Open Topics

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Histomorphometrical and Clinical Evaluation of the Effects of Decortication Procedure Using Er:Yag Laser on Tooth Movement in Rats

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The aim of this study was to histomorphometrically and clinically evaluate the effect of decortication procedure, which has been prepared transmucously with the use of Er:YAG laser, on tooth movement.

28 Sprague-Dawley rats were used for this purpose. The upper first molar teeth were mesialized with the use of a Sentalloy closed coil spring that was placed between the upper first molars and the incisor teeth.

Rats were separated into experimental and control groups. Each group consisted of one week and two weeks follow-ups. Total experimental time was 2 weeks. Experimental groups were treated with an Er:YAG laser right after the appliance insertion (1). Three decortication points were prepared on the mesial, palatal and buccal sides of the first upper molar teeth. The power of the laser applied was 1 watt and the duration was 8 seconds (2). Tooth displacements were measured on model casts which were prepared from impressions of the upper jaw taken before placement of the appliance, on day 7 and day 14. At the end of the experiment, upper jaws of the sacrified rats were dissected and prepared for histological examination.

The obtained tissue samples were fixed in 10% neutral formaldehyde in 0.1 M phosphate buffered saline (PBS; pH=7.4) and submitted to histological evaluation. Paraffin-embedded upper jaw tissues were sectioned to 10 µm. Physical fractionators and systematic sampling methods were used and stained with Hematoxyline and Eosin technique. Alveolar bone volume was examined under a stereological station and Cavalieri method (3).

The histological evaluation revealed that alveolar bone volume and total volume between the roots of upper first and second molar teeth of the experimental groups were statistically higher than the control groups on day 7 ($p<0,001$, $p<0,001$) and day 14 ($p<0,001$, $p<0,05$). Histopathologic findings revealed new bone formation areas and increased vascularization between the roots of experimental groups. (Table 1, Figure 1 and 2).

In our study decortication procedure, which is known to accelerate orthodontic tooth movement, was applied with a different and novel method (4). The results suggested that decortication procedure which is applied transmucously with the use of an Er:YAG laser, contributed favorably during bone remodeling and accelerated tooth movement consequently.

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	C7	D7	C14	D14
	n=7	n=7	n=7	n=6
Section Thickness	10	10	10	10
Number of Sampled Sections	16,7	14,7	16,7	15,8
Mean Interdental Point Number	6870	5346	5239	5288
CE InterdentaLRegion	0,006	0,006	0,007	0,006
Mean Interdental Alveolar Bone Point Number	2609	2926	1796	1695
CE Interdental Alveolar Bone	0,008	0,007	0,009	0,007

Table 1: Mean point number , section thickness and number of sample section for the interdental and alveolar bone region volume estimation Coefficient of Error (CE) of stereological analysis in the groups of rats applied to decortation during the period of 1 and 2 weeks after ER-YAG Laser exposed groups (D7, D14) and theirs controls (C7, C14)

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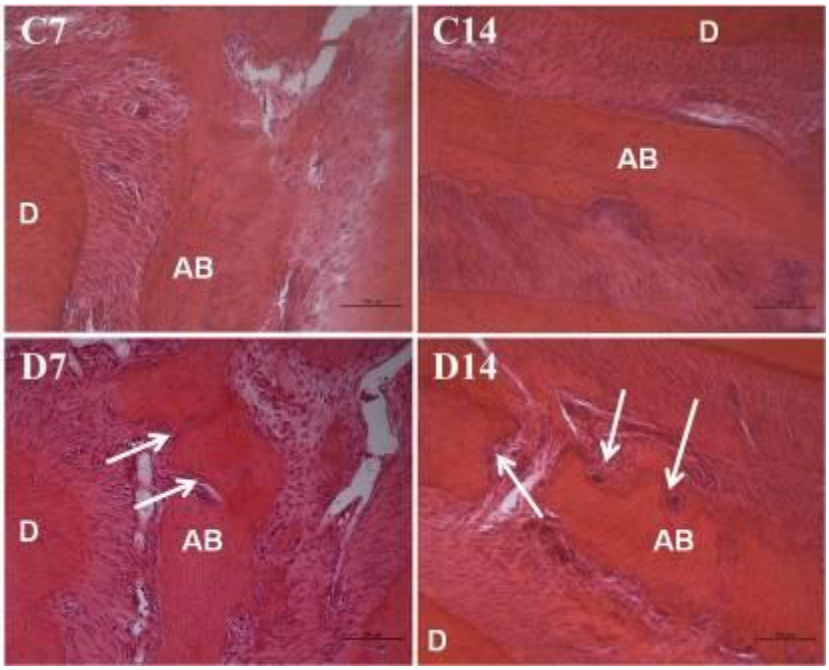

Figure 1. In decortation groups, the new ossification and vascularization areas are increased. Photomicrographs are demonstrated of sections taken from decortation and control groups and stained with Hematoxylin-eosin. Groups: C7; Control 7 day, C14; Control 14 day, D7; Decortation 7 day and D14; Decortation 14 day. Alveolar bone is demonstrated with (AB), dentin (D), new ossification and vascularization areas (arrow). The magnification is x20. Scale bar represents 100 µm.

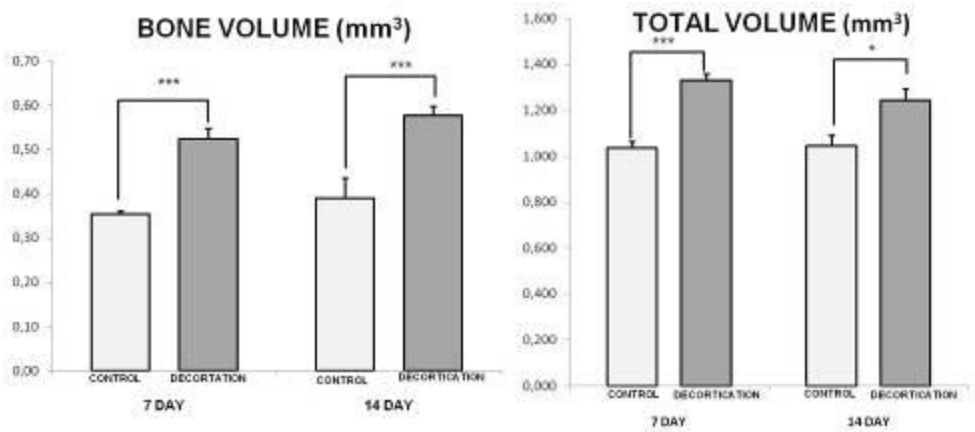

Figure 2. Graphs comparing the control and decortation groups (*p< 0,05 and *** p<0,001). The left panel of the figure is alveolar bone volume, the right panel of the figure is total volume.