



## Physical Anthropology Section – 2011

### H6 Peri-Mortem Fracture Patterns in South-Central Texas: A Preliminary Investigation Into the Peri-Mortem Interval

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After attending this presentation, attendees will have an understanding of peri- and postmortem decompositional changes in bone, and how these alterations are associated with changes in blunt force trauma fracture patterns. Additionally, attendees will learn which features proved most diagnostic in placing these fractures in an appropriate sequence during the peri-mortem interval.

This presentation will impact the forensic science community by providing tools to estimate the postmortem interval from long bone fractures, which will help to bring blunt force trauma analysis in line with the *Daubert* (2003) criteria for expert witnesses.

There have been several studies investigating long bone fracture characteristics during the peri-mortem interval (PMI), but none have been undertaken in the unique climate of southwest Texas. Additionally, the definition of the term “peri-mortem” as it applies to human remains is not unanimously agreed upon. Estimates vary regarding how long the peri-mortem interval lasts. Janjua and Roberts’ (2008) research in Ontario indicates that it takes bone approximately 200 days to reach a stage of “advanced decomposition,” which they measured based primarily on weathering and color change. Conversely, Bell et al. (1996) claim that buried bones may remain in the ground for five years or more before they begin showing any sort of postmortem change.

Issues arise because bone decomposition is a continuous process; however, anthropologists typically rely on non-quantifiable indicators to establish largely arbitrary divisions separating these three timeframes. To improve understanding of peri-mortem bone changes, 50 pig femora were allowed to weather at the Texas State University Forensic Anthropology Research Facility at Freeman Ranch, in San Marcos, TX for up to 18 weeks (PMI=126 days). A portion of the sample was

fractured at regular 2-week intervals by the mechanical application of a known dynamic force, and the resulting fracture outlines, angles, and edges, were methodically examined and documented. Also examined were the number and size of fragments produced.

A jagged fracture surface proved to be the feature most strongly indicative of postmortem drying in the short term, appearing approximately a month after death and appearing at consistently high rates in all subsequent tests. A significant change in the frequency of curvilinear versus transverse fracture outlines separates the first two months of the experiment from the following period. Fracture angle proved to have poor predictive powers, as obtuse and acute-angled fractures, indicative of fresh bone, occurred through the final test at PMI=126 days, though right-angled fractures did begin to appear at PMI=28 days.

There are essentially two “peaks of activity” when it comes to timing peri-mortem fractures in south-central Texas. The first peak occurs around 28 days, and is characterized by the first appearance of a jagged fracture surface, the first appearance of longitudinal cracking, and the beginning of a transition from curvilinear to intermediate fracture outlines. The second peak occurs around 70 days, and is distinguished by the absence of any smooth fracture surface after that point. Statistical tests indicated that different features may be diagnostic over a short period (e.g., 2-week intervals) than those over a longer period (e.g., 8-week intervals).

No one feature proved to have extraordinarily high diagnostic value, but fracture characteristics analyzed in conjunction with one another have the potential to time the occurrence of a fracture with some accuracy. The results of this experiment highlight the need to develop a shared knowledge base regarding the interpretation of blunt force trauma, backed by statistically supportable research. This replicable experimental design and method of quantitative analysis will help to bring blunt force trauma interpretation in line with the *Daubert* (1993) ruling, as well as aid in standardizing trauma analysis criteria.

**Peri-Mortem Interval, Blunt Force Trauma, Forensic Taphonomy**