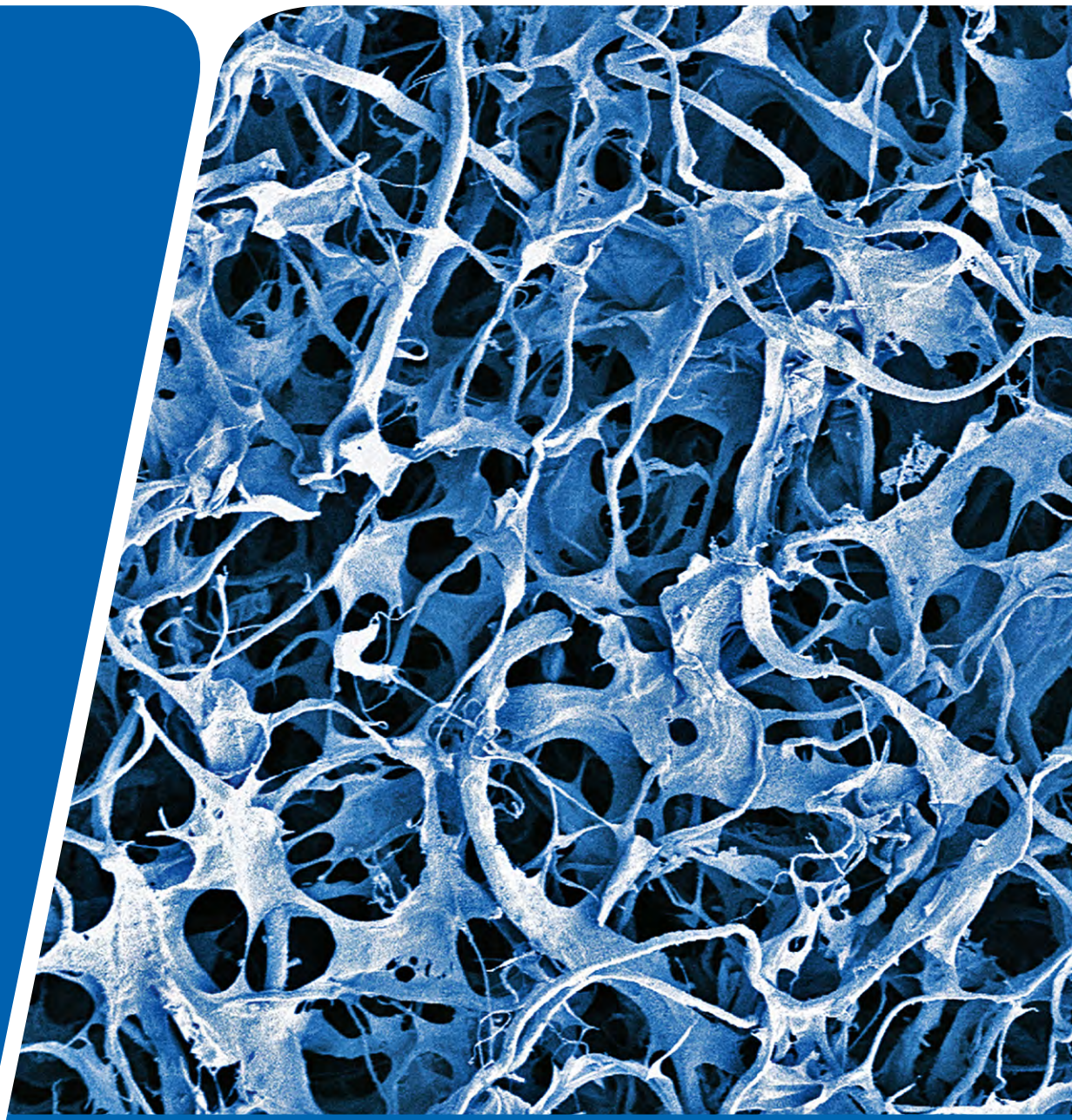
Geistlich
Mucograft®

The Dimensional Matrix

Designed for soft tissue regeneration



LEADING REGENERATION

Geistlich Mucograft®
Documented, Reliable, Experienced

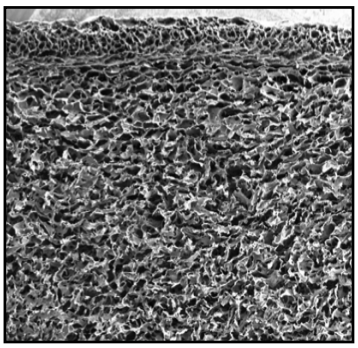
The Geistlich Mucograft® 3D matrix is the ideal biomaterial for your soft-tissue regeneration needs. Throughout our long history of quality and innovation, Geistlich Biomaterials have been intentionally designed for each application. In the patented production of Geistlich Mucograft®, a combination of intact and fragmented fibrillar collagen is used. The unique clot stabilizing macrostructure with a cell signalling microstructure results in an organized and vascularized regenerative healing.

Regeneration by design

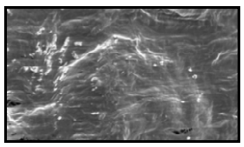
Geistlich Mucograft® is designed to provide a requisite, reinforcing matrix and a signaling source for regenerative wound healing. Fibroblasts respond to the collagen by attaching, orienting and producing new collagen integration.

