dental
bone & tissue
regeneration

botiss
biomaterials

mucoderm®

3D-Regenerative Tissue Graft

Handling, Clinical Application and Cases

by PD Dr. med. dent. Adrian Kasaj and Dr. Krzysztof Chmielewski

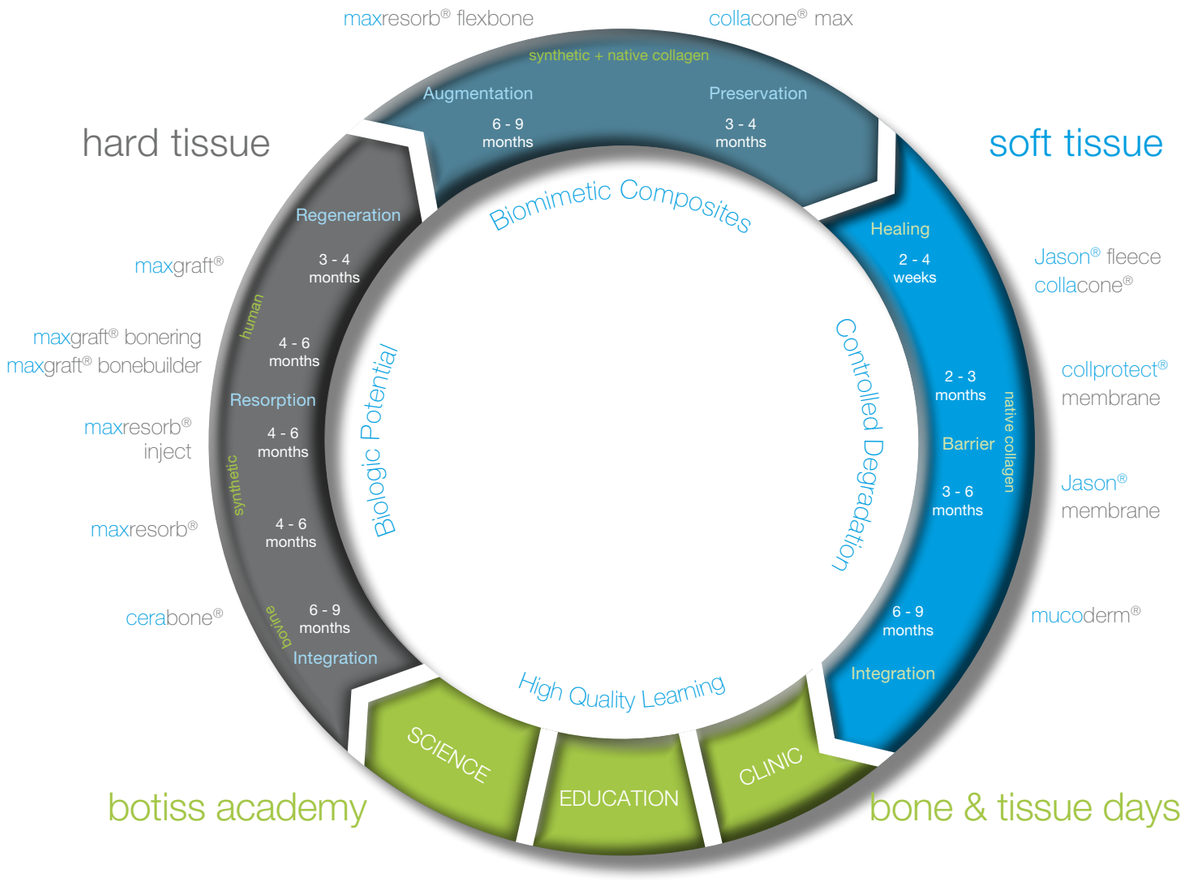
soft tissue

native

stable

3-dimensional

botiss regeneration system



cerabone®

natural bovine bone graft

maxresorb®

bi-phasic calcium phosphate

maxresorb® inject

synthetic injectable bone paste

maxgraft®

processed allogenic bone graft

maxgraft® bonering

processed allogenic bone rings

maxgraft® bonebuilder

patient matched allogenic bone implants

maxresorb® flexbone

flexible blocks (CaP/collagen composite)

collacone® max

cone (CaP/collagen composite)

mucoderm®

3D-stable soft tissue (collagen) graft

Jason® membrane

native pericardium GBR/ GTR membrane

collprotect® membrane

native collagen membrane

Jason fleece® collacone®

collagenic haemostypt (sponge/cone)

