Meetings International

18th World Congress on

DENTAL HEALTH

September 22-23, 2025 | London, UK

Effects of three types of attachments in the displacements, and distribution of stress and plastic deformation, trough finite elements (FEM)

Valentina Fayad Jaramillo
Fundacion Universitaria CIEOUniCIEO, Colombia

Objective: Evaluate the effect of resin attachments on the displacement and deformation pattern of the aligner plastic, determine the center of rotation and stress distribution in the upper canine during space closure using the finite element method (FEM). Furthermore, evaluate the plastic Aligner deformation.

Method: A CAD model of the superior right hemiarch was constructed with the simulation of a first premolar extraction and a canine distalization, recreating the periodontal ligament and alveolar bone. Finite element models were created to analyze the behavior of stress and displacement of the upper right canine with aligners in 4 situations, one without attachment and 3 with bonded attachments (vertical rectangular, rectangular beveled, optimized root control). In addition, the plastic deformation of the aligner was evaluated.

Results: In the simulation without attachment there was no apical movement, while with vertical rectangular and rectangular beveled the behavior was similar with crown distal displacement and mesial apex displacement. The optimized attachment had a better movement control of the canine body respecting the crown and apical movement towards the same direction. The mayor plastic deformation was shown without attachment and no deformation was evidenced with optimized attachment.

Conclusion: The FEM showed that, nevertheless the optimized attachment produced a distal crown and apical displacement with the use of plastic aligners during the space closure, the apex only moved ¼ of the distal crown movement. Our results, suggest that to obtain a pure translation of the canine with aligners it would be necessary the use of auxiliars which complement the needed biomechanics.

Biography

Valentina Fayad Jaramillo is a respected researcher and faculty member at Fundación Universitaria CIEO–UniCIEO, Colombia. She specializes in orthodontics and biomechanics with a strong emphasis on digital simulation techniques. Her research focuses on analyzing dental attachment systems using finite element methods (FEM). Dr. Fayad Jaramillo has contributed to several scientific investigations on stress distribution and tooth movement.

She is committed to advancing evidence-based orthodontic practices through computational modeling. Her work highlights the importance of precision in evaluating orthodontic appliance performance. She frequently participates in academic and clinical conferences to share her research findings. Dr. Fayad Jaramillo is recognized for her dedication to improving orthodontic treatment outcomes through innovation.