Collagen research suggests that in such scaffolds endothelial progenitor cells are activated for angiogenesis, and the intact collagen fibrils serve as conduits for endothelial cells and the formation of vascular channels of nutrition. These vascular channels are surrounded with perivascular mesenchymal stem cells with anti-inflammatory properties.[1-4]

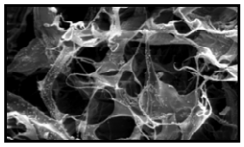
Due to these properties, the clinical result observed with Geistlich Mucograft® is optimal soft tissue regeneration rather than soft tissue repair.[5-8]



Geistlich Mucograft® 3D collagen matrix (scanning electronic microscopy; data on file , Geistlich Pharma AG, Wolhusen, Switzerland).



Compact macrostructure



Spongeous microstructure

Figure 1

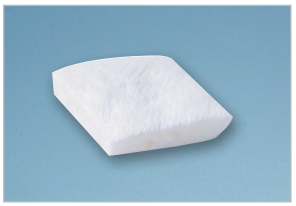
An alternative solution for regenerative results

Geistlich Mucograft® is the ideal solution as an alternative to autogenous soft tissue grafts in the following clinical situations:

- Increasing the width of keratinized tissue
- Regeneration of soft-tissue in recession defects

Geistlich Mucograft consists of porcine collagen and is specifically designed for soft-tissue regeneration. It is comprised of a compact structure that gives stability while allowing open healing and a spongeous structure that supports blood clot stabilization and the ingrowth of soft-tissue cells.

