H97 Establishing the Perimortem Interval: Correlation Between Bone Moisture Content and Blunt Force Trauma Characters

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After attending this presentation, attendees will understand some of the details of skeletal fracture morphology, how it varies throughout the postmortem interval and how bone moisture content affects that morphology.

This presentation will impact the forensic community and/or humanity by exploring the uncertainty in determining the timing (relative to death) of skeletal fractures and the results will impact the way fracture timing analyses are conducted and reported.

When determining the time of occurrence of skeletal injuries forensic anthropologists know that antemortem (before death) skeletal injuries are recognized by evidence of healing. Perimortem (at or near the time of death) and postmortem (after death) skeletal injuries are more difficult to distinguish between because neither show evidence of healing. Furthermore, bone does not immediately react in a postmortem manner as soon as an organism dies because it retains the moisture and collagen that gives bone its flexible nature. The perimortem interval is the period during the postmortem interval when a bone will react to injury in a typical perimortem manner rather than having the appearance of a postmortem modification.

Using 60 porcine long bones, the differences between macroscopic and microscopic blunt force trauma fracture characteristics were documented as they varied when created every 28 days throughout a 141 day period. It was also determined how those changes correlate with bone moisture content. The hypotheses tested were (1) there is no difference between fracture characteristics created during the period immediately after death (within 24 hours) and characteristics created five months (141 days) after death, and (2) there is no correlation between the moisture content of the bone and blunt force trauma characteristics.

An initial sample of ten bones was fractured to represent perimortem injury. The remaining fifty bones were placed in an enclosure to decompose and every 28 days another sample of ten bones was fractured. Once each set of ten specimens was fractured, they were photographed extensively before and after cleaning them in a mild detergent solution. The fractured bones were examined and the fracture surface appearance, fracture angle type, fracture outline type, and color differences were documented. Other observations that were recorded include: fragment mass, completeness of fractures, degree of bone weathering, and microscopic features of the fracture planes. Additionally, a small portion of each specimen was ashed in a muffle furnace to determine the moisture content of the bone at the time of fracture. Bones were assessed as having perimortem, intermediate or postmortem fracture morphology using all of the aforementioned observations.

Statistical results indicated that there was a significant relationship (1) between postmortem interval and ash percentage, fracture surface, and fracture angle; (2) between overall assessment and postmortem interval, ash weight, fracture surface, and fracture angle; and (3) between ash weight and fracture surface and fracture angle. Results showed that bone moisture content influences fracture morphology significantly.

Additionally, ten specimens were selected that represented all six postmortem intervals (0, 28, 57, 85, 113, and 141 days). These specimens were used in an interobserver study (IRB project #1054957) at the 2006 American Academy of Forensic Sciences Annual Meeting in Seattle, WA. Participants were asked to rate the fractures of each specimen as either perimortem or postmortem and list their determining criteria. The average score for the study was 6.82 and three of the 22 participants correctly identified the fracture timing of all ten specimens. Compilation of participants' answers provided a list of six characteristics used by the participants: color differences between fracture surface and cortical surface, completeness of the fracture, presence or absence of plastic deformation, appearance of fracture margins, shape of the fracture outline, and fracture surface appearance.

Blunt Force Trauma, Perimortem, Fracture Morphology

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