A80 Evaluating Timing of Injury in Central Florida: Examining the Transition of Fracture Characteristics From Wet to Dry in Long Bones

Ashley Green, MA, 1219 Dowden Street, Charleston, SC 29407; and John J. Schultz, PhD*, University of Central Florida, Dept of Anthropology, 4000 Central Florida Boulevard, HPH 309, Orlando, FL 32816*

After attending this presentation, attendees will better understand the transition of intrinsic properties of bone from wet to dry. This presentation will focus on the timing of injury in the postmortem period in order to fill a gap in the literature regarding the time frame in which bone transitions from wet properties to dry properties in the Central Florida environment by examining fracture characteristics.

This presentation will impact the forensic science community by discussing the timing of the transition of intrinsic properties of bone from wet to dry. Fracture characteristics such as fracture angle, fracture surface, and fracture outline will be discussed in terms of wet and dry characteristics. This will aid the forensic community in differentiating between peri-mortem and postmortem trauma in the elastic peri-mortem period.

Differentiating between peri-mortem and postmortem fractures can be difficult when bone retains fresh characteristics in the Postmortem Interval (PMI). As a result, it is important to conduct research that investigates the timing of the injury in the postmortem period by observing fracture characteristics created at known intervals.[1-4] Investigation into the timing of injury was undertaken over a 14-week time period in Central Florida. By fracturing bones using a custom impact device, specific morphological characteristics typically used in trauma analysis were able to be analyzed: fracture angle, fracture surface, and fracture outline.[1-4] Long bones of pigs (*Sus scrofa*) (N=140) were placed in two outdoor microenvironments: full sun (Group A) and full shade (Group B). Five bones were collected from each microenvironment weekly and subsequently fractured. Additionally, a control group of five fresh bones was fractured immediately to simulate peri-mortem trauma.

Analysis of fracture characteristics was conducted using a standardized protocol modified from previous studies.[1-4] Statistical analyses were performed to investigate the relationships between the variables. The statistically significant results of the Chi-square analysis for the entire data set comparing fracture angle and fracture outline (p=0.000), fracture angle and fracture surface (p=0.003), and fracture outline and fracture surface (p=0.000) indicate that the variables are likely dependent upon one another; however, when microenvironment was considered, the results indicate that fracture angle and fracture outline are likely independent of one another for Group B (p=0.080). Analysis of Variance (ANOVA) testing was conducted for the entire data set, as well as considering microenvironment, using time (the PMI) as a dependent variable. The results denote statistically significant relationships between fracture angle and PMI (p=0.001), fracture surface and PMI (p=0.000), and fracture outline and PMI (p=0.006); however, when environment was considered, the results denote no significant relationship between fracture outline and PMI for Group A (p=0.154). The results of this study indicate a discernable shift in the timing of occurrences of dry characteristics as PMI increases, with a transitional period identified around weeks 5 to 9. Wet characteristics were observed into the 13th week; however, dry characteristics were seen within two weeks postmortem Additionally, statistical analyses indicate that the environment in which bones are deposited has a significant effect on fracture surface and outline as PMI increases.

These results suggest that it is possible to distinguish wet from dry fracture characteristics in Central Florida earlier than previously reported.[1-4] Fracture surface and fracture outline were the most useful characteristics for evaluating the transition from wet to dry. Group B exhibited dry characteristics earlier than Group A, indicating environmental factors are regionally specific and specific to microenvironments. The use of taphonomic models that are regionally specific and standardized protocols for scoring fracture characteristics provides increased accuracy in estimating timing of injury.

Reference(s):

1. Coelho L., Cardoso H.F.V. Timing of blunt force injuries in long bones: The effects of the environment, PMI length, and human surrogate model. *Forensic Sci Int* 2013;233:230-237.
2. Shattuck R.E. *Perimortem fracture patterns in South-central Texas: a preliminary investigation into the perimortem interval*. (thesis). San Marcos, TX: Texas State University, San Marcos, 2010.
3. Wieberg D.A.M. *Establishing the perimortem interval: Correlation between bone moisture content and blunt force trauma characteristics*. (thesis) Columbia, MO: University of Missouri, 2006.
4. Wieberg D.A.M., Wescott D.J. Estimating the time of long bone fractures: Correlation between postmortem interval, bone moisture content, and blunt force trauma fracture characteristics. *J Forensic Sci* 2008;53:1028-1034.

Forensics, Fracture, Trauma