A54 Age Estimation of Adolescent and Post-Adolescent Children Via Radiographs of the Shoulder

Maureen Schaefer, PhD, Michigan State University, Division of Human Anatomy, E Fee Hall, 965 Fee Road, East Lansing, MI 48824-1316; and Gerald Aben, MD, Michigan State University, Radiology Bldg, 846 Service Road, Rm 184, East Lansing, MI 48824*

After attending this presentation, attendees will better understand the ages at which specific developmental milestones occur in regard to three of the epiphyses surrounding the shoulder. The radiographic data provided within the presentation can then be utilized to estimate the age of living or deceased children. Insight will also be gained into developmental processes that can aid in the determination of whether an individual is likely to be older or younger than two common threshold ages (16 years or 18 years).

This presentation will impact the forensic science community by providing age documentation of a joint region whose development has been traditionally understudied via radiographic means.

Age estimation using radiographic data is becoming increasingly important due to a surge in requests to estimate the age of living children. While numerous radiographic studies have been conducted on the development of the hand, medial clavicle, and iliac crest, a paucity of data exists in the recording of radiographic changes occurring at the shoulder. This presentation fills that void by providing the appearance and/or union times of the epiphyses of the angle/apex of the coracoid process, acromion process, and proximal humerus.

Developmental processes occurring at the three epiphyses were noted utilizing multiple views of shoulder radiographs from 264 males and 189 females between the ages of 10 years and 21 years of age. Images were obtained via two sources, including the Michigan State University's Clinical Center and Query Patricia, an online juvenile radiographic database developed by Mercyhurst University. Each epiphysis was assigned a unique phasing system based on the extent to which developmental processes could be visualized radiographically. Progressive union of the proximal humerus was the least challenging of the elements to interpret and therefore received the most robust phasing system, which included four stages: Phase 1=open union; Phase 2=active union; Phase 3=an unfused notch remains; and, Phase 4=complete union. Appearance times of the proximal humerus were unable to be documented due to the age limitations of the sample, which only included preadolescent and adolescent children. The epiphyses of the coracoid and acromion processes presented a greater interpretive challenge and therefore were assigned phasing systems that were less descriptive; however, the late appearance times of both these epiphyses did permit the inclusion of this event within the phasing system. The acromion process was assigned a three-phase scoring system: Phase 0=epiphysis not present; Phase 1=present and open or fusing; and, Phase 4=complete union. The angle and apex epiphyses of the coracoid process were the most difficult to interpret and therefore information was only recorded if the epiphysis was present and not completely fused.

Observations were recorded for each of the three elements and their age/phase distributions provided. A number of developmental processes were observed to always occur before the age of 16 years or 18 years. These results suggest that the shoulder region may be of particular value when evaluating the likely direction of an individual's age in relation to either of these two common threshold values.

Shoulder Development, Age Estimation, Developmental Osteology

*Presenting Author