

## RESEARCH ARTICLE

# Clinical Outcomes after Regenerative Periodontal Therapy with Emdogain

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**Objective:** Regeneration is defined as a reconstruction of a lost part of the body in such a way that the structure and function of the lost tissue are completely restored. The aim of this study is to compare the clinical outcomes of intrabony defects treatment using regenerative periodontal therapy with enamel matrix proteins (Emdogain, EMD) with a control group. **Methods:** Ten patients with chronic periodontitis were included in this randomized, controlled clinical study. Two groups received conservative periodontal therapy. In the test group, different teeth received regenerative treatment with EMD. In the control group teeth received solely conservative periodontal therapy. Pocket depth probing (PD) and bone reduction (based on X rays) were registered at baseline and after eight months in both groups. In the control group **Results:** Both groups showed a significant reduction of PD. The teeth treated with EMD showed a significant attachment gain. Within the test group, the radiographic examination of the teeth treated with EMD showed no significant change, whereas the teeth in the control group showed significant bone reduction. **Conclusions:** Intrabony defects in teeth treated with EMD exhibit a substantially higher gain in clinical attachment and defect filling. The use of EMD in dental practice can prevent further bone loss.

**Keywords:** chronic periodontitis, regeneration, emdogain, intrabony defects

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## Introduction

Periodontal diseases have become the most frequent ailment of the human body, affecting it irrespective of age, sex or geographical area. The factors incriminated in this condition are local associated with microbes or general factors (cardiovascular, haematological or hepatic conditions, diabetes, endocrine or immune dysfunctions, nutrition deficiencies, nervous system related diseases).

As such, periodontitis represents an infectious disease resulting in progressive loss of attachment and bone and ending in dental loss. Conservative therapy of periodontal disease aims at halting the progression of the disease by reducing the pockets, increasing the soft tissue gain and stopping the bone loss. Conservative therapy includes covering such issues as scaling and root planning and results in periodontal repair. Generally, the procedure leads to healing without having to restore the tooth attachment apparatus thus dramatically improving the quality of life in the patient [1,2].

However, restoration of a fraction of the original tissue can be achieved only by regenerative periodontal therapy where regeneration is defined as a "reconstruction of a lost or injured part of the body in such way that the structure and function of the injured tissue are completely restored". However, regenerative periodontal therapy can only restore a fraction of the original tissue. In many clinical situations, where regenerative techniques have been used, significant probing depth reduction in clinical attachment are gained, yet residual defects may still remain [3,4,5].

More than ten years have passed since Emdogain was introduced as an adjunctive to periodontal surgery. Emdogain was developed to promote regeneration of the periodontal tissue by mimicking the normal development of these tissues [1].

The purpose of the present study is to compare the clinical outcome of intrabony defects treatment using regenerative periodontal treatment using regenerative periodontal therapy with enamel matrix proteins (Emdogain, EMD) with a control group.

## Material and Methods

**Subjects.** In this clinical study, ten patients (four females, six males) aged between 25-55, with chronic periodontitis were included. The subjects were selected from a private practice. The patients were distributed in 2 groups according to the following inclusion criteria: presence of intrabony defect with probing depth (PD)  $\geq$  6mm, no smoking, no systemic diseases, good oral hygiene.

In the test group, different teeth received regenerative treatment with EMD after scaling and root planing. The control group received only conservative periodontal therapy.

**Conservative periodontal therapy.** After recording the patients' periodontal condition, conservative periodontal therapy was performed in both groups. This conservative periodontal treatment consisted of hygiene instructions, full mouth scaling and root planing.

**Surgical treatment.** The regenerative therapy using EMD used the papilla preservation technique (as described by Cortellini): on the buccal aspect of the damaged teeth, a vertical incision is performed and the site is conditioned

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with 24% EDTA for 2 minutes to remove smear layer. Then the site is carefully rinsed with sterile saline, and EMD is applied with a syringe starting at the most apical level. The mucoperiosteal flaps are replaced and sutured carefully in order to obtain primary closure and wound stability. Finally, patients are instructed concerning post-surgery maintenance care. Informed consent was obtained from each patient.

**Supportive periodontal therapy.** Patients were seen weekly postsurgery for professional tooth cleaning. After that, the patients were recalled monthly for maintenance, oral hygiene control, and reinstruction in oral hygiene.

