



Physical Anthropology Section – 2010

H21 Burned Beyond Recognition: Can the Biological Profile Be Estimated From Unprocessed Human Cremated Remains?

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After attending this presentation, attendees will understand the potential for determination of biological profile from bones that are believed to be “burned beyond recognition” based on macroscopic observations of unprocessed, cremated human skeletal remains.

This presentation will impact the forensic community by providing investigators with an indication of the skeletal elements that most frequently survive high temperature fires of lengthy duration and the patterning of preservation of the bony elements that are typically used to estimate the biological profile.

The biological profile of unidentified human skeletal remains is an integral part of forensic investigations and analyses. Cremation makes establishing a biological profile difficult due to the thermal destruction and associated fragmentation of bone. However, Stewart (1979:67)¹ emphasized that a “good number of skeletal parts often survive the firing with characteristic features intact enough to be recognizable as human.” Because there are a limited number of publications that corroborate Stewart’s observations (Bass 1984; Bass and Jantz 2004; Bohnert 1998; Brickley 2007; Eckert et al 1988; Murat 1998; Warren and Schultz 2002),² this study evaluates the potential for estimation of the biological profile based on macroscopic observations of unprocessed cremated human skeletal remains from contemporary commercial cremations. This presentation will impact the forensic community by providing investigators with an indication of the skeletal elements that most frequently survive high temperature fires of lengthy duration and the patterning of preservation of the bony elements that are typically used to estimate the biological profile.

Data for this study were gathered from blind macroscopic analyses of 18 individuals from the collection of documented human cremains from the University of Tennessee’s William M. Bass skeletal collection. These individuals were cremated using standard crematory procedures at temperatures between 1600-1700°F (870-926°C) for similar duration and were not mechanically pulverized. Use of these cremains allowed for an in depth examination of burned bone without debris such as building materials, soil, melted glass, and plastic that often confound the recovery of human remains at fatal fire scenes. Specific skeletal elements (pelvic, cranial, mandibular, vertebral, and certain long bone epiphyses) were selected as the focus of this study due to their standard use in estimating the biological profile. Because of the fragmentary nature of the sample, elements were not laid out in anatomical position, instead each element was reconstructed to the extent that preservation allowed and examined on its own. Each set of cremains was inventoried using the fragmentary remains inventory procedure described in Ubelaker and Buikstra’s Standards for Data Collection of Human Skeletal Remains (1994). Once an element was identified and sided, the completeness was determined and scored as 1 = > 75% present (or “complete”), 2 = 25%-75% present (or “partial”), and 3 = < 25% present (or “poor”). Paired elements were scored separately. In addition, degenerative changes, skeletal age markers, and pathology were recorded. Data reported here include: (1) the frequency of which skeletal elements relating to the biological profile most often survived cremation; (2) whether there was consistency in preservation of particular elements from one cremain to the next; and, (3) whether preserved elements included features that could be used to estimate age and sex.

Results showed that the bones of the cranial vault preserved in over 90% of the individuals in the sample. Cranial preservation frequencies were 94.4% for parietals, 91.6% for frontal, 91.6% for occipital, and 91.6% for temporals. Of the postcranial elements, only the proximal femur had a preservation frequency above 90%. Postcranial preservation frequencies were 94.4% for proximal femora, 88.8% for proximal humeri, 86.1% for ischia, and 82.8% for acetabulae. Age and sex indicators from the pelvis and cranium were less frequent, but observable. The following indicators of sex were observed from the pelvis: ventral arc (8.3%), subpubic concavity (2.7%), ischiopubic ramus ridge (8.3%), greater sciatic notch (16.6%), and preauricular sulcus (13.8%). The following indicators of age were observable from the pubic bone: auricular surface (52.7%) and pubic symphysis (27.7%). The following indicators of sex were observable from the cranium: nuchal area (27.7%), mastoid processes (22.2%), supraorbital margins (38.8%), and glabellar region (5.5%).

The results from this study clearly support earlier work done on estimation of the biological profile using human cremains. From this presentation, attendees will take away a greater understanding of the potential for determination of biological profile from bones that are believed to be “burned beyond recognition.”

References:

¹ Stewart, T.D. 1979. Essentials of Forensic Anthropology.

² Springfield: Charles C. Thomas.

Cremains, Biological Profile, Burned Remains