



## Physical Anthropology Section – 2008

### H44 Identifying Sharp Force Trauma on Burned Bones

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After attending this presentation, attendees will have a better understanding of the effects that liquid accelerant-only fires have on the identification of pre-existing sharp force trauma to the radius, ulna, carpals, and metacarpals.

This presentation will impact the forensic community by demonstrating experimental research under controlled settings in order to confirm or deny interpretation of perimortem defects on burned remains.

The role of the forensic anthropologist has become vital to fire investigations that involve human remains. It is likely that the forensic anthropologist will be asked to assist in interpreting skeletal defects that may have been caused by such forces as heat exposure and/or trauma to bones. To successfully complete this task, the anthropologist must be familiar with the various effects that fire has on human remains, as well as knowledge of fracture patterns and cut-mark morphology indicative of trauma. This study investigates the effects that liquid accelerant-only fires have on the identification of pre-existing sharp force trauma to the radius, ulna, carpals, and metacarpals. Wounds to these bones are commonly called defense wounds because they are created when victims try to defend themselves from a sharp instrument attack.

This study tests the hypothesis that various forms of sharp force trauma produced on fresh bone and then subjected to fire will still retain identifiable cut morphology that can be used to differentiate the sharp force trauma from the fragmentation effect of the fire. Included in this study are several variables not combined together in previous experiments, making this investigation a unique approach to the problem of identification of sharp force trauma. These variables included multiple types of instruments, uncut remains used as study controls, outside observers for conducting blind testing, and use of a variety of different liquid accelerants.

The experimental design used the distal half of pig (*Sus scrofa*) forelimbs to simulate human forearms. The limbs were acquired with the soft tissue still intact. In other words, there were no alterations to the limb to more closely approximate the fresh tissue state of a human inflicted during an attack. After five limbs were cut with a different instrument (meat cleaver, an ice pick, a common straight edged kitchen knife, a machete, and a serrated steak knife) they were placed together on a metal grate inside a large metal pan along with one uncut limb as a control. Subsequently, one gallon of a liquid accelerant was poured on top of all the limbs and into the pan. Only one accelerant was used at a time, and there was no mixing of liquids. The fire was started, allowed to burn until the liquid accelerant was completely consumed, and the fire was completely out. This procedure was repeated four times with four different accelerants. The accelerants included 87 octane unleaded gasoline, diesel, kerosene, and turpentine. With six limbs being used for each of the four accelerant burning episodes, a total sample size of 24 limbs was used in the experiment.

The analysis phase consisted of attempting to identify sharp force trauma (if any) on the remains without knowing which tool was used. The attempt to identify injuries was done at the macroscopic level only. If no trauma was found, the remains were recorded as uncut. However, if evidence of sharp force trauma was found, an attempt was made to correctly identify which particular tool was employed.

While the destructive force of fire does often produce fractures, it has been demonstrated that defects caused by the sharp force trauma would still be identifiable after the fire. This experiment, then, is a test of the ability of forensic anthropologists to locate possible sharp force trauma on human remains in cases that involve fire.

The results of the post-fire analysis compared with the pre-fire data made it clear that there are some limitations in the identification of sharp force injuries to burned remains. The current study showed that while the presence or absence of sharp force trauma was identifiable most of the time (73.9%), the presence of sharp force trauma was missed six times. The missed trauma was mostly due to extreme fragmentation of remains from their burning. Most often, it was the radius and ulna that were broken into numerous small pieces, making it difficult to find cut marks on these elements.

#### Forensic Anthropology, Sharp Force Trauma, Burned Remains