PD Dr. med. dent. Adrian Kasaj

Specialist in Periodontology

Department of Operative Dentistry and Periodontology at the University of Mainz

Curriculum Vitae

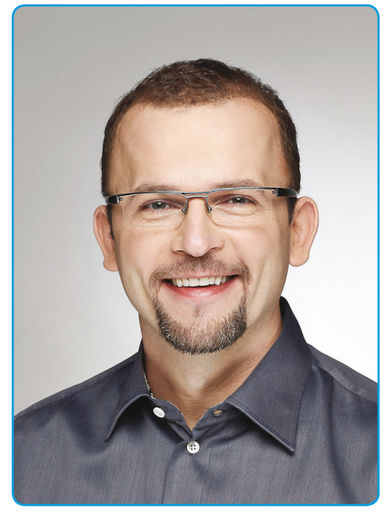
1994-2000	School of Dental Medicine, Zagreb, Croatia
2000-2001	Dentist in a private practice in Neustadt/Weinstrasse, Germany
2001-2009	Research associate at the Department of Operative Dentistry and Periodontology at the University of Mainz
2001	Dr. med. dent., Department of Operative Dentistry and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

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.

Dr. Krzysztof Chmielewski

President of Polish Academy of Esthetic Dentistry

Curriculum Vitae



Graduated 1993 Medical University in Gdansk. From 1996 runs his own private practice focused on esthetic treatment and implantology.

“Master of Science in Oral Implantology” at W.Goethe University in Frankfurt am Main.

Graduate of J.Kois in Seattle.

Gives lectures during Curriculum of Implantology Program at W.Goethe University in Frankfurt am Main.

International speaker in the field of implantology, esthetic treatment and dental photography.

Freelance photographer and filmmaker.

mucoderm® Soft Tissue Graft

mucoderm® is a 3D collagen tissue matrix derived of 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 and fast soft tissue integration and is a valid alternative for 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 the patient‘s healthy structure and other biologic or non-biologic 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.

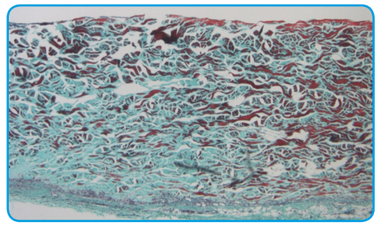
Properties & Advantages

- Natural collagen matrix
- Guided vascularization and integration
- Soft tissue graft without the need for autograft harvesting
- Remodeling into patients own tissue
- Resorption time ~6 - 12 months
- Thickness ~1.2 - 1.7 mm
- Malleable (wet and dry)
- Rapid rehydration
- Easy handling, application and fixation

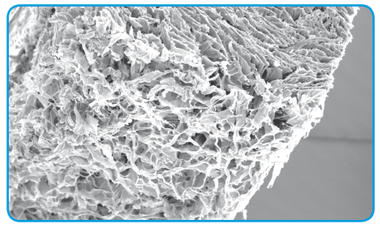
Product Specifications

mucoderm®

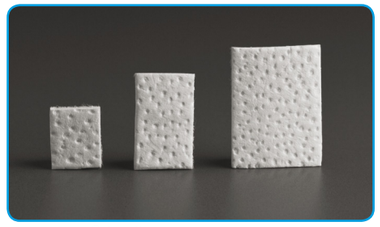
Article No.	Size	Content
701520	15x20mm	1 piece
702030	20x30mm	1 piece
703040	30x40mm	1 piece



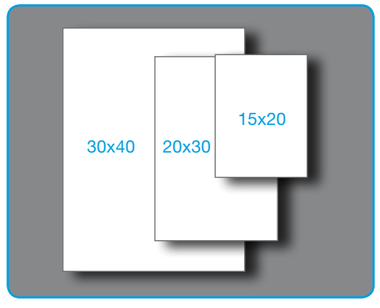
mucoderm® histology after 3 months; good revascularization



