



Physical Anthropology Section – 2011

H55 Fusion Patterns in Modern Hyoid Bones

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The goal of this presentation is to examine how unilateral and bilateral fusion patterns in the hyoid bone vary with age within a population, and how the ossification process can help forensic anthropologists understand fracture patterns of the hyoid in traumatic cases.

This presentation will impact the forensic science community by providing age ranges for unilateral and bilateral fusion of the greater cornua to the hyoid body, discussing the effect of demographic variables on the fusion patterns, and improving the interpretation of traumatic injuries to the neck.

The fusion of primary and secondary ossification centers is one of the commonly used methods by forensic anthropologists to age adolescents and young adults due to the specific age ranges at which elements of long bones and vertebrae fuse together; however, few studies have looked at the fusion process in the hyoid bone. Ossification of the hyoid bone occurs slowly over time and as the greater cornua fuse with the hyoid body, chances of traumatic injuries increase. This project was designed to study the fusion pattern of the greater cornua to the body of the hyoid bone using a modern North American sample, determine how variation arises between individuals of various sexes and ancestries, and determine probabilities of trauma to the hyoid bone from patterns of unilateral and bilateral fusion of the greater cornua.

Data collection was performed in collaboration with the Hillsborough County Medical Examiner's Office in Tampa, Florida. During a five-month period, all hyoid bones were collected during autopsies for the study regardless of demographics or cause of death. A sixth month was later added to collect additional hyoid bones to increase the percentage of juveniles and African-Americans in this sample. For each hyoid bone, demographic information, cause and manner of death, and past or present abuse of alcohol and drugs were noted. A total of 264 hyoid bones were processed and used for analysis. The hyoid bones were processed by removing the majority of the excess soft tissue and then boiling each hyoid to facilitate the removal of the remaining tissue. A mobility test was performed during processing to assess the fusion of each greater cornua: a positive test occurred when the cornua was still slightly movable while a negative result was associated with a greater cornua that was completely immobile. Once the hyoid bones were dry, photographs and radiographs were taken of each hyoid using superior and posterior views to observe the joints between the hyoid body and each greater cornua. The radiographs were used to assess the fusion of each greater cornua to the hyoid body. Each cornua was scored independently by two anthropologists: a score of "0" indicated a completely unfused cornua, while presence of fusion, whether complete or incomplete, was scored as "1." In addition, a linear regression was used to determine how much variation in age can be explained through unilateral and bilateral fusion.

Results indicate that a wide variation exists in the unilateral and bilateral fusion patterns of the hyoid bone. Unilateral fusion was observed as early as at eight years of age while bilateral fusion was first visible in a 23-year-old. As a previous study demonstrated, the majority of hyoid bones are fully fused in the elderly but in some cases the hyoid may remain only partially fused. Two males from our sample, one in his 70s and one in his 80s, still exhibited a unilaterally fused hyoid at the time of death. Overall, the number of individuals displaying unilateral fusion increased steadily until the 40-49-age bracket and decreased afterwards. Conversely, the percentage of individuals with bilateral fusion constantly increased from 65.0% in the 20-29-age bracket to over 90.0% in the 70-79 and 80+ age ranges. In both ancestral groups the mean age for bilateral fusion occurred approximately five years earlier in men, and in both sexes, African-American individuals exhibited bilateral fusion two years earlier. The regression formula demonstrated that 30% of the variation in age is explained by greater cornua fusion patterns. Through the understanding of the pattern in which the greater cornua fuse to the hyoid bone, anthropologists can better understand estimate the risk of fractures to neck structures according to the ossification of the hyoid bone.

Hyoid Bone, Fusion Pattern, Age Estimation