Geistlich Mucograft®
Collagen matrix



15 mm x 20 mm

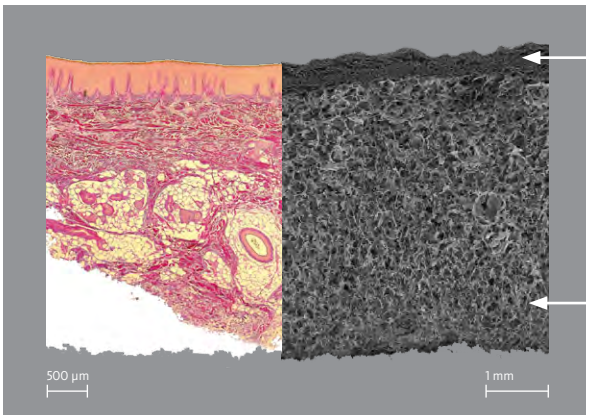
20 mm x 30 mm

[1] Nien, Y., Han, Y., Tawil, B., Chan, L.S., Tuan, T. & Garner, W.L., 2003; Wound Repair and Regeneration, 11(5), 380-385.
[2] Tran, K.T., Griffith, L. & Wells, A., 2004. Wound Repair and Regeneration, 12(3), 262-268.
[3] Davis, G.E., 1992. Biochemical and Biophysical Research Communications, 182(3), 1025-1031.
[4] Tran, K.T., Lamb, P. and Deng, J., 2005. Matrikines and matricryptins: Implications for cutaneous cancers and skin repair. Journal of Dermatological Science, 40(1), 11-20.
[5] Badylak, S.F., Freytes, D.O. & Gilbert, T.W., 2009. Acta Biomaterialia, 5(1), 1-13.
[6] Ghanaati S, et al. Biomed Mater. 2011 Feb;6(1):015010.
[7] Rocchietta I, et al., Int J Periodontics Restorative Dent. 2012 Feb;32(1):E34-40.
[8] Nevins M, et al. Int J Periodontics Restorative Dent. 2011 Jul-Aug;31(4):367-73.

Biofunctionality in a matrix

Geistlich Mucograft® is a unique 3D collagen matrix designed specifically for soft-tissue regeneration as an alternative to autogenous soft-tissue grafts.[1] The 3D matrix was developed using the free gingival graft as a model (figure 2).

The collagen in Geistlich Mucograft® is specifically processed to encourage immediate blood clot stabilization (figure 3). This leads to early vascularization,[2,3] facilitates soft-tissue cell ingrowth[2] and excellent integration of the 3D matrix with the surrounding tissues (figures 4, 5 and 6).[2,3]



Compact macrostructure:
- Protection in open healing situations
- Ability to be sutured

Spongy microstructure:
- Blood clot stabilization
- Ingrowth of soft-tissue cells

Figure 2
Human free gingival graft (histology; courtesy of Dr. D. Thoma).

Geistlich Mucograft® 3D collagen matrix (scanning electronic microscopy; data on file , Geistlich Pharma AG, Wolhusen, Switzerland).

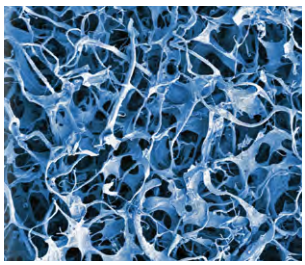


Figure 3
Geistlich Mucograft®, the 3D matrix consists of specially processed collagen (scanning electronic microscopy).

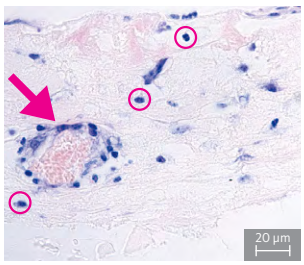


Figure 4
Histology showing early vascularization of Geistlich Mucograft® 15 days after implantation (mouse model). Arrow indicates the formation of a blood vessel. Circles show soft-tissue cells in the 3D matrix (courtesy of Prof. Dr. mult. Sader, Dr. Ghanaati).[2]

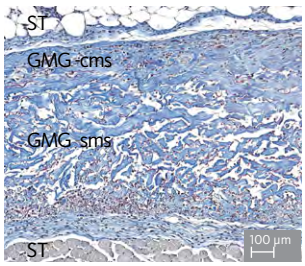


Figure 5
Soft-tissue cell ingrowth into Geistlich Mucograft®. Histology 30 days after implantation (mouse model). ST: soft tissue; GMG-cms: Geistlich Mucograft® compact macrostructure; GMG-ss: Geistlich Mucograft® spongy microstructure (courtesy of Prof. Dr. mult. Sader, Dr. Ghanaati).[2]

