



Pathology & Biology Section – 2008

G74 Difficulties in Determining Sex From the Skull: Considering Conflicting Lines of Evidence

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The goal of this presentation is to demonstrate that forensic scientists should understand and employ all available scientific techniques when analyzing human remains, as well as to emphasize that individuals performing forensic osteological analysis must possess a firm understanding both of modern human variation and of the theoretical subtleties of the methods employed to study such variation.

This presentation will impact the forensic community by emphasizing the importance of: (1) a firm foundation in patterns of modern human biological variation, (2) an equally firm understanding of the theoretical and practical strengths and limitations of the methods employed in sex determination, (3) an education in statistics in order to realize that misclassification is not random and can usually be traced to some morphological idiosyncrasy of the remains in question, and (4) a demonstration of the value of using all available scientific methods to determine biological sex from the human skeleton.

A common misconception held by non-anthropologists is that the determination of biological sex from human skeletal remains is relatively easy and/or straightforward because there is a 50% chance of just "guessing" the correct sex assignment. While it is true that forensic anthropologists are extremely accurate at sex determination, they are also aware of the potential sources of error within their assessments, as well as the potential error associated with the external interpretation of their analyses.

Determining sex from gross skeletal morphology can be accomplished via both non-metric and metric techniques. Non-metric techniques examine sexually-dimorphic patterns of discrete skeletal trait expression to distinguish between males and females. Metric techniques rely on the quantification of size and shape differences between males and females, as measured from several diagnostic skeletal elements. The determination of sex using metric methods is most frequently accomplished via the discriminant functions calculated by the FORDISC software (Ousley and Jantz, 1996). Both non-metric and metric approaches to sex determination rely heavily on the os coxa and cranium, which are the two most reliably-diagnostic skeletal elements. Though the os coxa is the preferred element for sex assessment, unfortunately this element is not always present in the remains available to forensic anthropologists for analysis. Indeed, many forensic anthropology cases consist solely of isolated skulls or crania. Not surprisingly, accurate sex determination becomes increasingly difficult in instances of heavily fragmented or largely incomplete skeletons.

Regardless of the techniques or skeletal elements used in the analysis, the forensic anthropologist's ability to accurately assess the sex of unidentified skeletal remains may be stymied by individuals who are atypically skeletally robust or gracile, or by individuals who originate from populations which are outside the forensic anthropologist's sphere of experience. The possibility of encountering such individuals therefore places several critical demands on the forensic anthropologist, including: 1) a firm foundation in patterns of modern human biological variation, and 2) an equally firm understanding of the theoretical and practical strengths and limitations of the methods employed in sex determination. Additionally, the forensic anthropologist should be well educated in statistics in order to realize that misclassification is not random, and can usually be traced to some morphological idiosyncrasy of the remains in question. Collectively, these considerations caution against the hasty interpretation of the results of anthropological analyses, as they may not always be as clear-cut as a cursory examination of the conclusions may suggest.

This presentation will impact the forensic community by demonstrating the value of using all available scientific methods to determine biological sex from the human skeleton. Two cases will be presented in which the only skeletal element available for analysis was the skull. In the first example the non-metric analysis was suggestive of a female and was supported by FORDISC's sex-only function; however, when ancestry was considered, the specimen was classified as a male. In the second example, both the metric and non-metric analyses suggested female. However, the individual's ancestry was questionable and the skull may have represented a male from a population of small, gracile individuals. The atypicality of both specimens alerted the forensic anthropologist to possible interpretational issues which warranted further investigation. In order to supplement the osteological analysis, samples from each individual were sent for genetic sex determination. While it is understood that there are also errors associated with genetic sex determination, this reemphasizes the forensic anthropologist's need to understand modern human variation and the available scientific methods to study variation. Each case will be discussed with an emphasis on sex determination by both osteological and genetic means, as well as a critical assessment of the interpretational error associated with each.

Sex Determination, FORDISC, DNA