



Physical Anthropology Section – 2007

H16 Stages of Epiphyseal Union in the Cervical Vertebrae of Young Adult Skeletons

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After attending this presentation, attendees will have an understanding of the stages of epiphyseal union of the cervical vertebral centra and its utility in aging an individual through observational analysis.

This presentation will impact the forensic community and/or humanity by contributing to the overall body of knowledge of forensic anthropology and skeletal analysis. Age estimation is one of the greatest challenges faced by forensic anthropologists and this presentation expands the knowledge of the maturation of the cervical vertebrae and its utility for age estimation for young adult skeletons.

The goal of this presentation is to introduce the application of the Albert and Maples (1995) stages of epiphyseal union to the cervical vertebrae and the utility of doing so. These findings contribute to the overall body of knowledge of skeletal analyses, specifically focused on the understanding of the timing and rate of epiphyseal union in the cervical vertebrae, as well as the rest of the vertebral column.

For this study, 77 individuals from the Hamann-Todd Osteological Collection housed at the Cleveland Museum of Natural History were observed. The sample consisted of 11 white females, 27 black females, 15 white males, and 24 black males aged 12 to 27 years at death. Eleven surfaces of the cervical vertebral centra were scored based on the method developed by Albert and Maples (1995). The eleven surfaces include the inferior surface of C2 and the superior and inferior surfaces of C3 through C7. Each surface received a score between 0 and 3 to represent the stage of epiphyseal union. Stage 0 represents no union, stage 1 represents beginning union with minimal attachment between the epiphyses and centra, stage 2 is characterized by almost complete union, and stage 3 is characterized by a completely mature vertebral body.

A review of the literature displays past discussions on the sequence of epiphyseal union throughout the body by Stevenson (1924) and Todd (1930), and radiographic analyses of epiphyseal union by several authors including Flecker (1942) and Girdany and Golden (1952). A radiographic analysis of epiphyseal union can only demonstrate incomplete or complete epiphyses, whereas an anthroposcopic analysis enables the researcher to observe the progression of union of the epiphyses, and therefore, facilitates the development of a scoring method. Observations about the extent to which the union has progressed are important in understanding the amount of time it takes for complete fusion to occur and any pattern in how the fusion occurs.

The timing and rate of epiphyseal union for the cervical vertebrae was studied to determine its relationship to the known age of the decedents in the sample. Results from cervical vertebral centra were compared to results of thoracic and first two lumbar vertebrae from the previous Albert and Maples (1995) study to determine if the rate and pattern of epiphyses of the centra were similar or different.

Observational and statistical analyses of the rate and pattern of the progress of epiphyseal union of the vertebral centra were performed. Observations did not result in significant findings regarding the pattern of epiphyseal union for the vertebral centra. However, in regards to comparison throughout the entire vertebral column, the vertebral centra epiphyseal union of the cervical vertebrae initiated union as early as 12 years whereas the youngest individual to exhibit beginning union on any vertebrae was 14 years in females and 16 years, 4 months in males in the Albert and Maples (1995) sample of thoracic and first two lumbar vertebrae. Statistical analyses resulted in the same correlation between age and stage of epiphyseal union as that found by Albert and Maples (1995) showing the reliability of the scoring method throughout the entire vertebral column. This study demonstrated that aging an individual through observations of cervical vertebral centra epiphyseal union is as accurate and reliable as using the thoracic and first two lumbar vertebrae.

The results of this research provide additional information about cervical vertebral centra epiphyseal union including the time at which beginning union initiates, the progress of union, and the age of complete union. This information aids in an age analyses for a biological profile of an unknown individual. This research could potentially help in both archaeological and forensic situations, such as in mass disaster or mass grave circumstances, concerning commingled remains.

Cervical Vertebrae, Age, Epiphyseal Union