A51 Reconstructing the Biological Profile of Cremated Human Remains

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After attending this presentation, attendees will better understand the process of recreating pertinent biological profile information about cremated or burned human remains and which methods prove to be most successful.

This presentation will impact the forensic science community by providing results from a case study in an area with little previous or current research. This presentation will add to research being performed in the fields of forensic taphonomy and forensic anthropology by broadening the understanding of how human remains are affected by a burning episode and how those changes affect the process of identification.

Reconstructing the biological profile of burned/cremated remains can prove to be a difficult task due to the extensive damage that fire inflicts on bone, such as heat-induced fracturing/fragmentation, shrinkage, and shape alterations.[1] The relatively small amount of literature on the topic also serves to make the reconstruction process more difficult. Although there are some methods specific to identifying cremated remains, more standard methods may be required in a situation where remains have incurred damage from fire, whether accidentally or purposefully.

The basis of this research comes from a case study performed in 2013 utilizing an unprocessed commercial cremation, meaning that the remains were not pulverized after cremation, from Western Carolina University's skeletal collection. The remains were screened through a ¼" table screen and a series of nested screens in order to separate the largest and most identifiable pieces for use in reconstructing the biological profile. Approximately 25% of the remains could be readily identified as a certain element with distinguishing features present. These discernable elements provided the basis for the reconstruction process in this study. A multitude of identification methods were utilized throughout this study to assess aspects of biological profile such as sex, stature, and age. Techniques used to assess sex include cremation-specific weight studies performed by Warren and Maples, Bass and Jantz, and Van Deest et al., as well as the more standard Walker method of scoring the greater sciatic notch.[2-4] The Steele method of partial bone length reconstruction was utilized to predict stature, and the Suchey-Brooks and Todd methods utilizing the pubic symphysis to estimate age-at-death were also used.[5] These estimations were then compared to available personal data for the individual in order to assess the success of the various methods applied.

Application of the aforementioned methods proved to be partially successful for this case study, success being defined as having been able to apply a reconstruction technique and have an accurate estimation of biological profile returned. The results were deemed to be partially successful due to the cremation-specific sex estimations yielding various results (male, probably male, and ambiguous), while the greater sciatic notch clearly indicated male. Stature was estimated by applying the Steele method to a fragment of humerus, specifically the head and proximal shaft, yielding a stature between 5'8" and 6'. Living stature for this individual was unknown, so the accuracy of the stature estimation could not be determined. Age estimation based on pubic symphysis morphology produced a broad age range (27 years to 66 years), which was representative of the actual age at death for this individual (57 years).

In conclusion, it was discovered that it is possible to reconstruct, at least partially, the biological profile of human remains that have been burned, even at extreme temperatures. This is important to the fields of forensic anthropology and forensic taphonomy because it demonstrates that there are methods applicable to situations where burning has occurred, whether it is an attempt to conceal identity or a mass disaster.

Reference(s):

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3. Bass W.M., Jantz R.L. Cremation weights in east Tennessee. *J Forensic Sci* 2004;49(5):901-904.
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5. Steele D.G., Bramblett C.A. *The anatomy and biology of the human skeleton*. College Station, Texas: Texas A&M University Press, 1998:165-169.

Cremation, Taphonomy, Biological Profile