SEM of mucoderm®



mucoderm® family

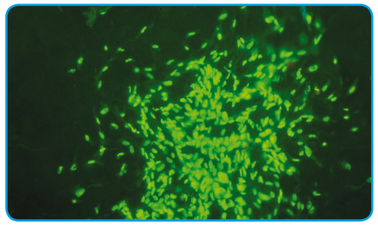


mucoderm® available sizes

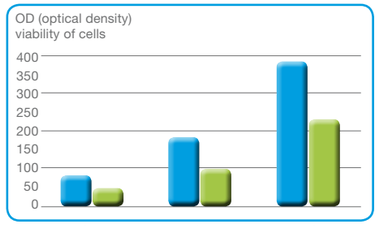
mucoderm® packaging

Scientific Results

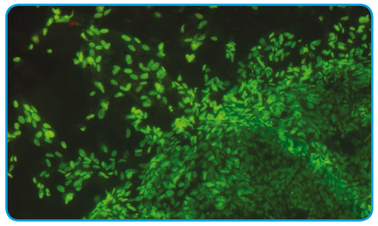
Biocompatibility proved by MTT in vitro viability assay testing



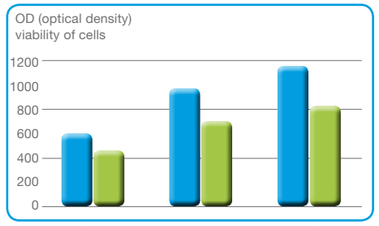
Gingival fibroblasts on mucoderm®



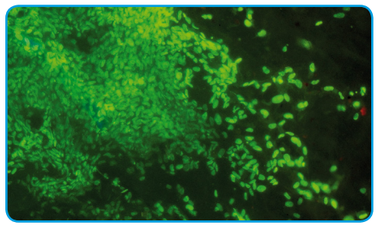
MTT assay gingival fibroblasts



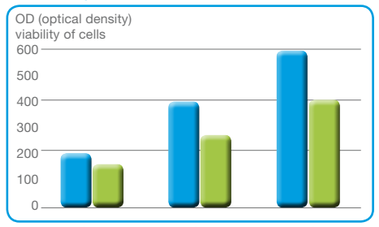
HUVEC cells on mucoderm®



MTT assay endothelial cells



Osteoblasts on mucoderm®



MTT assay osteoblasts

The viability assay prooved 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 ($p<0.05$).

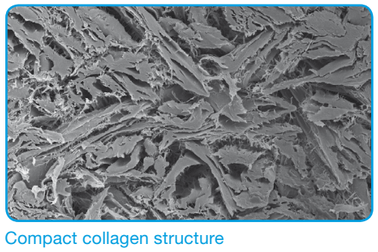
mucoderm®

control

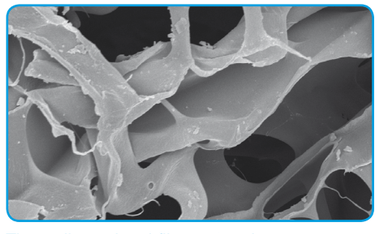
Scanning Electron Microscope Pictures

Natural 3D collagen network of mucoderm®

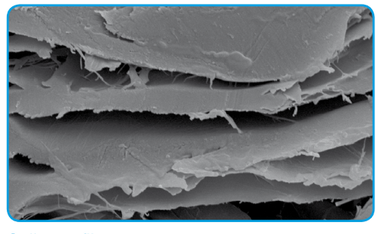
The natural collagen structure of mucoderm® absorbs quickly fluids/blood, with blood clot stabilization, promotes the formation and direction of new blood vessels, and allows fast tissue integration within the collagen matrix.



