A52 Experimental Analysis of Burned Human Remains

Amanda Williams, MA, 2450 Lymbery Street, Apt 309, Reno, NV 89509; Elayne J. Pope, PhD, Tidewater OCME, 830 Southampton Avenue, Ste 100, Norfolk, VA 23510; and Marin A. Pilloud, PhD, University of Nevada, Reno/0096, 1664 N Virginia, Reno, NV 89557*

After attending this presentation, attendees will better understand the soft tissue and skeletal changes that occur to human remains as a result of a fire. Attendees will learn which variables are strongly correlated and can potentially be used to predict fire conditions.

This presentation will impact the forensic science community by describing the experimental analysis of burned human remains, while also highlighting important variables in fires that alter remains. This work will be the start of creating a new model to investigate fire-related damage to soft and skeletal tissue, which will prove important in aiding investigators who are building a legal case.

Currently, forensic anthropologists use the Crow-Glassman Scale (CGS) to analyze burned remains.[1] This scale progresses quickly from blistering to fragmentation in only five stages, without descriptions of times or temperatures that contribute to these changes. The scale can also be fairly subjective as it does not quantify surface area or percentage of body affected. As such, descriptions of burned bodies from pathologists and medical examiners are often inconsistent with those provided by forensic anthropologists.[2-5] The challenge at hand is to bridge the work between the various practitioners of the forensic sciences, all of whom may examine the same remains. Therefore, this pilot study employs a subset of data that seeks to develop a method more applicable to remains encountered in fires. This initial study employs the CGS as a first step in analysis and identifies variables that are significant in creating the conditions observed. The next step of this study will be to employ a larger dataset with additional variables to develop a more detailed descriptive model of burned human remains.

The initial study involves data collected in 2015. Observational experiments involved the burning of six donated human cadavers as part of the San Luis Obispo Fire Investigation Strike Team training course. Three cadavers were placed in vehicle fires and the other three in structural fires. All physical alterations to both soft and skeletal tissues were documented with digital photography and thermocouples within the fire environment. The visual assessment of the burned bodies was guided by the existing CGS and supplemented by additional descriptions of time and temperatures. Skin splits, subcutaneous fat exposure, muscle exposure, and presence or absence of soft tissue color banding were among the soft tissue variables recorded for each individual. Skeletal color banding, percent fragmented, and percent charring were among the skeletal changes recorded.

Individuals exhibited varying degrees of heat-related damage. The physical alterations were found to differ depending on fire environment, temperature, duration, and location of remains within each context. A majority of the remains from the car fires remained intact, with limited soft tissue loss and bone exposure, consistent with a CGS score of two; however, one individual exhibited calcination on the skull, upper and lower limbs, hands, and feet, which was absent in the other individuals, and is consistent with a CGS score of five. This individual also exhibited heat-related fracturing on both upper and lower limbs, a feature also absent in the other sets of remains. The variability in heat-related damage can be explained by this individual's placement in the trunk, longer exposure to heat, and increased temperatures.

Remains from the structural fires exhibited partial soft tissue loss and soft tissue color banding, which was concentrated at the lower and upper limbs, feet, and hands, consistent with a CGS score of two. None of the individuals in the structure fires exhibited bone exposure or fragmentation as seen with the car fire remains. The structure fire remains also exhibited a larger percentage of soft tissue color banding than the car fire remains. The variability found between vehicular and structural fires is due to variations in the type of environment, followed by the duration and temperatures of exposure.

Overall, the six individuals in this study demonstrate variability in heat-related damage. The initial results demonstrate there are differences between type of fire environment and duration, illustrating the possibility of modeling heat-related conditions. As data collection progresses, a more robust model can be created to predict fire conditions based on damage to soft and skeletal tissues.

Copyright 2016 by the AAFS. Unless stated otherwise, noncommercial *photocopying* of editorial published in this periodical is permitted by AAFS. Permission to reprint, publish, or otherwise reproduce such material in any form other than photocopying must be obtained by AAFS.

*Presenting Author

Reference(s):

1. Glassman D., Crow R.M. Standardization of model for describing the extent of burn injury to human remains. *J Forensic Sci* 1996;41(1):152-154.
2. Ahmed I., Farooq U., Afzal W., Salman M. Medicolegal aspect of burn victims: a ten years study. *Pak J Med Sci* 2009;25(5):797-800.
3. Dunne M.J., McMeekin R.R. Medical investigation 01 fatalities from aircraft-accident burns. *Avaia Sp and Environ Med* 1977;48(10):964-968.
4. Fracasso T., Pfeiffer H., Pellerin P., Karger B. The morphology of cutaneous burn injuries and the type of heat application. *J Forensic Sci Int* 2009;187:81-86.
5. Martin-de las Heras S., Valenzuela A., Villanueva E., Marques T., Exposito N., Bohoyo J.M. Methods for identification of 28 burn victims following a 1996 bus accident in Spain. *J Forensic Sci* 1999;44(2):428-431.

Burned Human Remains, Crow-Glassman Scale, Forensic Anthropology

Copyright 2016 by the AAFS. Unless stated otherwise, noncommercial *photocopying* of editorial published in this periodical is permitted by AAFS. Permission to reprint, publish, or otherwise reproduce such material in any form other than photocopying must be obtained by AAFS.