A9 Sexual Dimorphism in Mandibular Morphology Between Dentate and Edentate Individuals — Implications for Sex Estimation

Heli Maijanen, PhD, University of Oulu, PO Box 1000, Oulu 90014, FINLAND; Beatrix Dudzik, PhD, 250 S Stadium Hall, Knoxville, TN 37996; and Kathleen Hauther, University of Tennessee, 250 S Stadium Hall, Knoxville, TN 37920*

After attending this presentation, attendees will be informed on the morphological changes between dentate and edentate mandibles and their impact on sex estimation.

This presentation will impact the forensic science community by providing quantification of shape variables of the mandible between the sexes in the dentate and edentulous state.

The mandible has traditionally been included in metric and non-metric methods for sex estimation of the skull. The accuracy of methods is debatable, as previous research provides contradictory results depending on which methods and areas of the mandible are used.[1,2] Several studies have found significant changes in mandibular morphology due to tooth loss. Some studies have reported these changes exceed the sexual dimorphism seen in mandibular measurements.[3,4] Thus, the sex estimation of an edentulous mandible may be compromised.

The focus of this study was to identify and quantify sex-related differences in shape and size between dentate and edentate mandibles. Emphasis was placed on regions that have traditionally been used in non-metric sex estimation methods such as gonial angle, chin shape, ramus breadth, and mental eminence. The study evaluated the degree of sexual dimorphism in mandibular morphology and whether this dimorphism is retained with extreme tooth loss.

The sample consisted of 120 individuals, including males, females, dentate, and edentate, from the W.M. Bass Donated Skeletal Collection. Coordinate data were collected using a MicroScribe® G2X digitizer. Twenty-three landmarks were collected that represent morphological areas that are typically used in sex estimation methods. Shape-related differences of dentate and edentulous samples were examined congruently with metric dimensions. Additionally, quantification of shape variables associated with the mental eminence was approximated by the use of a new combination of landmarks, including a novel landmark that makes visualization of shape variation among males and females more feasible when alveolar resorption has occurred.

Preliminary results showed significant differences between males and females in the dentate group in three measurements: bigonial diameter, bicondylar breadth, and mandibular length. All these measurements were greater in males. The differences were smaller in the edentate group. In both males and females, the gonial angle was wider in the edentate group, but no significant sex differences were found in either group. Comparison of shape coordinates of dentate males and females showed significant differences and provided higher accuracy in discriminant analyses than has been reported in previous studies. Differences in the sexes among the edentulous sample were not as significant as with the dentate cohort; however, accuracy estimation percentages were near 80%.

The results confirm the earlier findings that there are changes in mandibular morphology due to tooth loss. These changes seem to diminish the sexual dimorphism seen in dentate individuals in certain areas; however, when shape variables are examined, higher estimation accuracies can be obtained. These results indicate that quantified shape variables should be taken into account if sex estimation from isolated dimensions of an edentate mandible is attempted.

Reference(s):

1. Berg G. *Biological affinity and sex determination using morphometric and morphoscopic variables from the human mandible* (dissertation). Knoxville (TN): Univ. of Tennessee, 2008.
2. Spradley M.K., Jantz R. Sex estimation in forensic anthropology: skull versus postcranial elements. *J Forensic Sci* 2011;56:289-296.
3. Merrot O., Vacher C., Merrot S., Godlewski G., Frigard B., Goudot P. Changes in the edentate mandible in the elderly. *Surg Radiol Anat* 2005;27:265–270.
4. Chrcanovic B., Abreu M., Custodio A. Morphological variation in dentate and edentulous human mandibles. *Surg Radiol Anat* 2011;33:203–213.

Mandibular Morphology, Sex Estimation, Tooth Loss

*Presenting Author