The Effect of Pulsed Electro-magnetic Field on Orthodontic Tooth Movement (An Experimental Study)

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ABSTRACT

Background: Extremely low frequency pulsed electro-magnetic field has many biological effects and has special influences on calcified tissues. So it has been used successfully in the field of orthopedics, but its application in orthodontics is limited to animal model research.

Aims: The purpose of this study was to investigate the effects of pulsed electro-magnetic field on the rate and amount of orthodontic tooth movement in rabbits, in addition, to evaluate its effects on bony physiology and metabolism and to seek out for possible systemic side effects.

Materials and Methods: Laterally directed orthodontic force was applied to move the mandibular central incisors of a sample of (12) adult albino rabbits (8 males, 4 females). During the 12-day experimental period, the rabbits were placed in a specially constructed wooden boxes with their jaws positioned in an area of uniform pulsed electro-magnetic field of two intensities (4.4 mTesla) and (2 mTesla) with a frequency of (20 Hertz) for ten hours a day. The control animals were placed in similar boxes that did not carry the electrical apparatus. Tooth movement was measured daily during the experiment and blood sample and biopsy were taken at the last day. Histological assessment was done for the periodontal ligament and bone, and ten serological tests were done.

Results: The amount of orthodontic tooth movement was significantly greater ($P< 0.05$) in the (4.4 mTesla) pulsed electro-magnetic field group than the control group at the end of the experiment. Cellular activity was also enhanced reflected by the significantly greater ($P< 0.05$) number of osteoclasts on the compression side of the (4.4 mTesla) pulsed electro-magnetic field group compared to the control group. Serological analysis did not reveal any significant difference except in the case of potassium ion which was significantly ($P< 0.05$) reduced in both experimental groups than the control group.

Conclusion: The results suggest that the use of non-invasive pulsed electro-magnetic field can increase the amount of orthodontic tooth movement.