Compact collagen structure



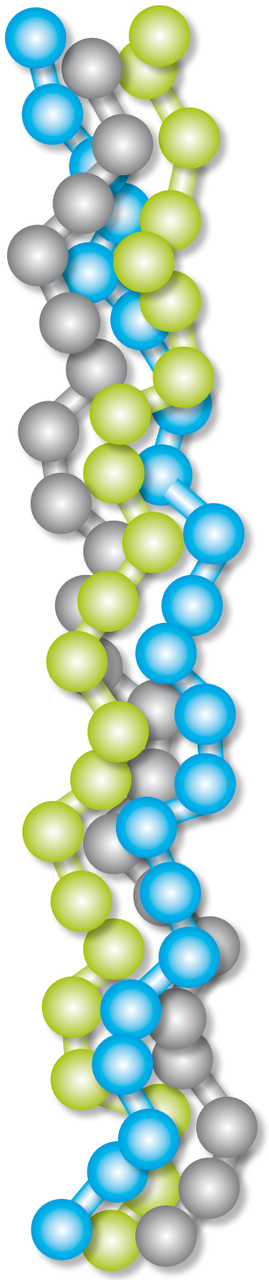
Three-dimensional fibre network



Collagen fibres

Application of mucoderm®

for the treatment of gingival recession defects



Collagen triple helix

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 as the “gold standard“ for the treatment of periodontal recessions, although harvesting is often painful for the patient.The application of a regenerative tissue graft spares the patient from autologous connective tissue harvesting, therefore often enhancing the patients 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 PD 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 about the clinical and aesthetic outcome of the surgery should be considered carefully and discussed with the patient. Patients compliance with the post-operative treatment plan as well as an unimpaired or controlled state of health are indispensable for the success of the treatment.

Product Specifications

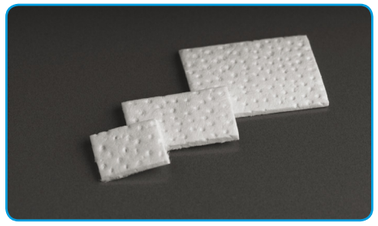
Independent of the applied technique, the clinical success of the treatment of Miller class I and II defects is more predictable than for class III and IV defects. In principle, a complete recession coverage could only be obtained for Miller class I and II defects. Likewise, predictability and success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

Post-operative treatment

After the 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. A plaque prevention can be achieved by mouthrinsing with a 0.2% chlorhexidine solution. The patient should be seen postoperative every week to evaluate healing and plaque control.

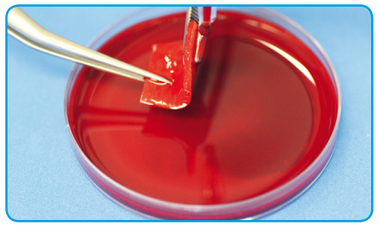
Handling of the mucoderm® matrix

General product handling



mucoderm® matrix, 3 sizes available

mucoderm® rehydrated with sterile saline



Perfect handling of mucoderm® after rehydration with blood

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

Rehydration

A sufficiently long rehydration of the mucoderm® prior to application is necessary. Rehydration should be performed in sterile saline or blood for 5 to maximally 15 minutes, depending on the applied technique and desired flexibility of the matrix (the longer the rehydration time the higher the flexibility of the mucoderm® graft).

Trimming

The form and size 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. When the mucoderm® matrix is only shortly rehydrated, cutting or rounding the edges can prevent a damage of the gingival tissue after flap closure.

For the coverage of multirecession defects an extension of the mucoderm® is possible by cutting the matrix alternating on both sides (mesh-graft-technique) and pulling it longer.

Exposition

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

Fixation

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

Suturing Flaps should always be sutured tension free.

Highlights Handling

Rehydration - from 5 to 15 minutes

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

Exposure - exposition of the mucoderm® graft should always be avoided

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

Special Handling

Dr. Adrian Kasaj, University of Mainz/Germany
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 mucoderm® can be cut alternating on both sides and can then be pulled longer.

Multiple gingival recessions at teeth 21, 22 and 23 before treatment with mucoderm®

mucoderm® is cut alternating on both sides to extend the matrix for covering of all recessed roots

A partial-thickness flap is prepared and the cut mucoderm® is placed over the denuded roots; the flap is repositioned over the graft and sutured

Good soft tissue situation and cover-age of the tooth roots 10 days after surgery

3 months post-op: significant cover-age of tooth roots and increase in 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

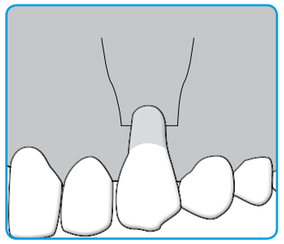
Implantology, Oral Surgery & CMF

Further fields of application for mucoderm® are

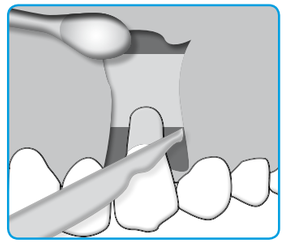
- Soft tissue augmentation/ thickening
- Covering of implants placed in immediate or delayed extraction sockets
- Localized ridge augmentation for later implantation
- Alveolar ridge reconstruction for prosthetic treatment

