

A8 Sexual Dimorphism in the Shape of the Auricular Surface of the Ilium

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Learning Overview: The goals of this presentation are for attendees to: (1) develop a better understanding of the factors influencing the shape of the auricular surface; and (2) recognize the limitations of using the shape of the auricular surface to determine the sex of the decedent from skeletonized remains.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a statistically rigorous study of the shape of the auricular surface using a large recent skeletal sample, helping to resolve the contradictory findings of prior research.

The following null hypotheses are tested: the shape of the auricular surface does not covary with any independent (profile) variables, including: (1) sex, (2) age, (3) collection of origin, (4) body size, or (5) the interaction between sex and collection of origin.

The coxa is considered to be the most sexually dimorphic bone in the adult human body and one of the most useful for sex determination from the skeleton. The auricular surface of the ilium preserves well and is often present in archeological assemblages and forensic cases. While the shape of the auricular surface has been analyzed with both metric and non-metric techniques, these studies tend to simplify the feature's complex shape or else rely on the use of a number of arbitrarily defined landmarks, which can limit the researcher's ability to describe subtle shape differences or to elucidate the causal effects of independent variables.

In this current study, the auricular surfaces of 964 identified "White" individuals from the United States (Bass Collection and Hamann-Todd Collection) and Portugal (Coimbra Collection) were photographed, outlined, and subjected to elliptical Fourier analysis and principle component analysis. Analysis of Covariance (ANCOVA) was then applied to the resulting eigenvalues for each principle component to tease out the effects of each independent (profile) variable on auricular shape. Five effective principle components were distinguished. The first principal component (PC1) explains ~38% of the variation in the shape of the auricular surface and reflects the posterior extension and curvature of the posterior border; it is not influenced by any of the tested independent variables and may reflect difficulty in accurately locating the vaguely defined posterior edge of the surface. PC2 explains ~18% of the variation in the shape of the auricular surface and depicts what has traditionally been described as its "C-shaped" or "L-shaped" appearance. PC2 is significantly affected by sex, with male surfaces being straight and "L-shaped" and females being more curved and "C-shaped".

The stature of the decedent is also significant in females, where taller females tend to have more "feminine" auricular surfaces. PC3 explains ~14% of the variation in shape and describes the pinching of the caudal limb and whether the center line running through the apex is twisted, creating an asymmetrical appearance. Females have a more pinched caudal limb and the apex is oriented toward the cranial limb (asymmetrical), while males have a less pinched caudal limb and the apex is oriented directly above/in front of the posterior indentation (symmetrical). The collection of origin is a significant influence, with individuals from the Bass Collection having less pinched caudal limbs than individuals from the Coimbra or Hamann-Todd Collections. PC4 explains ~6% of the variation in shape and describes the thickness of the cranial limb relative to the caudal limb. Only the collection of origin was found to influence the shape variation described in PC4, where the bulbous cranial limbs in the Bass Collection differ from the thinner cranial limbs of the other groups. PC5 explains ~5% of the variation in shape and describes whether both limbs are pointed or bulbous and whether there are one or two indentations in the posterior border. Again, only the collection of origin was found to influence the shape, where the double indentation of the Bass Collection differs from the single indentation of the other groups.

Overall, the best predictor of the shape of the auricular surface is the sex of the individual, but this factor only accounts for ~0.6% of the total shape variation as described by the effective principal components. Therefore, while the traditional understanding of sexual dimorphism in the shape of the auricular surface is verified here, anthropologists should give priority to other pelvic features over the auricular surface when determining the sex of a decedent.

Forensic Anthropology, Sexual Dimorphism, Auricular Surface