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Biological reaction of alveolar bone to orthodontic tooth movement

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ABSTRACT

Direct and indirect resorption are perceived as reactions to an applied force. This is in contrast to the view of orthopedic surgeons, who describe apposition as a reaction to loading of bone. A histomorphometric study of the circumalveolar bone reaction to a force system generating translation of premolars and molars of five *maccaca fascicularis* monkeys is described. Three force levels (100 cN, 200 cN, and 300 cN) were applied for a period of 11 weeks. Undecalcified serial sections were cut parallel to the occlusal plane, and a grid consisting of three concentric outlines of the root intersected by six radii was placed on each section. Areas anticipated to be submitted to different stress / strain distributions were isolated. A-posteriori tests were used in order to separate areas that differed with regard to parameters reflecting bone turnover. Based on these results, a new hypothesis regarding tissue reaction to orthodontic forces is suggested. Direct resorption could be perceived as a result of the lowering of the normal strain from the functioning PDL and as such, as a start of remodeling, in the bone biological sense of the word. Indirect remodeling could be perceived as a sterile inflammation attempting to remove ischemic bone under the hyalinized tissue. At a distance from the alveolus, dense woven bone was observed as a sign of a RAP (regional acceleratory phenomena). The apposition could, according to the new hypothesis, be perceived as a result of the bending of the alveolar wall produced by the pull from the Sharpey fibers. The above suggested interpretation of tissue reaction would be shared with bone biologists.

KEY WORDS: Orthodontic tooth movement, Tissue reaction, Bone remodeling, Bone modeling, Histomorphometry, Orthopedics, Stress / strain distribution.

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