H85 Age-Related Histomorphometric Changes in Fetal and Infant Long Bones

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After attending this presentation, attendees will gain an understanding of how histological changes in the long bones of fetuses and infants may be used to estimate age at death of fragmentary skeletal remains.

This presentation will impact the forensic community and/or humanity providing a preliminary investigation into the potential of utilizing histomorphometry in the estimation of age at death of fetal and infant remains. Microscopic methods may prove invaluable to the task of aging fragmentary remains that lack the characteristic features necessary for conventional methods.

The goal of this study is to investigate the age-related changes in histomorphometry among the femur, tibia, and humerus of fetal and infant skeletal remains. Histological studies have become increasingly important in distinguishing fragmentary human remains from non-human remains[1,2], as well as estimating age at death in forensic cases[3,4]. However, little work has been done with subadult material due to its distinct growth patterns and unique microscopic composition.

This study will impact the forensic community and/or humanity by providing a preliminary investigation into the potential of utilizing histomorphometry in the estimation of age at death of fetal and infant remains. Microscopic methods may prove invaluable to the task of aging fragmentary remains that lack the characteristic features necessary for conventional methods.

With permission from the mothers, cadavers were donated to the anthropology department by the University of Tennessee Regional Medical Center. Only fetuses and infants of known gestational age and those lacking pathological conditions that affect skeletal maturation were deemed adequate for study. The sample consisted of fetuses and infants of ages varying from 20 weeks gestation to 12 postnatal months. The femur, tibia, and humerus were chosen for study because previous research has suggested that these elements show more characteristic age-related changes in the adult than other skeletal elements. Since fragments of long bone shafts are often comprised of areas other than the midshaft, the entire diaphysis was utilized for study. Nine thin sections were cut from each bone (three each from the proximal third, middle third, and distal third of the diaphysis) using a high-concentration Buehler Isomet 1000 diamond blade saw. All sections were analyzed with a Leica DMRX light microscope at 5x, 10x, and 20x power magnification. Histomorphometric analysis was conducted using a Dell Optiplex GX270 and Image-Pro Express software. Seven measurements were recorded for each thin section - diaphyseal diameter, medullary diameter, cortical thickness, cortical area, osteon population density, osteon cross-sectional area, and percent non-remodelled bone.

Previous research conducted on changes in urinary excretion of the N-terminal telopeptide of type I collagen suggests that the rate of bone turnover in neonates increases up to 37 weeks gestation, slows around the time of birth, and increases steadily thereafter[5]. These changes are closely associated with the pattern of growth of the neonate; therefore, researchers can expect histological changes to follow a similar pattern. Osteon population density and percent non-remodelled bone seem the more promising measurements in detecting age-related histomorphometric changes.

References:

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Subadult, Histomorphometry, Age Estimation

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