

[\[Print Version\]](#)

[\[PubMed Citation\]](#) [\[Related Articles in PubMed\]](#)

The Angle Orthodontist: Vol. 66, No. 2, pp. 125–130.

Association between the direction of orthopedic headgear force and sutural responses in the nasomaxillary complex

Kazuo Tanne, DDS, PhD;^a Susumu Matsubara, DDS, PhD^b

^aKazuo Tanne, Department of Orthodontics, Hiroshima University School of Dentistry, I-2-3 Kasumi, Minami-Ku, Hiroshima 734, Japan

^b

ABSTRACT

This study was designed to investigate biomechanical responses of the sutures in the nasomaxillary complex to orthopedic headgear forces applied in various directions. A three-dimensional analytic model of the craniofacial complex was used for finite element analysis. A posteriorly-directed force of 1.0 Kgf was applied to the maxillary first molars in 30° inferior, parallel, and 30°, 52.4° and 60° superior directions to the functional occlusal plane. Mean principal and shear stresses were evaluated at the sphenozygomatic, temporozygomatic, sphenozygomatic, frontomaxillary and frontozygomatic sutures and lamina cribrosa. As the force direction passed closer to the center of resistance (CRe) of the complex (52.4° superior direction), normal stresses approached a certain level of uniform compressive stress (-2.5 gf/mm^2) with gradual decrease in shear stresses, whereas variation in these stresses produced by the forces applied in other horizontal and inferior directions was greater. It is shown that stresses in the nasomaxillary sutures are varied by the direction of headgear force. Directing the line of force closer to the CRe may produce the most optimal sutural modification effective for controlling forward and downward maxillary growth.

KEY WORDS: Orthopedic headgear therapy, Force direction, Center of resistance, Craniofacial suture, Finite element analysis.

Submitted: October 1994

Accepted: January 1995.