



Physical Anthropology Section - 2014

H105 Sexual Dimorphism in the Cementoenamel Junction of American Blacks

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After attending this presentation, attendees will have a better understanding of the ability to estimate sex from Cementoenamel Junction (CEJ) diameters and the reliability of these measurements.

This presentation will impact the forensic science community by providing accuracy rates of CEJ measurements in sex classification and determining which measurements are most reliable for sex estimation methods.

Tooth enamel is composed of the hardest tissue in the human body, resulting in exceptional preservation in the various contexts of forensic cases. For this reason, tooth dimensions are a valuable tool in forensic analyses. While a number of studies have analyzed the utility of tooth crown dimensions in sex estimation methods, measurements at the CEJ have not been thoroughly investigated. This region of the tooth is particularly resilient, as the area is protected by alveolar bone. Additionally, the junction of the cementum and enamel is clearly delineated, providing a reliable location for measurements. A recent study has shown that CEJ measurements significantly vary between Japanese males and females, and also between Japanese females and South Asian individuals when estimating ancestry.¹ However, CEJ differences between modern American populations have not yet been investigated. The goal of this study is to determine if CEJ measurements can be utilized in sex estimation of American populations, and if so, whether maxillary or mandibular measurements are the most accurate in estimation. Finally, this study examines which singular tooth measurement is best suited for estimating sex.

Data were collected from 20 Black females and 21 Black males from the Hamann-Todd skeletal collection following Hillson's measurement definitions.² Measurements included the buccolingual and mesiodistal diameters of the maxillary and mandibular left canines, left third premolars, and left second molars. Linear Discriminant Function Analysis (DFA) in FORDISC[®] 3.1 was employed in this study and was used to maximize the mean differences between groups using Mahalanobis distances and the pooled within-group variance-covariance matrix.³

When all measurements were included in a discriminant function analysis using a forward mean stepwise selection method and leave-one-out cross-validation method, the results indicate a 94.3% correct sex classification rate. The six measurements retained in the discriminant function, and hence the most sexually diagnostic, were the mesiodistal and buccolingual diameters of the mandibular canine, buccolingual diameter of the maxillary canine, the mesiodistal and buccolingual diameters of the mandibular third premolar, and the mesiodistal diameter of the maxillary third premolar. When the mandibular and maxillary CEJ dimensions were analyzed independently, the mandibular measurements performed better than the maxillary measurements (91.2% and 81.1% correct classification, respectively). Overall, the canine measurements were the most sexually diagnostic. In particular, the mesiodistal diameter of the mandibular canine displayed the greatest weight in all analyses. A univariate analysis using only this measurement resulted in an 85.7% classification rate.

As indicated by this study, tooth root dimensions at the CEJ can be successfully used in estimating the sex of an unknown individual. Combining various CEJ measurements in DFA results in a higher percentage of correctly classified individuals than using maxillary or mandibular measurements alone. This study indicates that CEJ measurement may provide a valuable resource in forensic sex estimation methods with accuracy rates comparable to methods utilizing the pelvis.

References:

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2. Hillson S, FitzGerald C, Flinn H. Alternative dental measurements: proposals and relationships with other measurements. *Am J Phys Anthropol* 2005;126:413-26.
3. Jantz RL, Ousley SD. FORDISC 3.1: Computerized forensic discriminant functions. University of Tennessee. Knoxville, TN: 2010.

Sex Estimation, Odontometrics, Cementoenamel Junction