**Clinical parameters.** The following parameters were recorded at baseline and after 8 months: bone reduction based on x-rays, probing depth (PD) and bleeding on probing. Tooth mobility was recorded using Miller's index. Plaque index (O'Leary et al. 1972) was used to evaluate the presence of plaque. Gingival index (Loe and Silness, 1963) was used to evaluate gingival inflammation [6,7].

**Statistical analysis.** The statistical analysis was carried out using t-test and chi-square. The level of significance was set at  $p < 0.05$ .

## Results

The groups consisted of ten patients (four females, six males). The average age in the test group was  $41.347 \pm 10.891$ , the mean age in the control group was  $43.965 \pm 11.008$ . The average observation period was  $7.26 \pm 0.97$  months (test group) and  $7.42 \pm 0.35$  months (control group).

In the test group, 106 teeth were treated with scaling and root planning; later 38 thereof with EMD. In the con-

trol group 129 teeth were treated with scaling and root planing. Table 1 shows the distribution of the teeth received regenerative treatment with EMD after scaling and root planing (Table I).

In both groups a significant reduction in PD was found: in the test group 1.6mm and in the control group 0.9mm ( $p = 0.000$ ) (Fig. 1 a, b). The difference between the two groups was significant ( $p < 0.0001$ ). The teeth treated with EMD showed a significant attachment gain with a mean of  $1.84 \pm 0.2$ mm ( $p < 0.001$ ). Figure 1 shows the changes of PD in test group at baseline (C) and after 8 months (D) in comparison with control group (A, at baseline and B, after 8 months).

The difference between groups was significant ( $p < 0.0001$ ). The teeth treated with EMD showed a significant attachment gain with a mean of  $1.84 \pm 0.2$ mm ( $p < 0.001$ ) (Fig. 2, Fig. 3).

A statistically significant increase in mean PD was observed at 8 months in test group ( $p < 0.0001$ ). Mean PD reduction in the recorded sites at 8 months was  $5.1 \pm 0.5$ mm (Fig. 2). The reduction was maintained during the 1 year observation period, with no significantly change. No significant correlation was found the baseline PD between the control group and the test group (Fig. 3).

In both group gingival aspects improve after regenerative periodontal therapy in comparison with baseline .

Table I. Distribution of Emdogain treated teeth

Teeth	Upper teeth	Lower teeth
Frontal teeth	7	8
Premolars	4	7
Molars	6	6

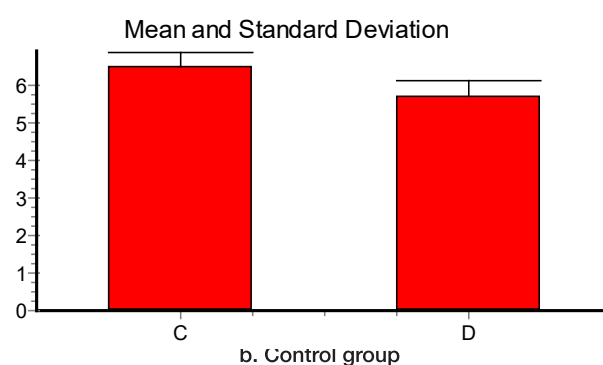
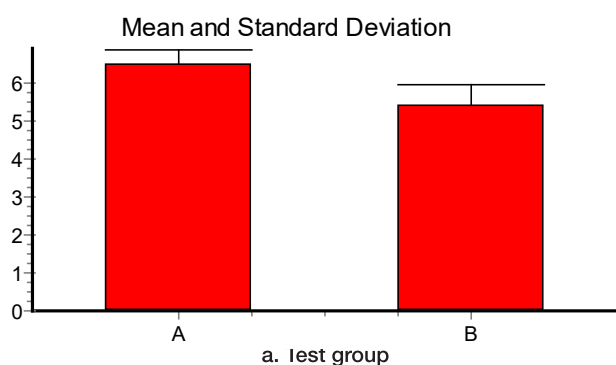


Fig. 1. Changes of PD in test group (a) and control group (b) at baseline (A, respectively C) and after 8 months (B, respectively D).