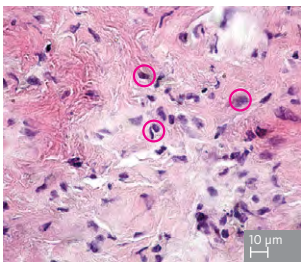


Figure 6
Complete soft-tissue integration of Geistlich Mucograft® within human connective tissue 6 weeks after clinical implantation, without any signs of foreign body reaction. Circles show soft-tissue cells in the 3D matrix. (courtesy of Prof. Dr. mult. Sader, Dr. Ghanaati).[2]

[1] Biocompatibility according to ISO 10993-1:2001. Data on file, Geistlich Pharma AG, Wolhusen, Switzerland.
[2] Ghanaati S, et al. Biomed Mater. 2011 Feb;6(1):015010.
[3] Rocchietta I, et al., *unpublished*.

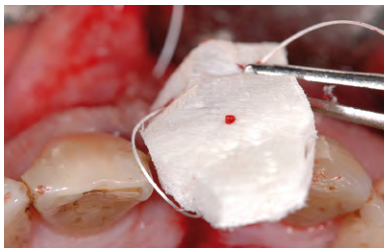
Easy application and handling

Geistlich Mucograft® offers all the benefits of an off-the-shelf product and is easy to handle compared to autogenous soft-tissue grafts.[1]

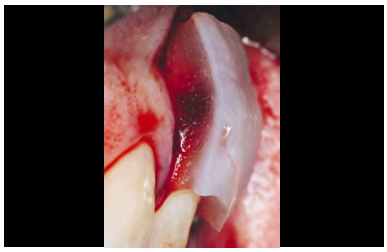
Ready to use: Direct from the blister pack to the defect without pre-treatment or pre-hydration.

Trimming to defect shape: After measuring the defect, the 3D matrix is trimmed to the desired size while dry.

Easy to suture: The outer compact structure provides optimal suture pull-out strength.



Dry application to the defect: The 3D matrix moistens rapidly as a result of its excellent hydrophilicity (courtesy of Dr. Zabalegui).

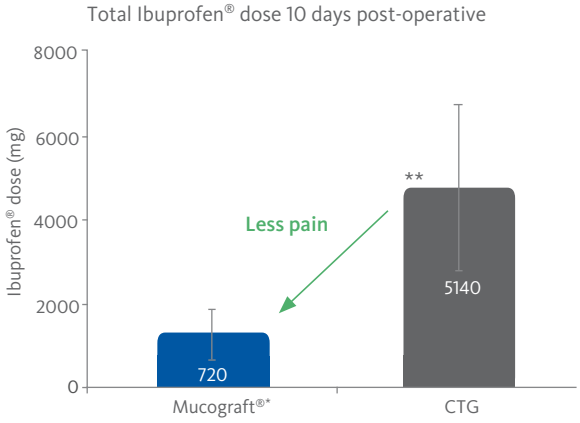


Good adherence: The soaked Geistlich Mucograft® readily adapts to contours and adheres well to the defect (courtesy of Dr. McGuire).[2]

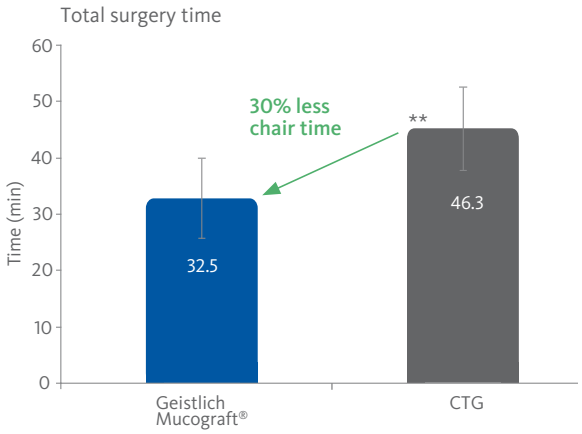
Unlimited availability and consistent quality: The likelihood of unexpected events during surgery is reduced and gives freedom to choose a less invasive surgical procedure for the surrounding tissues (e.g. flaps without releasing incisions; courtesy of Dr. Abundo).[3]

[1] Sanz M, et al. J Clin Periodontol. 2009 Oct;36(10):868-76.
[2] McGuire MK & Scheyer ET. J Periodontol. 2010 Aug;81(8):1108-17.
[3] Abundo R & Corrente G. Chirurgia plastica parodontale – Trattamento estetico delle recessioni gengivali. ACME Edizioni, 2010.

