



## Anthropology Section - 2016

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### A15 The First Thoracic Vertebral Centrum as an Adult Age Estimation Site

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After attending this presentation, attendees will be aware of a new adult age estimation site that may supplement current sites, such as the pubic symphysis and sternal rib ends.

This presentation will impact the forensic science community by providing a new adult age estimation site when others are unavailable in skeletal remains.

The thoracic vertebrae have received relatively little attention as age estimation sites compared to the pelvic joints, the ribs, and the cranial sutures. Albert and Maples established juvenile and young adult age estimates based on annular epiphysis fusion, while Stewart and Snodgrass found correlations between osteophyte development and adult age; however, none of these studies focused on specific vertebrae, and none have attempted to provide a “gestalt” description of the aging thoracic centrum.<sup>1-3</sup>

Photographs of the inferior centra of 168 undamaged first thoracic vertebrae from the Robert J. Terry Anatomical Skeletal Collection at the Smithsonian National Museum of Natural History were examined. The sample consisted of 48 White males, 44 Black males, 37 White females, and 39 Black females. The inferior aspect of first thoracic vertebra centra were assigned to one of five phases defined by degree of epiphyseal ring obliteration, texture, symmetry, and edge irregularity. Inter-observer error was assessed by using 14 first thoracic vertebrae from the C.A. Pound Human Identification Laboratory (CAPHIL) archives. The same vertebrae were scored one week later to assess intra-observer error. Similar tests of error were performed using the Brooks and Suchey method on 14 left pubes, also from the CAPHIL archives, for comparison.<sup>4</sup>

Age correlated with phase relatively well within the pooled sample ( $R^2=0.25$ ) and even better when sex was considered separately ( $R^2=0.27$  for males and 0.30 for females). An Analysis of Variance (ANOVA) test demonstrated that phases differ significantly from one another in mean age ( $p=2.39 \times 10^{-10}$ ), while a Games-Howell post-hoc test demonstrated that Phases 1 and 2 differed significantly from Phases 4 and 5; Phase 3 from Phase 5; Phase 4 from Phases 1, 2, and 5; and Phase 5 from all other phases. In addition, inter- and intra-observer errors were smaller when using this method than when utilizing the Suchey-Brooks pubic symphysis method: inter-observer kappa for the thoracic vertebrae was 0.51 and 0.70, indicating moderate and substantial agreement between observers, respectively. In contrast, inter-observer kappa was 0.30 for each pair of inter-observer comparisons for the pubic symphyses, indicating fair agreement. Intra-observer kappa was 1.0 for the thoracic vertebrae and 0.83 for the pubic symphyses, indicating perfect and almost perfect agreement, respectively.

These results suggest the first thoracic vertebral centrum may be a useful adult age estimation tool, in addition to more commonly utilized joint surfaces. Future research will develop this method more thoroughly on a more modern population.

#### Reference(s):

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3. Snodgrass J.J. Sex differences and aging of the vertebral column. *J Forensic Sci* 2004;49(3):458-463.
4. Brooks S., Suchey J.M. Skeletal age determination based on the os pubis: a comparison of the Acsadi-Nemeskeri and Suchey-Brooks methods. *J Hum Evol* 1990;5(3):227-238.

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#### Forensic Anthropology, Age Estimation, Vertebrae