H9 Standardized Descriptive Method for the Anthropological Evaluation of Pediatric Skull Fractures

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The goal of this presentation is to provide case example illustrations of a novel method developed for the standardization of pediatric skull fracture documentation.

This presentation will impact the forensic science community by describing a method designed for use by anthropologists in the description of pediatric skull fractures, and thus circumvents the confounding effects of the inappropriate application of clinical fracture descriptions in the forensic context.

Distinguishing accidental from non-accidental head trauma is an important component of the forensic autopsy and is based on the thorough detection, standardized description, and appropriate interpretation of skull fractures. The majority of the literature pertaining to pediatric skull fracture is clinically based and, thus, motivated by the need for effective assessment of both fracture characteristics (type, frequency, location, and mechanics) and context (severity of injury, associated soft tissue damage, and patient prognosis). This clinical perspective is reflected in the significant array of skull fracture classification systems that exist. Most clinical schema distinguish some variation of the following categories: simple, complex, comminuted/composite, depressed, basilar, stellate, diastatic, growing, and ping-pong. From a strictly descriptive standpoint, these categories are not mutually exclusive and instead represent overlapping levels of detail in fracture description, which are useful in the clinical setting but confound the non-clinical description of fractures in the forensic context. For this reason, application of these schema in the forensic anthropological interpretation of skull fractures, as manifest on the bone itself rather than imaging/associated clinical findings, is inappropriate.

It is argued that forensic anthropological interpretation of skull fractures requires a standard classification system that reflects fracture morphology alone, and a three-stepped classification system which conveys increasing detail with each additional step is suggested. The first and most basic step is the fracture *category* of which three variations exist: simple, complex, and comminuted. The second step describes the fracture *pattern*, and the third step adds the fracture *descriptors*. Thus, the proposed system utilizes the fracture characteristics that covary with, but are not independent, of the basic fracture categories, as modifiers rather than additional fracture categories.

The proposed schema was applied retrospectively to Harris County Institute of Forensic Sciences (HCIFS) anthropology cases analyzed between April 2007 and April 2012 to evaluate its applicability and repeatability. The study sample included all children age two years and under for which an anthropological examination was requested and that had at least one skull fracture.

The study was intended to statistically evaluate: (1) the effectiveness of the method in capturing the variation in pediatric cranial fractures seen at the HCIFS, and, (2) to identify the potential for interobserver error in the application of the schema. For each case, the diagrams and handwritten notes completed by the examining anthropologist, autopsy, anthropology photographs, and micrographs were reviewed.

Forty-four skull fractures were found in the 31 cases in the sample. Application of the method demonstrated that the proposed nomenclature adequately captured and concisely recorded fracture morphology variation in each of the cases and validated the effectiveness of the schema in describing pediatric cranial fractures. There was 100% agreement between the four anthropologists in the assignment of the fracture category (simple, complex, or comminuted). The fracture patterns assigned to each fracture were also highly consistent among the analysts, with 79% agreement between observers. The discordant entries did not represent contradictory fracture pattern interpretation but rather slight interpretational variation.

This study illustrates the value of the proposed nomenclature for the standardization of the anthropological description of skull fractures and the effective distinction of fracture description and clinical implication. The system is adequate for the anthropological classification of the majority of skull fractures observed during medicolegal autopsies of children two years of age and younger. This presentation will outline the practical application of the method using HCIFS case examples.

Child Abuse, Skull Fracture, Blunt Trauma