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## Dentistry Congress 2019: Effects of mechanical vibration force on tooth movement: Finite element analysis - Aylin Pasaoglu Bozkurt - Beykent University

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**Objective:** The purpose of this finite element have a look at became to evaluate the effect of mechanical vibration force on enamel motion, stress distribution and velocity.

**Introduction:** Speed, aesthetics and technology are the maximum crucial concepts inside the twenty first century. To meet the growing call for of orthodontic treatment and to prevent root resorption, white spot lesions, caries, gingivitis, patients with lack of motivation, oral hygiene worsening and infections. Remedy need to be finished quickly and correctly. Hence acceleration of teeth motion has gained reputation.

Orthodontic enamel motion is; displacement of a teeth in its bony socket from one place to another location as a result of alveolar resorption and formation at a positive time. It is essential to affect the mechanical and organic components of the movement to boost up it. Developed brackets and wires structures that are the mechanical additives of movement have come to a complicated degree and that they lessen treatment time drastically as compared to the past.

Chemical injection, surgical procedure, ultrasound, laser, electric present day utility methods are supposed to have an effect on the biological factor of moves to boost up teeth movement, by lowering the resistance around the periodontal tissue and changing environmental elements. One of the newly introduced strategies is to use non-invasive, cyclical vibration forces to accelerate teeth motion in current years. Studies performed on the bottom of the skull and cranial sutures confirmed that cyclical pressure may want to create bone islands more successfully than static force, and vibration application may want to boom remodeling and gene regulation. Nishimura et al. confirmed that cyclical vibration force ought to increase RANKL price and accelerate the charge of teeth movement; and not using harm on periodontal tissue in rats. Leethanakul et al. tested the secretion of interleukin (IL)-1b during enamel movement in vibration application. They determined that secretion and teeth movement had been on better levels on the aspect where vibration was carried out. Pavlin et al. confirmed that low-degree cyclical loading of 0.25 N at 30Hz increased the price of tooth motion when carried out as an addition to orthodontic remedy.

Sixteen besides proponents of vibration on acceleration enamel movement, there are also research arguing that it has a slowing impact or have no effect at all. Disorderly organized fibers, reduced alveolar bone volume and slowed down the movement of teeth due to cyclical vibration pressure software had been determined within the animal have a look at which become carried out by Kalajzic at al.

The animal study that investigated the outcomes of low frequency mechanical vibration force (5, 10, 20Hz) via Nanda et al., And the randomized managed clinical examine about AcceleDent (30 Hz) on tooth movement by way of Woodhouse et al. Showed that vibration force had no great acceleration effect.17, 18 Miles et al., of their randomized controlled trial, showed that utility of a 111 Hz vibration pressure for 20 minutes according to day had no effect on acceleration of teeth motion.19 There is inadequate statistics approximately the biomechanical consequences of mechanical cyclical vibration force on teeth motion. Finite detail evaluation (FEA) is a beneficial mathematical device for orthodontics and it can determine the amount of strain, strain, and displacement within the dent alveolar complicated after distinct loading situations of pressure.20 Hence the aim of this study became to determine the biomechanical effect of vibration pressure on tooth motion at dog distalization phase using FEM analysis, and evaluate the pressure distribution among utility of force only, and combined software of pressure and vibration.

**Methods**: A 3-D version turned into created using CBCT photo of a patient with elegance 2 malocclusion. Three distinct analyses had been achieved on a unmarried version where higher first premolars had been extracted. At dog distalization stage; 150 gf, 150 gf and 30 Hz (zero.2 N), a hundred and fifty gf and 111 Hz (0.06 N) have been applied to dog. The first moment impact of force and vibration had been evaluated the use of the Algor Fempro finite element analysis software. Stress and displacement distribution were investigated comparatively.

**Results:** It become determined that the maximum displacement occurred within the second analysis (one hundred fifty gf-30 Hz), whilst lower displacement became visible within the 1/3 analysis (one hundred fifty gf-111 Hz), and the lowest quantity of displacement was within the first analysis (a hundred and fifty gf). While simplest pressure application brought on extrusion of the tooth, linear and vibration forces collectively prompted intrusion. In the first evaluation canine turned around in the distovestibule path, but inside the second and 1/3 analysis, dog confirmed distopalatal rotation.

**Conclusion:** It turned into concluded that during a sure range, mechanical vibration force might also have improved teeth motion.