



A13 A Test of Cervical Vertebral Ring Union for Age-at-Death Estimation Using the Albert-Sherwood Method

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After attending this presentation, attendees will gain a more in-depth understanding of the applicability of the Albert-Sherwood vertebral ring epiphyseal union method for estimating the age of unknown skeletons. This presentation seeks to explain how the method may be applied, reports on its accuracy, for cervical vertebrae, and suggests contexts for its considered use in age estimation.

This presentation will impact the forensic science community by demonstrating how a specific skeletal age estimation method may be used and by explaining the meaningfulness and utility of the results that may be obtained. Information presented here may serve forensic anthropology practitioners as well as researchers interested in the further study of this approach to age estimation.

The purpose of this study was to test the accuracy of estimating age at death by examining the progress of cervical vertebral maturation using epiphyses of the centra that were in poor condition to simulate real-world forensic contexts. Further, another goal of this study was to test the accuracy of estimating age at death on a sample derived from a population differing from the reference/guideline sample. Ages were estimated using cervical vertebral data originally collected from a population differing from the test sample since in the practice of forensic anthropology there are often issues with applying guidelines developed on one sample but used for another — inasmuch as different samples may be affected by cross-population variability and or secular changes in skeletal growth, development, and degeneration.

The test sample for this study was derived from the Lisbon Collection housed at the Museu Nacional de História Natural, Museu Bocage in Lisbon, Portugal. It contained vertebrae that were deteriorated, damaged, and/or characterized by fragile epiphyseal rings. The test sample comprised 20 individuals (7 female, 12 male, and 1 individual of indeterminate sex), ranging in age at death from 10 years to 30 years old; however, the sex and age at death were unknown at the time the aging method test was conducted (i.e., this was a blind study). Due to the discovery of 1 of the 20 individuals not having any cervical vertebrae available for analysis, the final test sample included 19 individuals.

Guidelines used to estimate the ages at death for the test sample were developed from vertebral ring union data obtained from the Hamann-Todd Osteological Collection housed at the Cleveland Museum of Natural History in Ohio. The guideline sample comprised 100 individuals between the ages of 10 years to 30 years old at death: 55 African Americans (34 females and 21 males) and 45 European Americans (19 females and 26 males). The sample was selected by sorting the collection according to sex and age at death, and individuals were randomly selected for each age in years to ensure continuous representation of the maturation process, as much as possible. The progress of cervical vertebral ring union was documented in five stages (i.e., the Albert-Sherwood method, revised from the Albert-Maples method): (1) Stage 0 was no union; (2) Stage 1 was beginning and active union; (3) Stage 2 was complete union with no remodeling of the gaps between the epiphysis and centrum; (4) Stage 3 was complete union with some (incomplete) remodeling of the gaps; and, (5) Stage 4 was complete union with complete remodeling (note: this stage may not be attained in all vertebrae as occasionally a “scar” remains). The guidelines for age estimation, based on this five-stage method, include key ages at which the stages of vertebral ring union are first attained (Stages 0-4), at what ages they are sustained (Stages 0-4), and/or the ages at which they are surpassed (Stages 0-3; Stage 4 is the final stage and if/when attained, it persists).

Ages were estimated by comparing the test sample stages of union for each individual (age and sex unknown during this part of the study) with the guidelines for the earliest and latest ages for various stages of union. Since sex differences were found to exist when the guidelines were developed, not knowing the sex during the test of the method yielded wider intervals of estimated ages. Results indicated that age estimation intervals were correctly assessed for 16 out of 19 individuals (84%), spanning ages 10 years to 30 years old. For the three individuals incorrectly assessed, they were estimated to be no older than 10 years of age; however, the actual ages were 13 (one male) and 14 years (two males). This finding suggested that ring epiphyses may have broken off, giving the appearance of bare centra for which no epiphyseal union had begun, but in reality may have been in progress or it could be that maturation may simply begin later in the population from which the test sample was derived. Further details of the findings and their implications for the utility of this method are discussed. Overall, this method is promising for use in the field, particularly in conjunction with other skeletal age indicators and when sex can be adequately assessed.

Vertebral Maturation, Age Estimation, Epiphyseal Union

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