Anabolic Modeling of Trabecular Bone Following Selective Alveolar Decortication

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Introduction
Decortication-facilitated orthodontics is a relatively new technique combining braces and alveolar decortication plus grafting. Wilcko et al. (Int J Perio Restor Dent 2001) suggested that alveolar malocclusions like open bites are finished in 60-70% more rapid orthodontic treatment time. Jameson et al. (World J Ortho 2003) suggested that decortication is an incision made into cortical bone that is made after the orthodontic appliances have been placed. The scarring of alveolar bone induces an increase in hard and soft tissue turnover, a process collectively known as Regional Acceleratory Phenomena (RAP). (Frost HA, Orthop Clin of N Amer 1981)

Bogoch (J Orthop Res 1993) demonstrated 5X increase in apposition & resorption (osteopenia) of rabbit tibia long bone spongiosa adjacent to corticotomy.

Objective
The objective was to evaluate anabolic modeling of alveolar trabecular bone as a function of time and location following selective alveolar decortication.

Methods & Materials
Sample:
Five rats underwent unilateral selective alveolar decortication B-L to the upper left 1st molar with the right side serving as control.

Procedure:
- All animals were fed fluorescent bone stain calcein in their drinking water ad libitum.
- Sacrifices: Group 1 (n=3) @ post-op week 3
- Group 2 (n=2) @ post-op week 7
- Maxillary halves were harvested and processed for un-decalcified fluorescent stain histology.
- Amount of calcein stained newly formed bone was measured in transverse sections of spongiosa in 1st molar and 3rd molar areas using a 100 x 100 pixel square grid (10,000 sq pixels) and Olympus Micro Suite FIVE analysis software.

Results
- Percent of New Bone Apposition: At 3 weeks post decortication new bone apposition was 59.68% (5,968/10,000 pixels) and significantly greater compared to 3 week surgery and 3 week control (p=.03) and surgery 17.78% (p=.012)
- There were no significant differences (p>.05) between percent of new bone apposition in the 3 week surgery and any of the 7 week groups.

Data of Interest:
Bone Apposition: expressed as percent of calcein stained osteoid on calibrated images in a 10,000 sq pixels grid in 1st and 3rd molar areas.

Conclusion
Anabolic modeling of alveolar trabecular bone adjacent to the decortication site increased by about 1.5 times at 3 weeks; this increase represented a 2.6X to 3.4X greater anabolic modeling activity as compared to the 3rd molar area.

Anabolic regional acceleratory phenomena (RAP) of spongiosa resulted.