



CLINICAL LITERATURE FOR THERAPEUTIC INDICATIONS



Straumann® Emdogain

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FOR DENTAL PROFESSIONALS

TABLE OF CONTENTS

1 Basic principles of periodontal regeneration with Enamel Matrix Proteins	2
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2 Straumann® Emdogain in intrabony defects	5
2.1 Reviews	5
2.2 Controlled clinical studies	5
2.3 Case studies	6
2.4 Straumann® Emdogain and guided tissue regeneration (GTR)	9
<hr/>	
3 Straumann® Emdogain in furcation defects	10
3.1 Clinical studies with furcation defects	10
<hr/>	
4 Straumann® Emdogain in recession defects	11
4.1 Clinical studies and case reports with recession defects	11
<hr/>	
5 Straumann® Emdogain with bone graft material	13
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1 BASIC PRINCIPLES OF PERIODONTAL REGENERATION WITH ENAMEL MATRIX PROTEINS

The principle aim of periodontal reconstructive therapy is to save teeth. This is best achieved through regeneration of full functional attachment.

Enamel matrix proteins are responsible for the development of cementum and periodontal ligament in the crescent phase of the tooth⁸. Applied to the cleaned root surface of the periodontally diseased tooth, the periodontium, which includes the cementum, periodontal ligament and alveolar bone, is regenerated^{1, 2, 3, 4, 5, 105} by mimicking the biological processes of natural tooth development^{13, 14}.



Straumann® Emdogain distributes evenly and precipitates on the root surface to form an extracellular matrix.



Straumann® Emdogain stimulates the attraction and proliferation of mesenchymal cells from the healthy part of the periodontium.



Natural and specific cytokines and autocrine substances are secreted, promoting the necessary proliferation.

Straumann® Emdogain consists of a mixture of enamel matrix proteins and their derivatives^{6, 9} (EMD), and propylene-glycolic-alginate (PGA) as carrier. The most prevalent protein, amelogenin and its derivatives may also be the most important factor in the regenerative activity of EMD.⁷



Attraction and differentiation to cementoblasts which start with the formation of the cement matrix in which the periodontal fibers will be fixed.



The newly formed cement layer increases in thickness. The periodontal ligament fibers anchor on the root surface.



Within months, the defect fills with newly formed periodontal tissue.



New alveolar bone grows on the cementum layer and in the defect gap.



Straumann® Emdogain regenerates the complex dental structure of the periodontium, building a new functional attachment.

When Straumann® Emdogain is applied, EMD proteins precipitate from the PGA carrier onto the root surface. This precipitation process takes place immediately through the rise of pH and temperature, and EMD forms an extracellular matrix on the root surface^{12, 14}. This matrix influences cell attachment¹¹ and proliferation¹⁰ and mediates the formation of cementum on the root, providing a foundation for all necessary tissues associated with a true functional attachment.

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2. Bosshardt DD, et al. Effects of enamel matrix proteins on tissue formation along the roots of human teeth. *J Periodontol Res.* 2005;40:158–167.
3. Sallum EA, et al. Enamel matrix derivative and guided tissue regeneration in the treatment of dehiscence-type defects: a histomorphometric study in dogs. *J Periodontol.* 2004;75:1357–1363.
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2 STRAUMANN® EMDOGAIN IN INTRABONY DEFECTS

The ultimate goal of periodontal treatment is the preservation of teeth. While open flap debridement (OFD) does repair the periodontal defect, leading to an improved survival rate, the additional use of Straumann® Emdogain regenerates periodontal tissue and significantly improves the clinical outcome^{15, 16, 17, 18}. The clinical benefit of this procedure lies in the resulting long-term stability of the regenerated periodontal tissue^{19, 31, 36, 62}, which has been studied up to 9 years³¹.

There are several clinical parameters significantly improved through the use of Straumann® Emdogain compared to OFD alone: probing pocket depths (PPD) reduction^{19, 20, 21, 22, 23, 24, 25, 27, 28, 29}, clinical attachment level (CAL)^{19, 20, 21, 22, 23, 24, 25, 27, 28, 29}, bleeding on probing (BP)²⁸, and the bone fill measured by radiographic bone density^{19, 28, 29, 94} or at re-entry^{27, 36}. Moreover, an improvement in the patient's chewing ability was observed²¹. The probability of achieving clinically significant improved results could be shown to double²⁵ through Straumann® Emdogain. Numerous case reports³¹⁻⁶¹ including histological evidence^{37, 54, 55, 75} support these findings. Clinical factors like defect angle³⁹, smoking habit, oral hygiene and age⁷¹ do influence the outcome.

