



Physical Anthropology Section – 2005

H12 Perimortem Bone Fracture Distinguished From Postmortem Fire Trauma: A Case Study With Mixed Signals

Steven A. Symes, PhD*, Mercyhurst College, Department of Forensic/Biological Anthropology, 501 East 38th Street, Erie, PA 16546; James J. Woytash, DDS, MD, Erie County Medical Examiner's Office, 462 Grider Street, Buffalo, NY 14214; Anne M. Kroman, MA, Department of Anthropology, University of Tennessee, 250 South Stadium Hall, Knoxville, TN 37996; and Andrew C. Wilson, BS, Department of Forensic/Biological Anthropology, Mercyhurst College, Erie, PA 16509

The goal of this presentation is to illustrate the use of burned bone biomechanics to distinguish perimortem trauma from postmortem trauma.

This presentation will impact the forensic community and/or humanity by using a case study to demonstrate the potential of burned bone examination.

Burned bone fractures have been a curiosity to anthropologists for decades. Thermal destruction to bone has a recent renewed interest with increased popularity of forensic science analyses of taphonomic influences and also because of human rights issues.

A recent case in the Buffalo, NY, area illustrates a situation where a body was discovered when a blaze was extinguished in an abandoned building. It was soon determined that the fire was act of arson used in an attempt to conceal a death. While the heat and flames damaged the remains of this adult female, the third author (JJW) discovered head trauma in autopsy, thus a homicide was officially identified.

Past research in the area of thermal destruction of bone by the first author and others (1) has shown predictable patterns of destruction of human remains when observing and assessing body position, soft tissue influence, alteration of bone color, and burn fracture patterns, where charted normal patterns enable researchers to recognize abnormal patterns.

Examination of the burned victim's right hand and wrist presented an unusual pattern of destruction. At and above the wrist, severe burning occurred where there was complete separation of the radius and ulna. While wrist destruction is common for early fire destruction¹, the hand demonstrated atypical damage. The fingers were not in pugilistic posture, and distal phalanges are heat damaged or missing. Since atypical postcranium burning was diagnosed along with perimortem head trauma ruled as a homicide, the medical examiner (JJW) decided that all bones should be removed and examined in a dry state by anthropologists.

Re-examination of the right radius indicated heat damage and traumatic perimortem fracture at the distal end of the shaft. The radius indicates bending blunt force trauma of the shaft with the forearm shaft bending anterior (compression) to posterior (tension), the opposite direction of a typical Colles fracture that occurs when a person falls, and catches their weight on their wrist and hand.

Indications of pre-fire forearm trauma are confirmed by fracture and burn patterns. There is a fracture pattern that is continuous and uniform through burned and unburned bone. The fact that the fracture did not alter in direction or form in the unburned and burned portions of the bone indicates that the bone fractured in a green state, unburned. A second feature indicating fresh bone fracture is an incomplete butterfly fracture. While only visible under microscopic examination, this fracture illustrates a typical green bone butterfly fracture. The fractures described above appear to be the product of perimortem trauma. This trauma likely compromised the forearm and restricted pugilistic posture formation in the right hand since the fulcrum for the powerful forearm wrist flexors is absent. The distal ulna burned beyond analytical capabilities.

When the hand of a fire victim was viewed as atypical after burning, close examination indicated fracture characteristics that could have occurred only before the fire. This case illustrates that knowledge of normal burn patterns assists in the examination of perimortem trauma in human remains. This combined with knowledge of biomechanical properties of green bone fracture aided in the diagnosis and interpretation of a homicide, even in an incident when criminal behavior has attempted to alter evidence with arson.

References:

1. Symes SA, Smith OC, Berryman HE, and Pope EJ. Patterned Thermal Destruction of Human Remains. Paper presented to the 30th Anniversary Edition of the T. D. Stewart Personal Identification in Mass Disasters. 1999. Sponsored by the Central Identification Laboratory, Hawaii, and the Smithsonian Institution.

Burned Bone, Pugilistic Pose, Bone Fracture