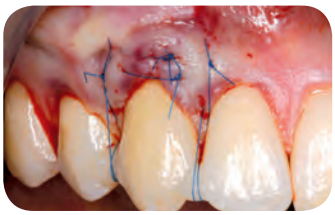
Recession coverage with mucoderm® by tunneling techniques

Recession Coverage with the Envelope Technique

Gingival recession at tooth 13 before the treatment with mucoderm® matrix; FST of a previous surgery for root coverage visible

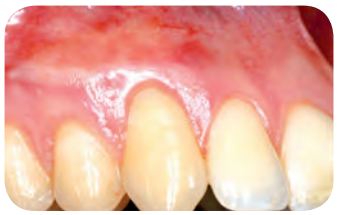
mucoderm® is rehydrated and cut to shape for placement over the root

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



After positioning of mucoderm® the flap is fixed so that it completely covers the graft

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



Situation after gingival plastic for leveling of the FST

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

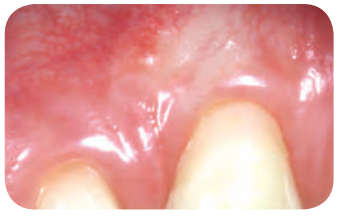
Conditioning of roots with 24% EDTA gel for 2 min

Sulcular inscisions 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

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Krokslätts Fabriker 45
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Tel: +46 31 708 75 00
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Straumann A/S
Post boks 1751, Vika
0122 Oslo
Tel: +47 23 35 44 88
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Straumann B.V.
Einsteinweg 15
Postbus 338
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Straumann SA/NV
Belgicastraat 3 Box 3
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Tel: +32 2 790 10 00
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Straumann s.r.o.
Na Žertvách 2196
180 00 Prague 8
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Tel.: +420 284 094 650
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Straumann UK
3 Pegasus Place
Gatwick Road
West Sussex
Crawley RH10 9AY
Tel: +44 1293 65 12 30
Fax +44 1293 65 12 39
www.straumann.co.uk

botiss dental GmbH
Uhlandstraße 20-25
10623 Berlin / Germany

Fon +49 30 20 60 73 98 30
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