



Physical Anthropology Section – 2008

H74 Spheno-Occipital Synchronosis Fusion in the American Population

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After attending this presentation, attendees will have a comprehensive understanding of spheno-occipital synchronosis fusion in the American population, with emphasis on the forensic application of aging standards developed from various methodologies and populations.

This presentation will impact the forensic science community by providing updated standards for age estimation from the basilar synchronosis and gives insight into skeletal development in human populations.

The literature on spheno-occipital (or basilar) synchronosis fusion reports that this maturation indicator fuses anywhere between the ages of 11 and 25. Some studies report that females fuse a couple of years before males, whereas others do not comment on sexual dimorphism in basilar synchronosis fusion. A recent study claims that the basilar synchronosis is a useful age indicator in males, but that its utility is questionable in females. Certainly, such disparity is not desirable in a forensic context, nor does it adequately explain the variation present in the modern American population. For example, given that spheno-occipital synchronosis fusion has been linked to puberty and the adolescent growth spurt, fusion at age 25 would be anomalous. Presumably, these inconsistencies are due largely to the various methodologies used to develop the standards (i.e., radiographic, computed-tomography scanning, histological, direct inspection from autopsies, and direct inspection from dry skeletal material). Whereas radiographic, CT scanning, and histological studies give a more precise estimate of the onset of fusion, most forensic age estimates are based on direct inspection. Furthermore, skeletal maturation standards are population-specific and should not be extrapolated from one population to another. Finally, the established secular trend in skeletal dimensions and age-at-pubertal onset necessitates that age estimates of modern decedents be based on standards developed from modern populations.

This study presents standards developed from 113 individuals between the ages of 5 and 25 years. The sample is a modern forensic sample with death years between 1980 and 2006 (the Forensic Data Bank, or FDB). The spheno-occipital synchronosis was scored as open, partially closed (fusing), or completely closed (fused) via direct inspection of skeletal material. Based on the raw data for females, the earliest age at which fusion was complete was 14, and all females were fused by age 20. The earliest age of complete fusion in males was 16, with all males fused by age 22. However, age ranges such as these can be deceiving because they include outliers that can extend the age range by several years due to an insignificant, unrepresentative portion of the sample. Many times this proportion is less than 1% of the sample or, as was the case in this study, just 1 individual. For this reason, a transition analysis was applied to the FDB sample in order to determine the average age at which an individual transitions from non-union to complete union (partially-fused individuals were subsumed into the non-union sample). Transition analysis provides a robust estimate of age-at-fusion that is more representative than the age ranges which include outliers. The females in the FDB sample transitioned from non-union to complete union at 13.64 ± 0.93 years, and the males transitioned at 16.90 ± 0.74 years. These results reflect sexual dimorphism in basilar synchronosis fusion and agree approximately with average age at puberty and its sexual dimorphism.

During this presentation, the FDB results will be compared to those obtained using alternative methodologies, as well as to standards developed from non-American populations. Additionally, the secular trend in age-at-pubertal onset will be addressed by comparing the modern FDB standards to those developed from a transition analysis of an earlier population (death years in the early 20th century). Studies such as this provide updated standards for the forensic community and give insight into skeletal development in human populations.

Spheno-Occipital Synchronosis, Age Estimation, Skeletal Maturation