



## Physical Anthropology Section – 2007

### H23 Age Estimation From the Posterior and Middle Part of the Ilium

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The goal of this presentation is to describe a revised method for estimating adult age at death using the auricular surface and the acetabulum.

This presentation will impact the forensic community and/or humanity by demonstrating a revised method using the acetabulum and the auricular surface that preserves the *os coxa* and can be used on a large population with known ages.

**Introduction:** The study of the posterior and middle part of the pelvis is of interest in forensic anthropology since it is an anatomical region that is very often preserved. The Lovejoy technique, using the auricular surface, has brought about many studies and attracted many authors foremost among them Buckberry and Chamberlain who utilized the criteria described by Lovejoy and developed new methods. By using this research as a starting point, in a preliminary study, acetabular criteria was described. The goal of this new study was to test these acetabular criteria and to link them to auricular surface reading criteria, as described by Buckberry and Chamberlain.

**Method:** The study concerned 463 *os coxae* of known age and sex from Caucasian individuals (identified collection of Coimbra – Portugal). The examiner was not aware of the age of the bodies when assessment was made. Four criteria with the auricular surface were described, using Buckberry and Chamberlain's method. The features used were transverse organization, surface texture, porosity and changes in the morphology of the apex. Each of the features was recorded independently and assigned a series of numerical scores corresponding to successive stages of degrees of expression. Concerning the acetabulum, three criteria were isolated: appearance of the acetabulum rim, appearance of the acetabulum fossa and apical activity. These criteria were observed and assigned a series of numerical scores corresponding to successive stages of degrees of expression. The age correlation of various criteria read at the acetabulum level and that of the auricular surface were studied. SPSS (software package for statistical analyses) were applied to evaluate the data. To argue the appropriateness of the variables and quantify correlation with age, Kruskal-Wallis tests were calculated. Mean, standard error and standard deviation have been considered. Intra- and inter-observer variability was also studied. A paired t-test was calculated for 114 individuals with both left and right auricular surfaces present. The difference between males and females with a regression line for both data sets was tested and a Spearman's correlation coefficient was calculated.

**Results:** Kruskal-Wallis statistics to quantify the correlation of each criterion with known age at death were all significant. This correlation is better once a score is established corresponding to the sum of ratings for the various criteria. Similar observations can be made regarding acetabulum criteria. Studying the correlation between the overall score (sum of acetabulum and auricular surface scores) and age is of interest. The method was tested for intra-observer error. Results are better when the overall score is studied. It's the same thing with the inter-observer error. There were no significant differences between ages for males and females and between sides.

Several total scores were found to have similar ranges, distributions and mean ages (using Buckberry and Chamberlain's method). These scores were grouped together to produce seven stages for the purposes of age estimation. A Bayesian analysis was used to provide probability of age, given the stage.

**Discussion:** Four acetabular criteria and four auricular surface criteria were isolated which have a correlation with age. Establishing these scores (sum of criteria) allows a better age-based correlation to be obtained. Establishing an overall score, including acetabular criteria and auricular surface criteria, allows a good level of correlation to be obtained with age, with low intra- and inter-observer variability. Several total scores to define a method were established. It has been shown that there is no significant difference between sexes and sides.

**Conclusion:** The study of the acetabulum is of interest for the age estimation of adult subjects. The joint study of the acetabulum and the auricular surface allows a higher correlation with actual age to be obtained.

The revised method using the acetabulum and the auricular surface is interesting. It's easier to apply and has low levels of inter- and intraobserver error. The method outlined here needs to be tested using a large, multiracial known-age population.

#### **Skeletal Age at Death, Auricular Surface, Acetabulum**