The Application of mucoderm® in the treatment of gingival recessions

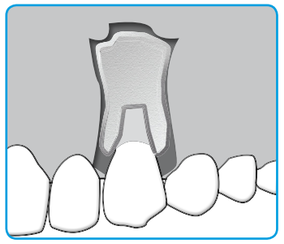
Recession Coverage with the Coronally Advanced Flap Technique
Schematic drawing of the application of mucoderm® by a Coronally Advanced Flap



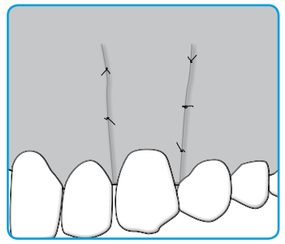
Clinical view of root recession before mucoderm® placement



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



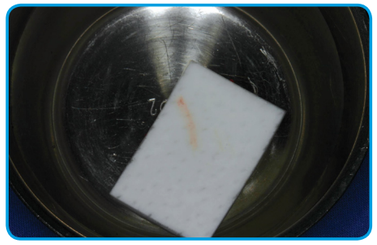
mucoderm® shaped and cut and placed over the root



Gingival tissue coronally repositi-oned, covering mucoderm® and sutured in place

Dr. Adrian Kasaj, University of Mainz/Germany
Treatment of a single recession with mucoderm® by a Coronally Advanced Flap

Gingival recession at tooth 43 before the treatment with mucoderm® matrix



Rehydration of the mucoderm® matrix with sterile saline

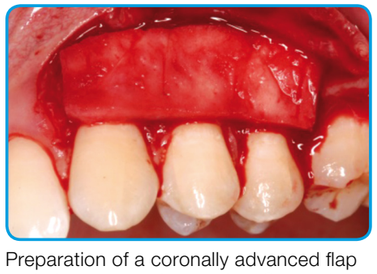
Preparation of a split flap with two vertical releasing incisions and placement of the mucoderm® over the denuded root

The flap is coronally repositioned over the tooth root and the mucoderm® and final suturing

Clinical situation 6 weeks post-op show-ing significant root coverage and thicke-ning of the marginal tissue

Dr. Adrian Kasaj, University of Mainz/Germany
Clinical Case: Treatment of multiple recessions and soft tissue thickening with muco-derm® by a Coronally Advanced Flap

Gingival recession at teeth 23, 24 and 25 before the treatment with mucoderm® matrix



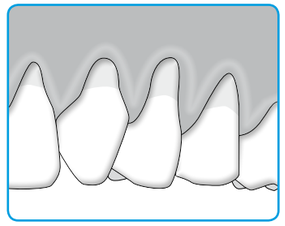
Preparation of a coronally advanced flap and placement od mucoderm® over the denuded roots

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

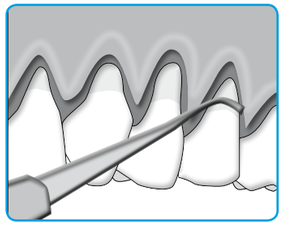
Recession Coverage with the modified Coronally Advanced Flap Technique

(by Zuchelli)

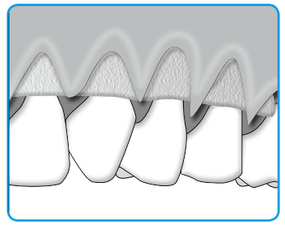
Schematic drawing of the application of mucoderm® by a modified Coronally Advanced Flap



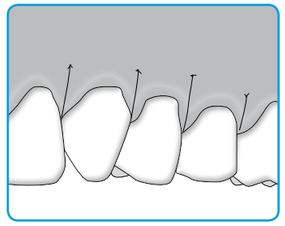
Clinical view of root recession before mucoderm® placement



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

Dr. Adrian Kasaj, University of Mainz/Germany

Recession coverage with mucoderm® by a modified Coronally Advanced Flap

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 and trimmed and placed over denuded roots

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

3 months post-op: significant coverage of roots and increase in thick-ness of marginal tissue

Handling tips

- contact of mucoderm® with the periosteal wound bed and immobilization should be ensured by suturing the matrix with the periosteum using single-interrupted sutures or all-crossed sutures
- when the matrix is only shortly rehydrated, cutting the edges can prevent damage of the gingival tissue after flap closure