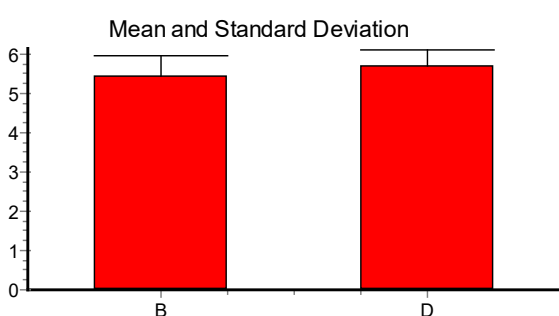


Fig. 2. Changes of PD in test group (B) and control (D) after 8 months

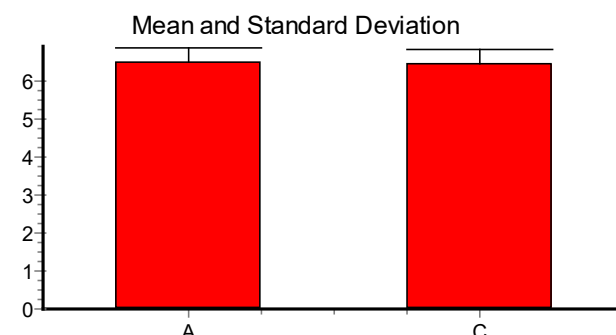


Fig. 3. Changes of PD in test group (A) and control group (C) at baseline

There was no significant change in tooth mobility after 8 months. Minimal significant changes were evidenced radiographically in the test group over the observation period, while the control group showed no changes whatsoever.

## Discussion

The present study carried on regenerative periodontal therapy with Emdogain. The results showed significant PD reduction and CAL gains. Wound healing following EMD application appeared to be favourable. EMD may influence soft tissue healing, in addition to its capability of promoting periodontal regeneration. The results reported in our study are consistent with those published by other authors.

Several studies have been published concerning degree of clinical success, possibilities for combining Emdogain with other agents, or means to promote periodontal regeneration, as well as cellular effects and mechanism of action [8]. The introduction of Emdogain as an adjunct to periodontal surgery therapy has stimulated a great number of research projects concerning its effects and efficacy.

The majority of these publications show that Emdogain is able to significantly regenerate cementum, periodontal ligament and alveolar bone when it is used to treat deep intrabony defects, as was originally indicated [9].

Our findings that the regenerative periodontal therapy with Emdogain may results in higher significantly improvement regarding CAL and PD when compared to the baseline are in agreement with the results of other studies. In the first controlled clinical trial, Heijl was compared the efficiency of EMD treatment used to support periodontal flap surgery to the efficiency of surgery alone in treating intrabony defects. The parameters followed were radiographic bone level and clinical attachment level. Follow-up examination after three years showed that mean radiographic bone gain in the EMD -treated sites had increased from 2.2mm to 2.6mm. The bone level at the control sites was more or less unchanged after three years.

The results showed clinically relevant difference especially since almost half of the patients were smokers [10].

In a controlled clinical study, it was demonstrated that treatment with EMD was superior to open flap debridement (OFD) at 12 months postsurgery [11,12]. In addition, it was demonstrated that the percentage defect fill after adjusting for crestal bone resorption was more than three times greater for EMD than for OFD alone [13,14].

In a multicentric study, Tonetti et al. reported a mean CAL gain of 3.1mm at one year [14]. Saito et al. evaluated the long-term clinical outcomes of treatment with EMD in a private practice setting [15]. The mean CAL gain at six months was 3.6mm which was significantly greater.

In our study we reported higher CAL gain after regenerative periodontal therapy with Emdogain. These clinical results are also supported by other study. Sculean et al. reported the formation of new attachment at six months

following EMD treatment of advanced intrabony lesions. Their results showed bone regeneration after formation of new attachment was not always followed by bone regeneration, although the newly formed cementum was predominantly of a cellular character [15]. Ozelik et al emphasized that patients' perceptions on the postsurgery period were significantly better in the groups with non-surgery and surgery with EMD group as compared to the surgery group [14,15]. In our study the clinical outcomes after regenerative periodontal therapy with Emdogain are significant and we reported a significant attachment gain in the group treated with Emdogain.

However, Zetterstrom et al. and Hagenars et al. reported no differences in patients' perceptions and post-surgical healing between surgeries with EMD and flap operations[16-18]. Saito et al. in a study regarding the treatment of periodontal defects with enamel matrix derivative, showed after three to six months that periodontal surgery with EMD results in a clinically relevant reduction in probing depth and a gain in clinical attachment [19-22].

Our results are in agreement with those of others authors. Further research need to be performed, due to the reduced number of patients included.

## Conclusions

Treatment of intrabony defects with EMD may lead to substantially higher gains in clinical attachment and defect filling. The use of EMD in dental practice can prevent further bone loss. However, these results need to be confirmed on a larger scale in multicenter controlled clinical trials.

## Competing interests

The authors declare that they have no competing interests.

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