

AAO Foundation Award Final Report

Principal Investigator	Hao-Fu Lee, DDS, MS
Co-Investigator	Dr. Kang Ting
Secondary Investigators	
Award Type	Orthodontic Faculty Development Fellowship
Project Title	Maxillary expansion in customized finite element method models
Project Year	2008
Institution	University of California – Los Angeles
Summary/Abstract (250 word maximum)	<p>Introduction: The aims of this study were to develop a method for constructing a 3-dimensional finite-element model (FEM) of the maxilla and to evaluate the effects of transverse expansion on the status of various midpalatal sutures.</p> <p>Methods: A 3-dimensional FEM of the craniofacial complex was developed by using computed-tomography images and Bionix modeling software. To evaluate the differences between transverse expansion forces in the solid model (maxilla without a midpalatal suture), the fused model (maxilla with suture elements), and the patent model (maxilla without suture elements), transverse expansion forces of 100 g were applied bilaterally to the maxillary first premolars and the first molars.</p> <p>Results: The fused model expressed a stress pattern similar to that of the solid model, except for the decreased first principal stress concentration in the incisive foramen area. The patent model, however, had a unique stress pattern, with the stress translated superiorly to the nasal area. The anterior nasal spine and the central incisors moved downward and backward in both solid and fused models but moved primarily downward with a slight backward movement of the anterior nasal spine in the patent model.</p> <p>Conclusions: Clinical observations of maxillary expansion can be explained by different suture statuses. This efficient and customized FEM model can be used to predict craniofacial responses to biomechanics in patients.</p>
Were the original, specific aims of the proposal realized?	Yes.
Were the results published? If not, are there plans to publish? If not, why not?	Yes. American Journal of Orthodontics & Dentofacial Orthopedics. Volume 136, Issue 3 , Pages 367-374, September 2009.
Have the results of this proposal been presented? If so, when and where? If not, are	Yes. 2007 AAO annual meeting, San Francisco. The related project of Unilateral cleft lip and palate finite element study was presented at AADR in San Diego, 2011 by resident Paul Hoang.

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