Dr. Adrian Kasaj, University of Mainz/Germany

Recession Coverage with the Envelope Technique

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

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 muco-derm® treatment showing significant root coverage and increased thickness of the marginal tissue

Situation after gingival plastic for level-ing of the FST

Dr. Adrian Kasaj, University of Mainz/Germany

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 planning with sonic scaler and conditioning of roots with 24% EDTA gel for 2 min

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

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

The flap is repositioned over the mucoderm® matrix and sutured

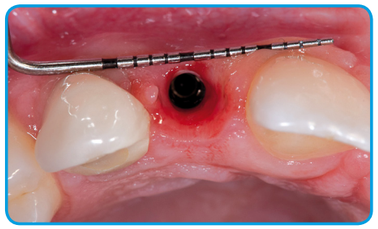
3 months post-op: previously exposed roots are significantly covered, in addition the thick-ness of the marginal tissue is increased

Handling tips

- For the tunnel technique a prolonged rehydration of mucoderm® is recommended; 10 to 15 minutes
- A fixation of the matrix by single-interrupted sutures or all-crossed sutures is required

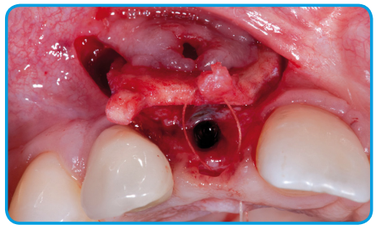
Dr. Krzysztof Chmielewski, Gdansk/PL
Vestibular augmentation of soft tissue with mucoderm®

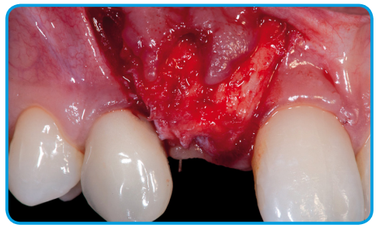

Initial situation showing vestibular recession of soft tissue; crowns 12 and 13 are temporary and screw retained on implants


Checking the position of the implant in aesthetic window


Splitting of the flap, periostium is left on the bone; implant margin is visible due to marginal resorption of the bone


Checking the fitting of prepared shape of the mucoderm®


Stabilization and suturing of mucoderm® with resorbable sutures 5-0 (PGA)

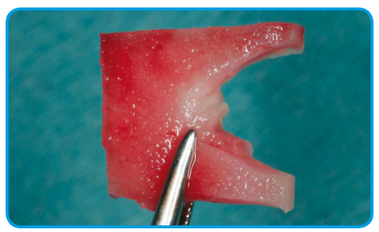

Matrix mucoderm® placed in final position and stabilized with PGA sutures

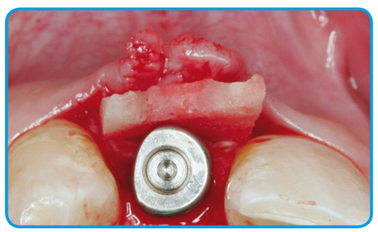

Final tension free flap closure with nonresorbable monofilament sutures 6-0

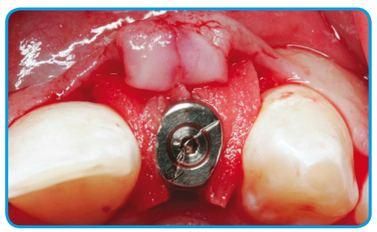

Healing of soft tissue after 3 weeks from surgery


1 year after surgery

Reopening of implants with soft tissue improvement


mucoderm® matrix rehydrated and adjusted to a proper shape before finall application


mucoderm® matrix inserted into the vestibular envelope created before with a split soft tissue flap design


Placement and positioning of the mucoderm® matrix around implant gingiva former prior to sutures stabile fixation


Stabile level of soft tissue 4 months after mucoderm® application just before the finall prosthetic reconstruction to be done

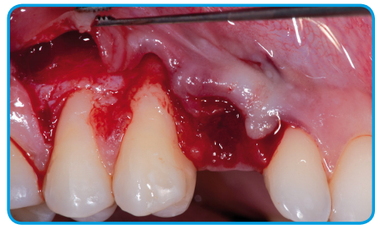
Dr. Krzysztof Chmielewski, Gdansk/PL
Recession coverage with mucoderm® instead of free subepithelial graft of soft tissue


