H86 Comparing Human and Porcine Infant Parietal Histomorphology to Facilitate Research on Pediatric Cranial Trauma

Lindsey L. Jenny, MA, Paige V. Wojcik, BS, and Todd W. Fenton, PhD, Michigan State University, Department of Anthropology, 354 Baker Hall, East Lansing, MI 48824*

After attending this presentation, attendees will understand similarities and differences in histomorphology between human infant and porcine infant parietal bones as well as histomorphology's relationship to trauma research.

This presentation will impact the forensic science community by indicating that infant porcine parietal bones are an appropriate analog to human infant parietal bones up to 24 months of age when conducting pediatric cranial trauma research. Because it is difficult to obtain human pediatric skeletal material for trauma and biomechanics research, it is important to understand the histological relationships between the human infant skull and the porcine infant skull, which is often used as an analog in these types of studies.

This study established the baseline histomorphological properties of the human infant parietal bones and the porcine infant parietal bone, which did not previously exist. Histomorphology, the study of microscopic features of bone, is useful in determining the growth and developmental patterns of the porcine infant and human infant skulls. This information is essential to understand the manifestations of cranial injury on a histomorphological as well as biomechanical level.

Previous research at Michigan State University suggests a correlation in cranial bone development between 1-day-old porcine skulls and 1-month-old human skulls based on biomechanical properties. This research tests the hypothesized correlation by comparing porcine bone histology to human bone histology. By comparing the appearance and thickness of diploe, endocranial thickness, ectocranial thickness, and secondary osteon size, number, and arrangement, it was determined if the hypothesized correlation in cranial bone development is valid in a histomorphological context.

Human infant and porcine infant parietal bones were thin sectioned using a saw and examined using light microscopy at 100x. Images were captured using image analysis software. Image analysis software was also used to measure endocranial and ectocranial thickness and osteon size and density.

The main goal of this research was to determine whether the porcine infant skull is a reasonable analog for the human infant skull in conducting research on pediatric cranial trauma. It is necessary to use the porcine skull as an animal model of the human skull due to a lack of pediatric cadaveric material available for research and experimentation.

Paired t-tests found no significant differences between the human and porcine skulls in the ratios between the ectocranial, endocranial, and diploe thickness to total parietal thickness. Results indicate that there was a correlation in the appearance of diploe between nine-day-old pigs and twelve month old humans. However, parietal development permanently diverged at two years in humans and twenty-four days in pigs. There was no correlation in osteon density as infant pigs had more osteons than human infants. Differences in osteon size and density have been reported between species in long bones (Hillier and Bell, 2007) but the skull requires further exploration.

In conclusion, this study indicates that infant porcine parietal bones are an appropriate analog to human infant parietal bones up to 24 months of age when conducting pediatric cranial trauma research. Because it is difficult to obtain human pediatric skeletal material for trauma and biomechanics research, it is important to understand the histological relationships between the human infant skull and the porcine infant skull, which is often used as an analog in these types of studies.

Pediatric, Trauma, Histology

 ** Presenting Author*