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Finite-element morphometry of soft tissue morphology in subjects with untreated Class III malocclusions

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ABSTRACT

Soft tissue dynamics may contribute to maxillomandibular allometry (size-related changes in shape) associated with the development of Class III malocclusions. Lateral cephalographs of 124 prepubertal European American children were traced and 12 soft tissue landmarks were digitized. Resultant geometries were normalized, and Procrustes analysis established the statistical difference ($p<0.001$) between mean Class III and Class I configurations. Comparing the Class III configurations with normals for size-change, color-coded finite element analysis revealed a superoinferior gradient of positive allometry of the Class III facial nodal mesh. A conspicuous area of negative allometry (≈40%) was localized near soft subspinale, with a ≈70% increase in size in the mental region. For shape-change, the Class III facial mesh was isotropic, except in the anisotropic circumoral regions. Conventional cephalometry revealed that about 50% of linear and 75% of angular parameters differed statistically ($p<0.001$). Soft tissue dynamics during early postnatal development may contribute to the development of Class III malocclusions.

KEY WORDS: Class III, Finite-element, Soft tissues, Morphology, Morphometry.

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