Advantages for your patients



Graph 1
Significantly less patient pain with Mucograft® (prototype)* as compared to connective tissue graft (CTG).[1]



Graph 2
Significantly less surgical chair time with Geistlich Mucograft® when compared to connective tissue graft (CTG).[4]

Less pain and morbidity: The absence of a donor site significantly reduces post-operative pain (graph 1).[1] Additionally it avoids post-operative complications such as numbness, which often continues for several weeks.[2,3]

Less surgical chair time: With no need to harvest an autogenous graft, surgery time is reduced by 30 % (statistically significant) when using the off-the-shelf 3D matrix compared to connective tissue grafts (graph 2).[1,4]

Faster soft-tissue healing: Early healing of a surgical wound in open healing situations is significantly faster when covered with Geistlich Mucograft® than in spontaneous healing.[5]

Natural soft-tissue color and structure: Natural texture and color match to surrounding native tissues are obtained after treatment with Geistlich Mucograft®.[6,7]

[1] Sanz M, et al. J Clin Periodontol. 2009 Oct;36(10):868-76.
[2] Del Pizzo M, et al. J Clin Periodontol. 2002 Sep;29(9):848-54.
[3] Soileau KM & Brannon RB. J Periodontol. 2006 Jul;77(7):1267-73.
[4] Lorenzo R, et al. Clin. Oral Impl. Res, 2012 Mar;23(3):316-24.
[5] Thoma D, et al. *manuscript in preparation*.
[6] McGuire MK & Scheyer ET. J Periodontol. 2010 Aug;81(8):1108-17.
[7] McGuire MK, et al., *accepted for publication*.

* Mucograft® (prototype) exhibited highly similar physical, mechanical and biological properties to the final product Geistlich Mucograft® differing only in the porcine collagen source used.

Benefits of Geistlich Mucograft®

- 3D Matrix specifically designed for soft-tissue regeneration
- Optimal alternative to soft-tissue grafts for the gain of keratinized tissue[1,2,10] and root coverage[5]
- Easy handling[1] and application in a dry state
- Unlimited availability and consistent quality[2,3]
- Reduced surgical chair time[1,2,4,5]
- No harvest-site morbidity[1-5]
- Early vascularization and good tissue integration[6,7]
- Good tissue color and texture match[4,8,9]
- Ready to use

Improved patient satisfaction

[1] Sanz M, et al. J Clin Periodontol. 2009 Oct;36(10):868-76.
[2] Konter U, et al. Deutsche Zahnärztliche Zeitschrift 2010;65:723-30.
[3] Herford AS, et al. J Oral Maxillofac Surg. 2010 Jul;68(7):1463-70.
[4] McGuire MK & Scheyer ET. J Periodontol. 2010 Aug;81(8):1108-17.
[5] Cardaropoli D, et al. J Periodontol. 2011 Jul 1, Epub.
[6] Ghanaati S, et al. Biomed Mater. 2011 Feb;6(1):015010.
[7] Rocchietta I, et al., Int J Periodontics Restorative Dent. 2012 Feb;32(1):e34-40.
[8] McGuire MK, et al., *accepted for publication.*
[9] Nevins M, et al. Int J Periodontics Restorative Dent. 2011 Jul-Aug;31(4):367-73.
[10] Lorenzo R, et al. Clin. Oral Impl. Res, 2012 Mar;23(3): 316-24.

