Anabolic Modeling of the Lamina Dura Following Selective Alveolar Decortication

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Introduction

Scarring of alveolar bone induces an increase in hard and soft tissue turnover, a process collectively known as Regional Acceleratory Phenomena or RAP. (Frost HA, Orthop Clin N Amer 12:725, 1981)

Sebaoun (MS Thesis, BU, 2005) demonstrated an increase in apposition and resorption of rat alveolar spongiosa adjacent to corticotony incisions with 3X bone turnover and diminished bone density.

Although increased turnover within the periodontium has been demonstrated, the character of anabolic changes in the lamina dura following selective alveolar decortication is unknown.

Objectives
The aim of this study was to analyze bone apposition in the lamina dura following selective alveolar decortication.

Methods & Materials
Sample:
Six rats underwent unilateral selective alveolar decortication bucral and lingual to the upper left first molar with the right side serving as control; then they were divided into 2 groups.

Procedure:
Fluorescent bone stains were injected sub-peritoneal at 1-week intervals in the following order: calcein < tetracycline < alizarin red
Group 1 - starting 1 week post-op; Group 2 - starting week 4 post-op
Sacrifices:
Group 1 - post-op week 4; Group 2 - post-op week 7
Maxillary halves were harvested and processed for un-decalcified fluorescent stain histology.

Bone apposition perimeter and apposition width per root were measured only where 3 fluorescent labels were visible.
Multiple systematic measurements (80 to 294 values per specimen) of bone apposition surrounding the 5 roots of the first molar were made using Olympus Micro Suite FIVE analysis software.

Data of Interest:
Bone Apposition: fluorescent staining of new bone formation:
1) total 3-week apposition width
2) apposition length as percent of overall root perimeter

Results
One-way ANOVA with Tukey post hoc testing demonstrated that first molar lamina dura apposition width was significantly greater (p<0.001) following surgery at 4 weeks post decortication (.051mm) compared with 4 week control (.037mm), and 7 week surgery (.037mm) and 7 week control (.032mm).

No differences were observed in apposition length of the lamina dura as a percentage of first molar root perimeters.

Conclusion
Anabolic modeling (apposition) of the lamina dura increased 46% at the 4-weeks stage following selective alveolar decortication in the rat. The anabolic aspect of regional acceleratory phenomena (RAP) was demonstrated.