



Pathology Biology Section – 2011

G127 The Utility of Skeletal Examination in Recognition of Occult Skeletal Injury

Jason M. Wiersema, PhD*, Jennifer C. Love, PhD, Sharon M. Derrick, PhD, and Luis A. Sanchez, MD, Harris County Institute of Forensic Sciences, 1885 Old Spanish Trail, Houston, TX 77054

The goal of this presentation is to illustrate the effectiveness of the skeletal examination method at locating otherwise obscure fractures in children.

This presentation will impact the forensic science community by illustrating particularly to forensic pathologists the effectiveness of the skeletal examination method in the recognition of otherwise occult fractures in children.

The Harris County Institute of Forensic Sciences (HCIFS) has been conducting skeletal examination, an autopsy method for recognizing skeletal fractures in children, described by Love and Sanchez in 2009, since March of 2007. The method involves incising and reflecting the skeletal muscle and periosteum overlying the long bones, scapulae, and ribs of infants and children with medical history and/or soft tissue injuries that are suspicious for inflicted trauma. The current study is a retrospective analysis of the utility of this method in the recognition of subadult skeletal injury.

The method is intended to expose occult fractures typically not recognized during standard radiograph surveys and autopsy (Love and Sanchez 2009). The traditional autopsy protocol provides good visibility of the skull and thoracic skeleton but not the appendicular skeleton. For this reason, an increase in the number of long bone fractures, particularly classic metaphyseal lesions, was expected in cases that have undergone this method, relative to those that predate it. However, a significant increase in the number of either skull or rib fractures was not expected.

Following HCIFS protocol, a skeletal examination is performed on all children with a history, or autopsy findings suspicious for inflicted injury aged three years and younger. Fifty-four total cases have undergone the procedure since March of 2007. This presentation considers only those cases that were ultimately classified as homicides with blunt injury included in the cause of death. HCIFS anthropologists have completed 41 such cases (experimental sample). These cases were compared to the same number of consecutive cases with the same criteria

(41) that predate adoption of the method (control sample). All cases in the control sample underwent complete autopsies as defined in the National Association of Medical Examiners standards, but were not subjected to anthropological skeletal examinations.

Of the 41 cases that have undergone skeletal examination, skull fractures were noted in 22 (53%), compared to 20 (49%) in the control sample. Seventeen (41%) of the 41 cases in the experimental sample had thoracic fractures (ribs, vertebrae, clavicles or scapulae), compared to 16 (39%) of the 41 in the control sample. Both of these numbers are expectedly similar between the control and experimental samples. However, the number of long bone fractures recognized per case since the method was adopted has increased significantly. Long bone fractures were noted in 17 of the 41 (41%) cases in the experimental sample, as compared to 6 of the 41 (14%) in the control sample. Worth noting is the fact that the fractures noted in four of the six cases in the control sample were complete fractures mentioned in the medical records prior to autopsy. The fractures recognized in the experimental sample are predominantly classic metaphyseal lesions. In addition, both the number of cases with multiple fractures and the number of fractures per case is appreciably higher in the experimental sample than in the control sample. The average number of rib fractures identified in cases with multiple rib fractures is 13 for the control sample and 22 for the experimental sample. The average number of long bone fractures identified in cases with at least one long bone fracture is one for the control sample and four for the experimental sample.

These preliminary results indicate that skeletal examination affords the anthropologist or pathologist the means to better recognize fractures that are difficult to appreciate on radiographs, and has increased the degree to which fractures in infants and young children, particularly of the long bones can be recognized, described, and interpreted. An additional benefit of skeletal examination is that it also facilitates interpretation of the degree of healing and the forces associated with individual fractures.

Skeletal Examination, Child Abuse, Fractures