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10-year success with Straumann® Emdogain® in intra-bony defects with enamel matrix proteins and guided tissue regeneration

**SCIENTIFIC SOURCE**

**STUDY DESIGN**
- Randomized, controlled, single center study
- Primary outcome is change in Clinical Attachment Level (CAL)
- 38 patients completed 10 year follow up (56 patients enrolled)
- Defects with probing depth of ≥ 6mm and intra-bony component ≥ 3mm
- 4 treatment modalities (EMD, EMD+GTR, GTR, OFD)
- Regular maintenance program (4 visits per year)

**RESULTS**
EMD = Straumann® Emdogain
GTR = Guided Tissue Regeneration (membrane)
OFD = Open Flap Debridement

**STUDY OBSERVATIONS**
- All treatment modalities demonstrated statistical significance from baseline
- No treatment modalities demonstrated statistical significance from 1 year to 10 year follow up
- Significantly higher CAL gain with Straumann Emdogain vs OFD
- Clinical results can be maintained over 10 years
- GTR in combination with Emdogain shows no improvement over Emdogain alone.

- **CAL gain**
  - OFD
  - GTR
  - EMD GTR after 10 years
  - EMD

*Statistical significance of other regenerative therapies over OFD in this study
Comparison of recession defects treated with Coronally Advanced Flaps and either Emdogain® or Connective Tissue: 10 years*

**SCIENTIFIC SOURCE**

**STUDY DESIGN**
- Randomized, controlled, split-mouth, single-center study
- Nine patients with Miller Class I and II recession defects on incisors/premolars at 10 years (17 patients in original study)
- Baseline recession depth ≥ 4 mm with ≤ 2.5 mm keratinized tissue

**RESULTS**

<table>
<thead>
<tr>
<th>Recession Depth (mean, in mm)</th>
<th>Probing Depth (mean, in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td><strong>Baseline</strong></td>
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<tr>
<td><strong>1 Year</strong></td>
<td><strong>1 Year</strong></td>
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<tr>
<td><strong>10 Years</strong></td>
<td><strong>10 Years</strong></td>
</tr>
</tbody>
</table>

**CONCLUSIONS AND OBSERVATIONS**
- Both treatments showed stable, long-term, clinically effective outcomes for the treatment of Miller Class I and II recession defects
- Both treatments showed improvements in the measured clinical parameters up to 10 years
- Emdogain + CAF showed no significant difference from CTG + CAF for measured parameters at 10 years
- Any differences in keratinized tissue between treatment modalities observed at 1 year were negated at 10 years
- Patient satisfaction with the treatment was higher for Emdogain and two thirds of patients would choose Emdogain to avoid a secondary harvesting procedure (not statistically significant)

*See part 1 study on page 5.
Successful Recession Coverage with Straumann® Emdogain®

**SCIENTIFIC SOURCE**

**STUDY DESIGN**
- 20 patients with Miller’s Class II facial recession on incisors/premolars (17 completed study)
- Randomized, controlled, single center, split mouth
- Primary outcome is change in recession depth with secondary outcomes of CAL gain, PD reduction, and gingival height
- Recession of ≥ 4 mm and ≥ 3 mm width. Teeth with ≤ 2.5 mm of keratinized tissue
- Measurements at baseline, 6, 9 and 12 months
- Two treatment modalities (Emdogain + CAF, CTG + CAF)

**RESULTS**
Case courtesy of Dr. Michael K. McGuire

- **Emdogain in conjunction with a coronally advanced flap**
  - Average Root Coverage (% after 12 month): 93.8% for EMD, 95.1% for CTG
  - Complete Root Coverage (% after 12 month): 89% for EMD, 89.5% for CTG

- **Connective tissue graft with a coronally advanced flap**
  - Average Root Coverage (% after 12 month): 93.8% for EMD, 95.1% for CTG
  - Complete Root Coverage (% after 12 month): 79% for EMD, 89.5% for CTG

- Equivalent results for recession depth, CAL gain, PD reduction and gingival height

**STUDY OBSERVATIONS**
- 95.1% average root coverage after treatment with Emdogain and 93.8% average root coverage with CTG
- Complete root coverage was 89.5% in treatment with Emdogain as compared to CTG
- More patients reporting high discomfort level with CTG at 1 month as compared to Emdogain
- The amount of keratinized tissue achieved with CTG was statistically significantly higher than with Emdogain
- Both treatments demonstrated a statistically significant change in keratinized tissue from baseline to 12 months

*CTG requires a second surgical intervention as compared to Emdogain.*
Bone graft material coated with Emdogain® shown to enhance biologic factors involved in bone formation in an in vitro model


RESEARCH QUESTIONS
1. How is the enamel matrix derivative (EMD)* adsorption to bone graft** particles influenced by the presence of blood?
2. What are the cellular responses if bone graft particles are pre-coated with EMD?

METHODS
1. To discover the influence of blood on EMD adsorption to the particulate material
   a. Pre-coating of bone graft particles with different combinations of EMD and/or human blood vs a control of no coating
   b. Detection of EMD adsorption and penetration of bone graft particles by immunological assays

2. To discover the cellular response when EMD is applied to particulate material:
   a. Cultures of periodontal ligament cells (PDL) and osteoblasts were exposed to bone graft particles which were left uncoated, coated with blood or coated with EMD
   b. Measurement of cell attachment and proliferation on bone graft particles of cells involved in bone formation and periodontal regeneration in these cultures
   c. Measurement of certain protein markers involved in periodontal regeneration
RESULTS

- Blood contact with bone graft particles prior to EMD adsorption hinders EMD from adsorbing on and penetrating into bone graft particles
- Cell adhesion (Fig 1 and 3), proliferation (Fig 2 and 4) and differentiation are significantly higher on EMD coated bone graft particles compared to uncoated or blood coated particles at multiple time points studied
- EMD coating enhances the expression of factors important for the formation of bone (BMP-2) at all time points studied
- EMD coating reduces expression of pro-inflammatory marker proteins (IL-1) at multiple time points studied

CONCLUSIONS

- EMD enhances osteoblast and PDL cell attachment, proliferation and differentiation on bone graft particles
- EMD affects the release of factors important for bone formation and reduced wound inflammation
- EMD attachment to bone graft particles may be reduced in the presence of blood