



Physical Anthropology Section – 2008

H127 Comparison of Two Methods of Age Determination Using Histomorphology: Periosteal vs. Endosteal Surface Equations

Andrea Clowes, BA*, Michigan State University, 16789 Chandler Road, #1422A, East Lansing, MI 48823

After attending this presentation, attendees will gain a greater understanding on the applicability of estimating age through the histomorphological evaluation of bone, and more specifically, the relevance of endosteal and periosteal surfaces in such analysis.

This presentation will impact the forensic community by employing a simple histological method of determining age at death that many do not realize exists. The estimation of adult age at death typically relies on standard techniques that use the pubic and rib bones. When these bones are not present, estimating age at death can prove to be challenging. In fact, forensic cases involving unidentified individuals whose remains are not fully present, fragmented, and/or otherwise damaged can prove impossible to positively identify. Forensic techniques of bone histology, the microstructural analysis of tissue, are known to be good aging techniques. This is important because establishing the age at death in a human remains case is a critical component in positive identification. By narrowing the age range, identification becomes more likely.

Two histological aging methods were tested: (1) The Hauser Method (Hauser, R, D Barres, M Durigon, and L Derobert, 1980. Identification par l'histomorphometrie du femur et du tibia, *Acta medicinae legalis et socialis*. 30:91-97), and (2) the Kerley-Ubelaker Method (1978). By directly comparing the two methods, the applicability of the equations of Hauser et al. will be showcased next to those already well established by Kerley-Ubelaker. The ease of use and repeatability of the Hauser method provides an attractive alternative to those more complicated. This method will prove to be of great use in the determination of age in damaged bone.

Since its original presentation, the Kerley-Ubelaker technique has become a standard histological method for the determination of age in forensic anthropology (Kerley, 1965; Ahlqvist and Damsten, 1969; Kerley and Ubelaker, 1978; Stout and Gehlert, 1980; Robling and Stout, 2000). Though considered one of the more accurate, Kerley-Ubelaker's method is less than ideal in circumstances in which the periosteal surface of the bone (the outer fibrous layer) has been worn away due to erosion, chemical substances, burning of the remains or other processes. This research tests the system developed by Hauser et al. utilizing endosteal and periosteal bone and compares the results with those of the Kerley-Ubelaker updated method which utilizes the outer periosteal layer (Kerley, 1965; Kerley and Ubelaker, 1978; Hauser et al. 1980).

There are two main strengths to the Hauser method: the application of the endosteal surface of bone for age analysis (to avoid difficulty in circumstances in which the periosteal surface is damaged), and the ease of use of the method itself. When analyzing Hauser, the diameter of the circular field was decreased to 1.16mm (area 1.06 mm²). Two areas of each bone (periosteal and endosteal) were utilized for separate equations. As such, they were treated as separate methods. The full analysis is dependant only upon the counting of present Haversian canals which are either present or are not.

The Kerley-Ubelaker method is based on the identification of osteons, osteon fragments, and measurement of the percentage of present lamellar bone. An osteon includes those Haversian systems that are equal to or greater than 80% complete while fragments are defined as less than 80% completeness. The field size is circular with a diameter of 1.62 mm (area of 2.06 mm²). A circular image of 1.62 mm was placed over a calibrated image captured through the Sigma Scan Pro 5.0 program.

This research validates the Hauser method of aging unknown individuals as well as provides an additional option when severe fragmentation eliminates other histological methods, such as Kerley-Ubelaker. The Hauser method, specifically the equation which utilizes the endocortical surface, provides an accurate method for estimating age, which opens the door for future research on the medullary cavity of bone.

Histology, Age Determination, Endosteal