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Effects of systemic administrations of calcitonin and zoledronic acid on orthodontic relapse (histological and immunohistochemical experimental study on rats)

**A thesis submitted to the council of the College of
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Abstract

Relapse after orthodontic treatment is an inevitable condition that represents a major problem facing the orthodontist. Although several attempts were made to minimize relapse they lacked the feasibility regarding their cost effectiveness and patient compliance.

The aim of this study was to determine the effect of systemic administration of calcitonin and zoledronic acid on the post orthodontic relapse and bone cells activities using histological and immunohistochemical investigations.

Materials and methods: Thirty six male Wister rats were divided into three groups; the Control group, Calcitonin receiving group and Zoledronic acid receiving group. The right maxillary first molars were orthodontically moved mesially for 14 days, using custom made fixed orthodontic devices, followed by 4 days of retention during which, the control group was injected subcutaneously with normal saline and the calcitonin group was injected subcutaneously with 20 IU/Kg of calcitonin for three times every alternative day while the zoledronic acid group received 0.15 mg/kg of zoledronic acid intravenously for one time. After that, the molars were left to relapse for ten days. Study models for the upper teeth were constructed before orthodontic tooth movement, after the removal of the orthodontic appliance and at the end of the relapse period. Then the models were photographed and the animals were sacrificed. Relapse ratio, histological analysis (osteoblasts number, osteoclasts number and bone area) and immuno-histochemical analysis (expression of RANK, RANKL and OPG) were measured.

The results showed that the relapse ratio was significantly reduced in calcitonin group (28%) compared to 42% and 46% for zoledronic acid

and control group respectively. This was accompanied by an increase in osteoblasts number and bone area, in addition to a non-significant reduction in osteoclasts number in the experimental groups. Regarding the immuno-histochemical investigation, the experimental groups showed a lower expression of RANK and RANKL in addition to a higher expression of OPG compared to control group; however, the differences was not statistically significant.

Conclusions: Systemic administration of calcitonin significantly minimized the post orthodontic relapse and enhanced osteoclastic suppression. Although the relapse in zoledronic acid was not reduced markedly, it showed a similar effect to calcitonin with regard to histological and immune-histochemical reaction.