



A10 Sex Estimation of the Subadult Pelvis Prior to Acetabular Fusion

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Learning Overview: After attending this presentation, attendees will understand the limitations in sexing the subadult pelvis prior to fusion of the acetabulum.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing sex estimation results and recommendations for ilium outlines and basic pelvic measurements on a large sample of modern United States subadults.

The Scientific Working Group for Forensic Anthropology (SWGANTH) suggests that sex estimation should not be performed on subadults less than 12 to 14 years of age. A review of the literature, however, reveals multiple studies on the subadult pelvis that report significant levels of sexual dimorphism and suggest a potential utility for subadult sex estimation, particularly using variables related to the ilium. The goal of this study was to test the ability of ilium outlines, greater sciatic notch measurements, and pelvic length indices to differentiate males from females in a large, modern sample of subadults.

Pelvic 3D surface models were extracted from postmortem Computed Tomography (CT) scans of 392 subadult individuals obtained from the University of New Mexico Health Sciences Center, Office of the Medical Investigator aged 0 to 14 years. Only individuals in which the tri-radiate cartilage of the acetabulum remained unfused were included in the study. Once orientation was standardized, 2D images of the internal/visceral surface of the ilia were extracted from the 3D models, and elliptical Fourier analyses were performed on the ilium outlines (contours), followed by a Principal Component (PC) analysis. Pubic length, ischial length, iliac height, maximum ilium breadth, and minimum ilium breadth were collected from the virtual specimens, as were five measurements from the greater sciatic notch. The PCs and various indices of the pelvic and greater sciatic notch measurements were subjected to Multivariate Analysis of Variance (MANCOVA) analyses to test for sex differences given age as a covariate. Discriminant Function Analyses (DFAs) were performed to evaluate correct sex classification rates. It was hypothesized that sexual dimorphism in the pelvis should increase with age; thus, analyses were rerun systematically eliminating the youngest one-year cohort one at a time in an attempt to determine a minimum age at which the subadult pelvis can be sexed.

MANCOVA results indicate significant sex differences in ilium outline shape and pelvic measurements ($p < 0.05$), and Analysis of Covariance (ANCOVA) results revealed sexually dimorphic features related to greater sciatic notch shape and relative pubic length. Despite significant sex differences, less than 70% of the individuals could be sexed correctly with the DFAs, regardless of the variables included. Eliminating the youngest cohorts did not improve results. Scatter plots illustrate a large overlap between males and females in all variables. These results highlight the fact that statistically significant sex differences do not equate to forensically acceptable classification results. Previous studies may be confounding those results or their sample biases may be contributing to their positive results. When limiting analyses to only those individuals over the age of five years in the current study, sample sizes were greatly reduced; thus, additional samples and analyses should be performed to evaluate potential sex classification in subadults over the age of five years. Individuals aged five years or less, however, do not have high enough levels of sexual dimorphism in overall ilium shape, greater sciatic notch morphology, or pelvic length indices to have utility in forensic anthropological assessments. Age was a significant covariate for almost all variables, and morphological variation related to growth and development likely obscures any potential sex-discriminating variables at these young ages.

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