Straumann® Emdogain is easy to use and safe. It has the flexibility, in single or multiple applications in conjunction with periodontal surgery, to manage areas that are difficult to treat.^{30, 38, 53}

2.1 Reviews

15. Sculean A, et al. The application of enamel matrix protein derivate (Emdogain) in regenerative periodontal therapy: a review. *Med Princ Pract.* 2007;16:167–180.
16. Esposito M, et al. Enamel matrix derivative (Emdogain®) for periodontal tissue regeneration in intrabony defects. *Cochrane Database Syst Rev.* 2003;2:CD003875. Update in: *Cochrane Database Syst Rev.* 2005;4: CD003875.
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2.2 Controlled clinical studies

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Int J Periodontics Restorative Dent. 2003;23(4):345–351.
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2.4 Straumann® Emdogain and guided tissue regeneration (GTR)

Direct comparisons between GTR and Straumann® Emdogain in intrabony defects show that treatment with Straumann® Emdogain results in a much lower rate of complications and patient morbidity.^{62, 64, 67, 72} The clinical results with Straumann® Emdogain are at least equivalent^{62, 65, 68, 75} or better¹⁸. Long-term stability of the clinical benefit in direct comparison to GTR has been followed up for a maximum of 8 years⁶². Additional use of a membrane in the regenerative treatment with Straumann® Emdogain does not improve the outcome, but rather increases a patient's postoperative discomfort⁶³.

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3 STRAUMANN® EMDOGAIN IN FURCATION DEFECTS

In the surgical treatment of Class II furcation, Straumann® Emdogain leads to a significant regeneration of the furcation lesions^{72, 74}. Results from randomized clinical trials comparing Straumann® Emdogain and a resorbable membrane in the treatment of Class II furcations have demonstrated a significant reduction in horizontal furcation depth. Clinically, Straumann® Emdogain treatment reduced 78% of the defects, 18% of which completely. Furcation reduction in membrane treatment could be observed only in 67% of the defects, 7% of which completely. A lower incidence of postoperative complications following Straumann® Emdogain compared to GTR treatment was obvious. At 1-week post-operative 62% of the patients treated with Straumann® Emdogain had no pain compared to only 12% treated with GTR. Moreover, 44% showed no swelling compared to 6% for the GTR control group, respectively^{72, 73}. Also, in patients with limiting factors like age and poor oral hygiene, the treatment of Class II furcation defects with Straumann® Emdogain was found to be superior compared to GTR⁷¹.

3.1 Clinical studies with furcation defects

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J Clin Periodontol. 2003;30:1061–1068.

4 STRAUMANN® EMDOGAIN IN RECESSION DEFECTS

Treatment of exposed root surfaces is becoming an increasingly important therapeutic issue. A driving force behind this development is the patient's increasing esthetic demands.

For the patient and the clinician, long-term stability of the defect coverage is a stringent criterion for success. Straumann® Emdogain has successfully been used to enhance the clinical parameters of the coronally-advanced flap technique (CAF)⁸⁷. On formally exposed root surfaces treated with the CAF, the addition of Straumann® Emdogain leads to significantly improved clinical parameters including root coverage^{77, 80, 83, 84, 85}, tissue quality and tissue quantity (e.g. keratinized tissue^{76, 77, 80, 83, 84, 85, 91}) and long term stability⁸¹ after recession coverage procedures.

Compared to the CAF with a connective tissue graft (CTG), CAF and Straumann® Emdogain treatment has shown in 89.5% of the cases to 100% root coverage compared to 79%, respectively⁸⁷. The combined technique with Straumann® Emdogain exhibits fewer complications and is less painful for the patient^{87, 85} in that it avoids a second iatrogenic wound. Histological evidence of periodontal regeneration including new cementum, newly formed bone and connective tissue fibers could also be shown^{92, 88} for the combined therapy of CAF and Straumann® Emdogain.

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Int J Periodontics Restorative Dent. 2006;26(1):71–77.
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J Periodontol. 2006;77(2):195–202.
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J Periodontol. 2006;77(1):7–14.
81. Spahr A, et al. Coverage of Miller class I and II recession defects using enamel matrix proteins versus coronally advanced flap technique: a 2-year report.
J Periodontol. 2005;76(11):1871–1880.
82. Berlucchi I, et al. The influence of anatomical features on the outcome of gingival recessions treated with coronally advanced flap and enamel matrix derivative: a 1-year prospective study.
J Periodontol. 2005;76(6):899–907.
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J Clin Periodontol. 2005;32:1181–1187.

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Int J Periodontics Restorative Dent. 2003;23:607–613.
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Int J Periodontics Restorative Dent. 2002;22(6): 583–593.
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J Clin Periodontol. 2002;29:35–41.
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Int J Periodontics Restorative Dent. 2000;20:269–275.
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J Clin Periodontol. 1997;24:693–696.

5 STRAUMANN® EMDOGAIN WITH BONE GRAFT MATERIAL

In the treatment of wide intrabony defects, mechanical support of soft tissue is occasionally considered. Clinicians have reported using Straumann® Emdogain in combination with various bone graft substitutes offering structural support for the soft tissue in wide defects⁹⁴⁻¹²⁰. Straumann® Emdogain PLUS combines the regenerative properties of Straumann® Emdogain with the structural support of the osteoconductive Straumann® BoneCeramic.

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J Periodontol. 2007;78(2):231–238.
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Clin Oral Investig. 2006;10:227–234.
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