P10-2

The effect of high-frequency vibration with light orthodontic force to accelerate tooth movement in rat models.

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Background and rationale

Orthodontic treatment can increase a quality of life of patients by improving occlusion, esthetic, and psychological problems. Nevertheless, long duration of treatment time also increases risks of dental caries, periodontitis, and patient burn out. The mechanical vibration is one of the several methods to accelerate orthodontic tooth movement which provides the advantages, such as non-invasive, painless, and fewer complications. However, the effect of mechanical high-frequency vibration (HFV) is still controversy.

Material and Methods

The forty-eight of rat molars were randomly assigned to control and 3-experimental groups: Vibration (HFV), Light force (LF), Light force with HFV (LFV). The NiTi close coil springs were delivered 5 g constant force on maxillary 1st molar. The modified electrical toothbrush (Oral-B®) was used to generate HFV on occlusal surface of maxillary 1st molar for 125 Hz, 5 mins per day. Tooth movement was measured with micro-CT on days 14, 21. The root resorption was analyzed with a three-dimensional root volume.

Results

The amount of tooth movement of the LFV showed significantly greater than LF. The vibration caused a 1.8 and 2-fold significantly increased amount of tooth movement on day 14 and 21 respectively (0.22 ± 0.018 mm vs 0.125 ± 0.008 mm, 0.354 ± 0.039 mm vs 0.178 ± 0.013 mm), ($p<0.05$). The volumetric analysis of mesial, distobuccal, and distopalatal roots showed no significant difference among all groups.

Conclusions

Supplement the HFV with light force has the effect of accelerating tooth movement without changing the root volume

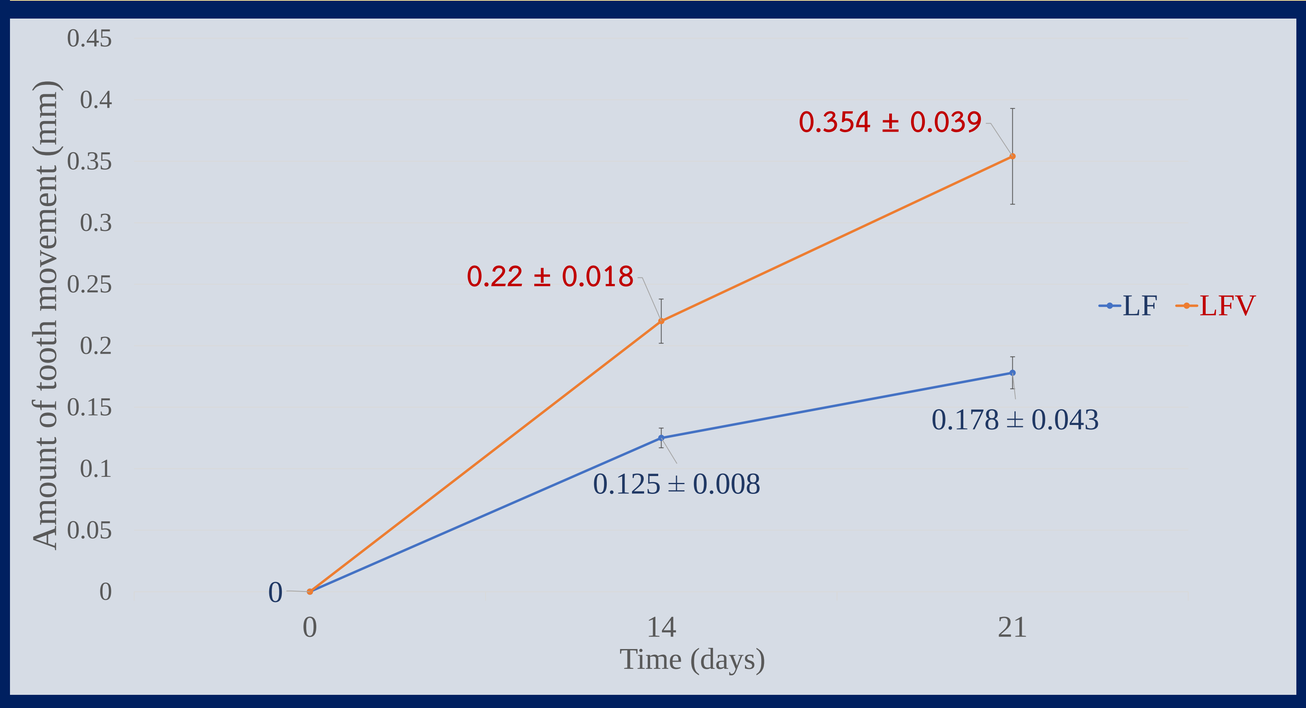

Figure 1: Cumulative amount of tooth movement from starting the experiment until day 21.

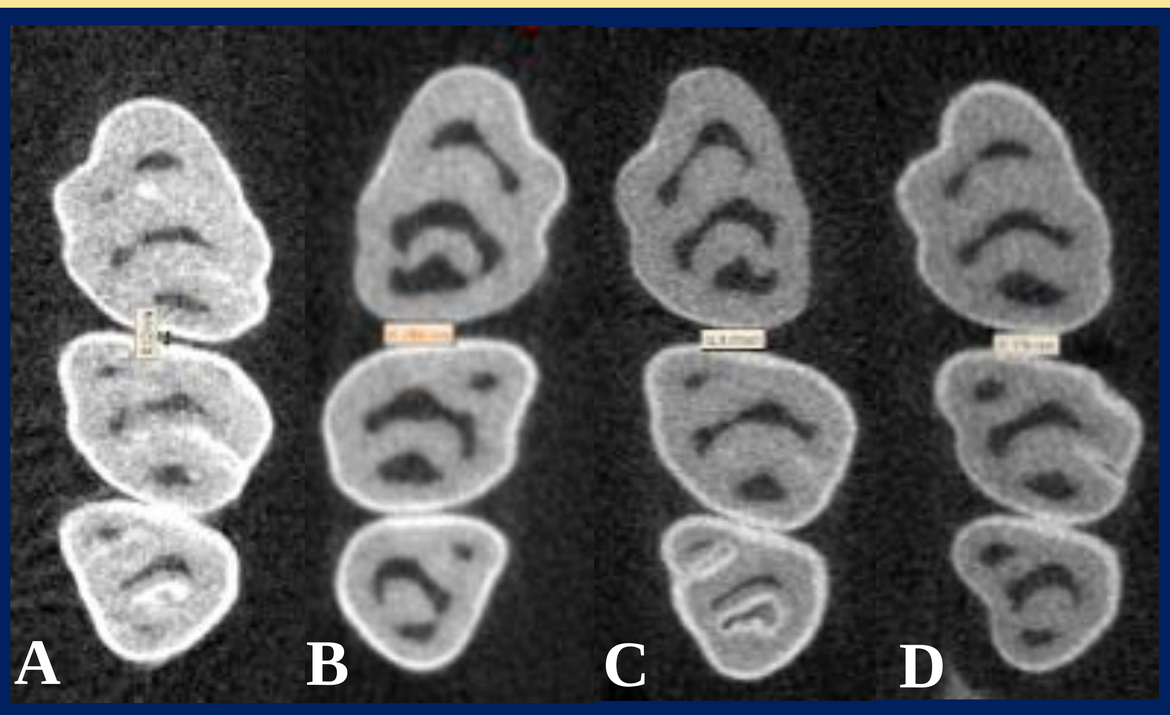

Figure 2: Micro-CT images (A: LF, 14 d, B: LFV, 14 d, C: LF, 21 d, D: LFV, 21 d)