The Effect Of Low Intensity Pulsed Ultra Sound (LIPUS) Therapy On The Relapse Rate And Bone Remodeling Post-Orthodontic Tooth Movement.

(An Experimental Study on Rabbits)

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Abstract

Relapse has been recognized as a major clinical problem among orthodontists, perhaps due to lack of understanding of the process, the mechanism of post-treatment relapse, and inadequate data regarding the effects of different treatment approaches on relapse tendency, or due to lack of the cooperation of the patient with the retainer appliance.

In Orthopedic treatment, Low Intensity Pulsed Ultrasound (LIPUS) has many effects on acceleration of bone fracture healing due to its physical effect and Piezo-electral effects.

The present study was carried out to evaluate the effect of Low Intensity Pulsed Ultrasound (LIPUS) therapy on the relapse rate and bone remodeling post-orthodontic tooth movement clinically ,radiographically, biologically, histologically ,and immunohistochemically.

Twenty eight New Zealand male rabbits of 14-16 weeks of age were used. Divided randomly into four groups :control group with Circumferential Supracrestal Fibrotomy (CSF) (GIA, n=7),control group without CSF (GIB, n=7), experimental group with CSF (GIIA, n=7), experimental group without CSF (GIIB, n=7).These four groups received orthodontic appliance include only the mandibular central incisors (MCIs), and these teeth were moved distally for 22 days by using pushing coil spring that will be delivered a total constant amount of light continuous orthodontic force, and without force deflection of about100gm (50gm for each tooth). Then GIIA received CSF procedure plus LIPUS therapy post Orthodontic Tooth Movement (OTM), and GIIB received only LIPUS therapy post OTM., LIPUS therapy performed for 28 days, 20min./day by using a commercial ultrasound device that provide LIPUS with a 1MHz frequency, and an intensity of 50 mW/cm^2, while GIA received only CSF procedure post OTM., and neither CSF procedure nor LIPUS therapy was performed in GIB post OTM. First, the measurements of the OTM monitored throughout the first period of the experiment (1^{st} 3 weeks) after insertion

of orthodontic appliance for each group at four times interval (0, 1, 2, and 3 wk. OTM). Second, the rate and measurements of the relapse movement monitored throughout the last 4 weeks of the experimental period after the removing of the orthodontic open-coil spring for each group at four times interval (1, 2, 3,and 4 wk. Relapse). At the end of the experiment, the biopsy was taken. A Radiographical assessment method for the Percentage of Relapse(PR) was performed first, then ,histopathological ,and immunohistochimecal based assessment method for the amount of bone formation and resorption was performed at the labial, pressure and tension sides of the coronal , middle and apical levels.

The results show on the bases of clinical findings that there are significant difference in the percentage of relapse movement (PR.) between the control and the experimental groups: GIA× (GIIA&B), and GIB×(GIIA&B), the PR. in experimental groups was less in contrast to control groups. The Radiographic, histological and immunohistochemical findings support this, as the radiographic findings show the same result of clinical finding in decreased of PR. of the Mandibular Central Incisors (MCIs) in the experimental groups, while the histological and immunohistochemical findings show that there is a significant increase in the number of osteoblast cells (Ob.) and blood vessels (Bl.v.), and significant decrease in the number of osteoclast cells (OCL.) in the experimental groups in contrast to control groups .

The results also show that there was no significant difference neither clinically, radiographically ,histologically nor immunohistochemicaly between the two control groups, while there was a significant difference clinically and radiographically in the PR. between the two experimental groups ,but there was no significant difference between them neither histologically nor immunohistochemicaly in the numbers of Ob., Bl.v. ,and OCL. cells (bone remodeling).

From this experimental study we conclude that the LIPUS therapy can reduce the rate and percentage of relapse movement post–orthodontic tooth movement and has the potential to accelerate tooth stability in a new position by stimulating PDL remodeling and increasing alveolar bone formation.