H17 New Method of Skeletal Age Estimation Based on Progressive Morphological Changes in Vertebral Column

Eva-Elvira Klonowski, PhD, Nermin Sarajlic, PhD, MD, and Senem Skulj, BSc, International Commission on Missing Persons, Alipasina 45A, Sarajevo, 71 000, Bosnia and Herzegovina*

After attending this presentation, attendees will be introduced to a new method of age estimation based on changes in the morphology in thoracic and lumbar vertebrae.

This presentation will impact the forensic community and/or humanity by allowing forensic anthropologists to verify and use this new aging method for narrowing age ranges estimation, and therefore for more correct age at death estimation, essential in identification of unknown human remains.

The estimation of age at death from the skeletal remains of unknown individuals is an essential part of the identification process (Krogman and Iscan, 1986). During the last decades many anthropologists have tried to modify old aging methods as well as develop new ones in order to achieve greater accuracy in estimation of age at death of unknown skeletal remains. Most of these efforts were concerned either with improving and testing the effectiveness of accepted standards or with introducing new aging methods based on age-related changes in such bones as the sternal rib (Iscan et al., 1984) and the auricular surface of ilium (Lovejoy at al., 1985). These latter sites were chosen because previous observations indicated that changes occurred in these skeletal elements throughout an individual's life.

Although reported figures differ, about 30,000 people were unaccounted for and considered "missing" after three and a half years of war in Bosnia and Herzegovina (1992-1995). The exhumation and identification process began immediately following the end of the war. During the examination of hundreds of skeletal remains exhumed in Bosnia and Herzegovina, the authors found that the pattern of changes observed in the vertebral body can be used as additional indicators for estimation of age at death. The variables that contribute to the overall pattern of change include (1) the sequence of fusion of the internal rim of the epiphyseal rings to the surface of the vertebral body, (2) the subsequent absorption of the rings into body, and (3) age related changes to superior and inferior edges and surfaces of the body itself.

The progression of the union of epiphyseal rings in thoracic and lumbar vertebrae in teenagers and young adults was studied and described by McKern and Stewart (1957) and Albert and Maples (1995). Vertebral ring epiphyseal unification was observed from the anterior as well as the superior and inferior sides of the vertebral body. While examining the vertebrae, the authors realized that Albert and Maples' (1995) description of unification of the epiphyseal rings related only to the fusion of the external margin of the ring to the vertebral body, while fusion of the internal rim of the ring was not observed.

The remains used in this study comprise individuals killed during ethnic cleansing actions in 1992 in Krajina, in northwest Bosnia. All of the individuals examined for this study were exhumed from mass graves in the Krajina, between 2001 and 2005. For this study, a series of six vertebrae from 360 skeletal remains representing males of known age were examined. For each individual, the last three thoracic (Th10 – Th12) and first three lumbar (L1 – L3) were examined. The remains were completely skeletonized. The process of decomposition of soft tissues and skeletonization was natural and all examined vertebrae were dry, showing no trace of soft tissue (e.g. free of intervertebral cartilage and periosteum), which enabled the observation of changes in fusion of the vertebral rings. Three features at the vertebrae bodies were examined: fusion of the internal rim of epiphyseal rings observed from posterior (dorsal) view, changes in shape of the superior and inferior edges of the vertebral body and changes of texture of the superior and inferior surface of the vertebral body. Each vertebra was scored according to the presence and development of those three features with age.

A comparison of real and estimated ages of identified remains has shown that age-related changes observed in the vertebral column can contribute significantly to narrowing estimated age ranges, especially for individuals between the ages of 25-45 years, who constitute the majority of the missing from Bosnia and Herzegovina.

References:

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Age Related Changes, Aging Techniques, Forensic Anthropology

 ** Presenting Author*