Initial situation: recession of soft tissue and premolars roots exposure

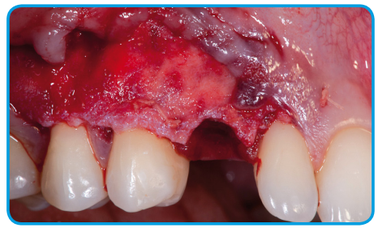

Removing of temporary screw retained crown placed on implant in canine position


Cleaning of the teeth surface


Preparation and conditioning of the roots surface with antibiotic (Doxycycline)


Split flap technique with one distal releasing incision


Flap mobility check


Collagen matrix mucoderm® replacing subepithelial soft tissue graft stabilized with PGA sutures


mucoderm® is very fast infiltrated with blood and is adapted to the recipient site


Situation after tension free flap closure and temporary crown instalation in canine position


Healing after 2 weeks from surgery and sutures removal


Healing after 2 months from surgery


Healing after 4 months from surgery


1 year after surgery

Dr. Krzysztof Chmielewski, Gdansk/PL
Tunnel technique recession coverage with mucoderm®


Initial situation with recession present on first left premolar


Cleaning of the root surface with cleaning paste


Preparation and conditioning of the root surface with antibiotic (Doxycycline)


Tunnel preparation with microsurgical instruments


Splitting of the flap and preparation of the internal envelope


Checking of the mobility of the flap before mucoderm® placement


Checking of the mobility of the flap before mucoderm® placement with coronal positioning


Trimming of the mucoderm® before placement in to the tunnel


mucoderm® in situ before soft tissue positioning


Stabilization of the soft tissue with sutures; mucoderm® should be always covered with soft tissue

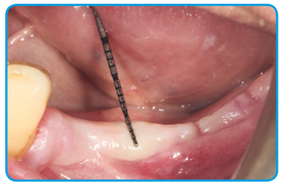

Healing after 7 days


Healing after 7 weeks

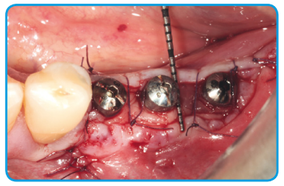

1 year after surgery

Clinical Applications

Soft tissue augmentation/thickening: **Dr. Tiziano Testori**, Como/IT


Second stage surgery to uncover 3 implants in the lower left mandibular quadrant


Partial thickness flap and mucoderm® anchored to the periosteum to thicken soft tissue


Flaps sutured leaving interimplant periosteum exposed to heal by secondary intention


1 year post-op; an adequate quantity of keratinized tissue is present

Root recession: **PD Dr. Stefan Hägewald**, Berlin/DE

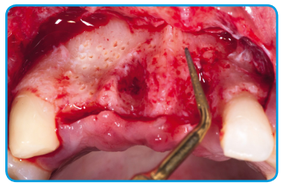

Clinical situation of the root recession before mucderm® placement

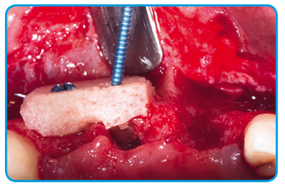

mucoderm® placement over the tooth root

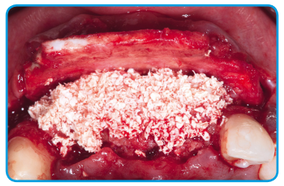

Gingival tissue was coronally repositioned, covering mucderm® and roots of teeth and sutured in place

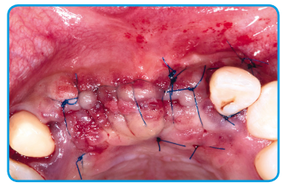

6 months post-op; previously recessed roots are covered with attached pink, keratinized gingival tissue

Ridge augmentation: **Dr. Krzysztof Chmielewski**, Gdansk/PL


Clinical situation before block surgery


maxgraft® block fixation


maxgraft® block covered with cerabone® and protected by mucoderm®


Final suturing and closing

Root coverage „Tunnel technique“: **Dr. Ziv Mazor**, Ra‘anana/IL


Clinical situation before surgery


mucoderm® placement by tunnel technique


Clinical situation after 3 months


3 years follow up clinical situation

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