A98 A Comparison of Radiographic and Osteological Findings in Suspected Infant Abuse Cases

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After attending this presentation, attendees will understand the pros and cons of radiographic and osteological methods of trauma evaluation in suspected infant abuse cases and the benefits of forensic anthropological analyses performed in conjunction with clinical radiographic methods. Examples will also familiarize the audience with key skeletal signatures of infant abuse.

This presentation will impact the forensic science community by supporting the need for more comprehensive osteological analyses to be performed in cases of suspected infant abuse in order to confirm and supplement clinical radiographic findings. By implementing both radiographic and osteological methods, infant skeletal trauma can be more accurately documented and interpreted, thereby contributing to accurate assessments of accidental versus non-accidental trauma and providing justice to the deceased.

Approximately 700,000 children were abused in the United States in 2012, with infants (<1 year) displaying the highest number of deaths due to abuse. Even so, infant abuse cases are rarely received by forensic anthropologists. This is due in part because forensic anthropologists are usually only consulted in the event of a death and only if it is suspected that the death included significant skeletal trauma; however, it may also reflect an assumption that the clinical radiographic analysis performed by the radiologist and autopsy conducted by the medical examiner sufficiently document all necessary trauma, eliminating the need for invasive skeletal processing and osteological analysis. In such scenarios, information vital to the investigation may go undetected.

The goal of this study was to compare clinical radiographic reports of skeletal trauma in suspected infant cases to the skeletal trauma revealed by a comprehensive osteological analysis. Radiographic and osteological findings were compared in four suspected infant abuse cases examined for this study. The limited sample size reflects the scarcity of infant abuse cases received by forensic anthropologists and should not diminish the significance of such cases. The results of the comparison reveal that in many instances, the documented skeletal trauma in the clinical radiographic reports were not as extensive as the injuries observed during the osteological analysis. Errors in radiographic reports of antemortem and peri-mortem trauma were noted (e.g., rib assignments), and smaller healing calluses on the ribs were often overlooked or not apparent from the radiographs, despite being clearly evident after skeletal processing. These inconsistencies are likely due to the imposed two-dimensionality of the radiographs and overlapping anatomical structures that obscure the injuries.

Limb fractures were well documented in the radiographic reports and in one case, the radiologist noted a recently healed fracture in the limb which was not initially visible in the osteological analyses due to the overlying periosteal reaction, but became evident as the processed bones dried out. Generally, the radiographic reports were also more successful at noting metaphyseal fractures than the osteological analyses, due to the fragility of the area and possible disturbances to the metaphyseal surface during processing. In one case, close monitoring of remains during the maceration procedure, with repeated photodocumentation during processing, revealed very distinct metaphyseal ("bucket handle") fractures that were consistent with the radiographic findings. Callus sizes, fracture direction, and evidence of re-fracturing events were also more discernible in the processed remains than radiographs.

The results of this study indicate that both radiographic and osteological analyses should be required in cases of suspected infant abuse. In addition to the clinical radiographs evaluated by the radiologists, forensic anthropologists should perform their own radiographic and photographic documentation prior to any processing, and if possible at different intervals during the maceration process. With such careful procedures, even delicate signatures of infant abuse, such as metaphyseal fractures, can be osteologically documented. It is the forensic anthropologists' responsibility to educate medical examiners in the benefits of performing a full osteological analysis. In addition, because infant abuse cases are rare occurrences in forensic anthropology, it is important for forensic anthropologists to document and share their case experiences in order to create a growing knowledge base of accidental and non-accidental trauma in infant skeletons.

Child Abuse, Infant Abuse, Radiographic