H76   Investigating Macroscopic Changes of the Pubic Symphysis at the Young End of the Age Spectrum

Natalie R. Shirley, PhD*, Lincoln Memorial Univ, DeBusk College Osteopathic Medicine, 6965 Cumberland Gap Pkwy, Harrogate, TN 37752; and Beatrix Dudzik, MA, 3909 Briargate Ave, Knoxville, TN 37919

After attending this presentation, attendees will have been provided with an introduction to an aging method using the pubic symphysis that provides more precise estimates than are currently assigned to individuals under the age of 40 years.

This presentation will impact the forensic science community by systematically documenting age-related changes that occur at the pubic symphysis within the first two decades after sexual maturity and by providing a method with more accurate and precise age estimates for individuals at the younger end of the age spectrum.

Among the standards employed for age estimation in forensic contexts, the Suchey-Brooks pubic symphysis method is a highly favored technique.[1,2] Difficulties arise, however, when researchers are forced to assign phase-based ages to complex patterns of growth and development *and* degenerative changes associated with biomechanical loading, both of which can be highly variable among individuals and across populations. In regard to the pubic symphysis, it has been documented that minute morphological transitions occur along the ventral and dorsal borders and at the superior and inferior aspects of the face and pubic tubercle.[1,3-7] Current pubic symphyseal aging methods combine the morphology associated with the developmental changes that occur into the mid-30s with the degenerative changes that span the latter portion of the age spectrum. The most popular methods are phase-based; however, the definitions currently used to assign age intervals may not be adequately defined and/or accurately understood by burgeoning researchers and seasoned practitioners alike. Furthermore, phase-based systems assume that these complex changes occur in lock-step, which may not accurately reflect biological reality.

This study investigated macroscopic changes in forensically relevant modern U.S. samples of known age, sex, and ancestry from the Maricopa County Forensic Science Center in Phoenix, Arizona, as well as donated individuals from the William M. Bass Forensic and Donated Collections at the University of Tennessee, Knoxville (n=210). As disparities have been noted in the Hispanic population with pubic symphyseal aging, the present sample is comprised of American Black and White individuals only.[8] Age-related traits at locations with ontogenetic and biomechanical relevance were broken into components and scored. The components included the pubic tubercle, the superior apex of the face, the ventral and dorsal demifaces, and the ventral and dorsal symphyseal margins. Males and females were scored and analyzed separately (n=141 and n=69, respectively). A range of two to three categorical values were assigned based on the changes observed within each component. Scores for each category ranged from presence/absence to a three-step categorical option, thus allowing for simplistic and unambiguous scoring. Transition analysis was applied to elucidate the transition ages between the morphological states of each component. The categorical scores and transition analysis ages were subjected to multinomial logistic regression to derive estimates with high classification accuracy. In addition, inter-observer error was assessed on 100 pubic symphyses using a kappa statistic.

The transition ages for the categorical states generally agree with the documented literature.[7] There were significant sex differences (α=.05) in the ages at transition for all categorical traits except the pubic tubercle, with males transitioning from one state to the next at earlier ages than females (1 – 5 years earlier). Interestingly, this is contrary to the expectation with regard to developmental traits, where females are usually precocious. The categorical output gave smaller age ranges for individuals aged 18 to 40 years, which translated to minimum ranges of three years. The logistic regression provided high classification rates for the age categories, with classification accuracy reaching 93%; the predictive model was significant (p<.001). Inter-rater agreement was high for the pubic tubercle, superior apex, ventral demiface, and ventral rampart (kappa≥0.8), but lower for the dorsal margin (0.6) and dorsal demiface (0.5). The latter will be addressed, with possible revision of the scoring categories and/or definitions.

Based on these preliminary results, it is proposed that an unambiguous scoring method for age-related changes of the pubic symphysis can provide precise age estimates for younger adults, and thus strengthen the quantification of the methods employed when building a biological profile for forensically relevant remains. This method can be combined with other methods for age estimation in young adults (i.e., sacrum and clavicle) or used as a stand-alone method to derive more precise and accurate estimates from the pubic symphysis than is possible with existing methods.

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Age Estimation, Pubic Symphysis, Logistic Regression