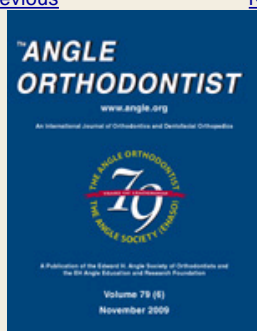


Volume 79, Issue 4  
(July 2009)
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Original Articles

## Biomechanical Effects of Fixed Functional Appliance on Craniofacial Structures

Priyankar Panigrahi<sup>a</sup> and Varadarajan Vineeth<sup>b</sup>

### Abstract

**Objective:** To evaluate displacement and stress distribution on craniofacial structures associated with fixed functional therapy.

**Materials and Methods:** A finite element model of the human skull was constructed from sequential computed tomography images at 2-mm intervals using a dry adult human skull. In this study, linear, four-nodal, tetramesh and triangular shell elements were used with six degrees of freedom at each of their unstrained nodes: three translations (x, y, and z) and three rotations (around the x-, y-, and z-axes).

**Results:** The entire mandible moved anteroinferiorly. Maximum displacement was observed in the parasymphiseal and midsymphiseal regions. The pterygoid plate was displaced in a posterosuperior direction. The anteroinferior displacement of the mandibular dentition was most pronounced in the incisor region, while the maxillary dentition was displaced posterosuperiorly. The entire dentition experienced tensile stress except for the maxillary posterior teeth. Tensile stress was also demonstrated at point A, the pterygoid plates, and the mandible, and minimal compressive stress was demonstrated at anterior nasal spine. Maximum tensile stress and von Mises stresses occurred in the condylar neck and head.

**Conclusion:** Fixed functional therapy causes a posterosuperior displacement of the maxillary dentition and pterygoid plate and thus can contribute to the correction of Class II malocclusion. The displacement was more pronounced in the dentoalveolar region as compared to the skeletal displacement. All dentoalveolar structures experienced tensile stress, except for anterior nasal spine and the maxillary posterior teeth.

**Keywords:** [Fixed functional appliance](#), [Stress](#), [Displacement](#)

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