



CFAO GRADUATE STUDENT POSTERBOARD ABSTRACTS

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Orthodontic Simulation of Forces and Moments Using Space Generation Mechanics with a Lingual Bracket System

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Introduction: Orthodontic treatment involves applying forces and moments to teeth to allow them to move through bone in a safe and effective way. The primary goal is to preserve the health of teeth and surrounding tissues throughout orthodontic treatment. Understanding the forces that orthodontic appliances exert on teeth can ensure that safe force levels are applied.

Objectives: Analysis of the three dimensional (3D) forces and moments exerted by lingual braces in a simulated dental arch with crowded teeth. Two treatment mechanics for generating space in the anterior dental arch were analyzed: Nickel Titanium coil springs and archwire stop mechanics. Two different orthodontic wire systems were analyzed: straight wires and mushroom wires.

Methods: Data was collected using an Orthodontic Simulator (OSIM); an in-vitro model of the human mouth to measure 3D forces and moments on each tooth around the arch. Lingual braces (In-Ovation L, Dentsply GAC, York, PA, USA) were positioned on anatomically designed metal teeth on the OSIM. The metal teeth simulations are attached to load cells (Nano17, ATI Industrial, Apex, NC, USA) which measure the real-time 3D forces and moments experienced by all of the teeth in the dental arch simultaneously. Teeth in the anterior dental arch were moved from a crowded position to the desired neutral uncrowded position to simulate space generation.

Results: There are statistically significant differences between the forces and moments experienced by the teeth when comparing the different treatment types and different wire types. Clinically these results may be of interest when planning treatment mechanics.