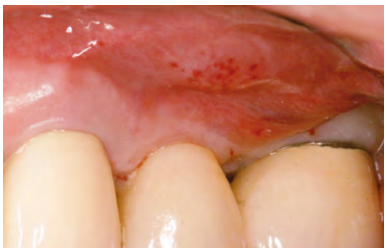
Increased width of keratinized tissue around implants

Surgery by Dr. Doina Panaite and Dr. Allan Charles[1]

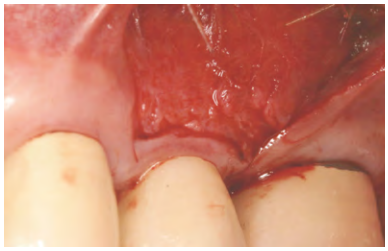
Aim: Increase the width of keratinized tissue around implants with Geistlich Mucograft®, while also achieving vestibule creation and oral hygiene access improvement.

Jaw	Region	Restorative Status	Gingival Biotype
☒ Upper Jaw	☐ Anterior	☐ Tooth	☒ Thick
☐ Lower Jaw	☒ Posterior	☒ Implant	☐ Thin

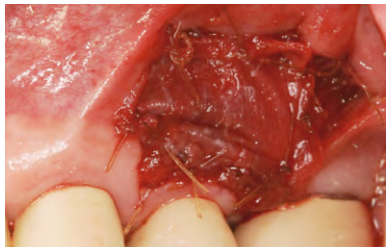
Material	› Geistlich Mucograft®
Technique	› Split-thickness flap and open healing



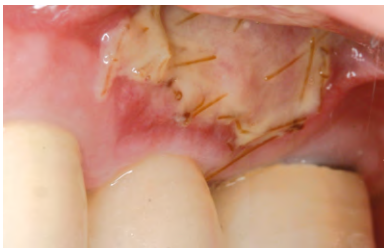
1 Pre-operative view. A small band of keratinized gingiva is present.



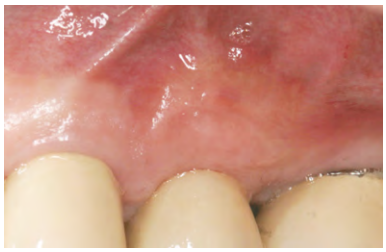
2 The band of keratinized gingiva is split and a split-thickness flap is elevated exposing connective tissue and periosteum.



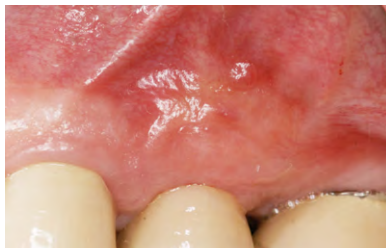
3 Geistlich Mucograft® is sutured to the recipient bed and left exposed.



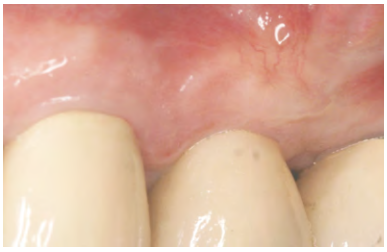
4 Underneath the fibrin clot, the area appears to granulate 1 week post-operative.



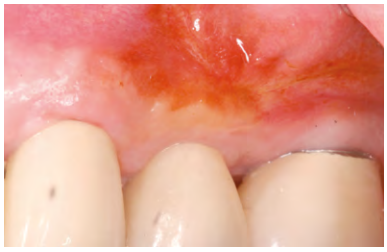
5 Excellent wound healing 4 weeks after surgery.



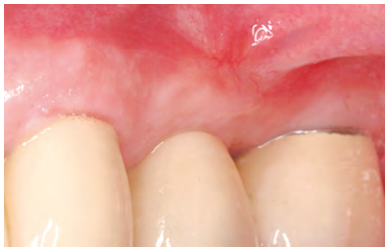
6 Post-operative follow-up after 2 months.



