H17 A Review of the Calce (2012) Method for Estimating Age-at-Death From the Acetabulum

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After attending this presentation, attendees will have a greater understanding of the human acetabulum and its use as an age indicator.

This presentation will impact the forensic science community by providing the results of further investigation into the traits and statistical analysis for estimating age-at-death from the human acetabulum.

The goal of this presentation is to inform attendees on the performance of the recently developed Calce method for assessing age-at-death utilizing the acetabulum through a phase-based approach.[1]

Accurate estimation of age-at-death is of important value to the forensic anthropology community as it provides information toward building a biological profile. While a number of methods can be employed for age-at-death estimation, continued development on the utility of less-researched regions of the human skeleton is of importance for expanding on our understanding of how age is physiologically represented in bone.

The Calce method approaches age-at-death estimation through use of the acetabulum by gross observation of three traits with the goal of defining three broad age ranges: young adult, 17-39; middle adult, 40-64; and, old adult, 65+ years-at-death.[1] The value of an accurate method for determining age over 65 is of great interest due to the current lack of methods that provide the ability to accurately and precisely distinguish these older individuals from those of middle-age adult (40-64).

The method is applied through combined observation of three traits that develop through age: (1) acetabular groove; (2) rim porosity; and (3) apex activity. Use of this method is not sex-specific and was developed on a modern sample drawn from the Grant Collection curated at the University of Toronto and the William M. Bass Donated Skeletal Collection (WMBDSC) located at the University of Tennessee.[1]

The study sample consisted of a bilateral sample of 979 ossa coxae from 499 individuals drawn from the WMBDSC. The WMBDSC was chosen for its significance as the most comprehensive modern American sample so as to provide the most forensic benefit as a reference population. The sample includes male and female individuals of known age. The sample was evaluated blind to all demographic data. In this study, both left and right sides were observed to test differences in asymmetry. The order of evaluation was staggered to prevent introduction of bias in scoring.

Statistical analysis to determine correct age estimation was conducted on a bilateral sample of 247 ossa coxae representing 126 individuals. In this sample, the range of age includes 35-94 years-at-death, with an average of 63.5 years and a standard deviation of 13.4. Individuals were sorted into the correct age range 68.4% of the time. When evaluating for asymmetry in score assignment, the left and right side have an accuracy of 67.7% and 69.1%, respectively.

Of the 126 individuals, only 121 in this sample contained both os coxa in good condition. Average age of this subsample is 63.2 years with a standard deviation of 13.5. From this sample, it was found that symmetrical scores (the same score given to both the right and left os coxa of the same individual) were assigned 84.3% of the time.

To assess for precision, 224 ossa coxae representing 114 individuals were randomly selected for re-evaluation. Correlations between first and second observations resulted in an intra-observer error kappa test value of 0.79, representing substantial agreement between observations.

For inter-observer error in scoring, a peer with a similar level of training in skeletal biology utilized the same sample that was used in evaluating intra-observer error. The scores observed in this evaluation were compared against the original scores. Inter-observer precision was found to have a kappa value of 0.54, representing moderate agreement between scores assigned by observers.

Results of this data analysis suggest that the accuracy of this method, to be 68.4%, is lower than the reported 81% accuracy by Calce.1 While intra-observer error has a substantial kappa value of 0.79, the inter-observer error was found to be kappa = 0.54. These findings suggest that the Calce method for aging the acetabulum might benefit from a re-evaluation of the traits and descriptions used to assign age or that they require the user to be well-versed in the variability of the human acetabulum.

Reference:

1. Calce, SE. A new method to estimate adult age-at-death using the acetabulum. Am J Phys Anthropol 2012;48:11-23.

Age Estimation, Acetabulum, Forensic Anthropology

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