7 Surgical site view 3 months post-operative.



8 Lugol's iodine staining delineating keratinized tissue at 6 months.



9 Mucogingival appearance (4 mm of keratinized tissue) 6 months post surgery.

Conclusion: Geistlich Mucograft® can be used as an alternative to significantly increase the zone of keratinized and attached tissue around existing implants. In addition, good texture and color match to the surrounding native tissues was observed on the mucogingival tissues regenerated with the 3D collagen matrix.

[1] Charles A, *submitted for publication.*

Single recession coverage with coronally advanced flap in thin biotype

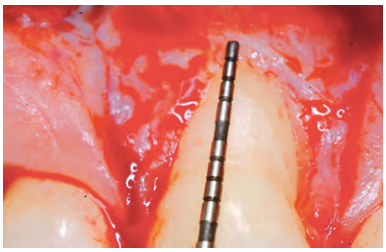
Surgery by Dr. Michael K. McGuire and Dr. E. Todd Scheyer (Houston)[1]

Aim: Root coverage combining Geistlich Mucograft® with coronally advanced flap (CAF) without the morbidity of soft-tissue graft harvest.

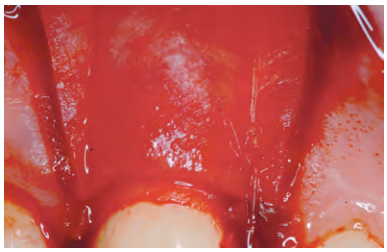
Jaw	Region	Restorative Status	Gingival Biotype
☒ Upper Jaw	☒ Anterior	☒ Tooth	☐ Thick
☐ Lower Jaw	☐ Posterior	☐ Implant	☒ Thin

Material	› Geistlich Mucograft®
Technique	› Split-thickness flap (coronally advanced) and submerged healing

1 Pre-operative image showing the recession defect (tooth 13).



2 After elevation of a partial thickness flap, the interdental papillae are de-epithelialized.



3 Geistlich Mucograft® is placed over the defect and sutured to the papillae.

4 The flap is coronally advanced and sutured completely covering the 3D matrix.

5 Healing of the surgical site 1 week after treatment.

6 Post-operative situation after 4 weeks.

7 Surgical site 3 months post-operative.

8 Optimal outcome 6 months post-operative. Note the natural appearance of the soft tissue achieved with Geistlich Mucograft®.

9 Outcome 1 year after treatment.

Conclusion: Recession coverage with Geistlich Mucograft® and CAF provides an acceptable option to connective tissue graft and CAF. A notable creeping attachment of the gingiva is observed in this case with Geistlich Mucograft® during the healing of the surgical site and optimal outcomes after 6 months appear to have further improved at 1 year follow-up.

[1] McGuire MK & Scheyer ET. J Periodontol. 2010 Aug;81(8):1108-17.

Geistlich
Biomaterials

DOCUMENTED: More than 900 publications
RELIABLE: More than 25 years of clinical experience
EXPERIENCED: 160 years of Geistlich collagen competence

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202 Carnegie Center • Princeton, NJ 08540

G-136-14

CAUTION: Federal law restricts these devices to sale by or on the order of a dentist or physician.

Indications:
Geistlich Mucograft® is indicated for the following uses: Covering of implants placed in immediate or delayed extraction sockets, localized gingival augmentation to increase keratinized tissue (KT) around teeth and implants, alveolar ridge reconstruction for prosthetic treatment, recession defects for root coverage.

Warnings:
As Geistlich Mucograft® is a collagen product allergic reactions may not be totally excluded. Possible complications which may occur with any surgery include swelling at the surgical site, flap sloughing, bleeding dehiscence, hematoma, increased sensitivity and pain, bone loss, redness and local inflammation.

For more information on contraindications, precautions, and directions for use, please refer to the Geistlich Mucograft® Instructions for Use at: **www.geistlich-na.com/ifu**