A54 Radiographic Evidence of Gunshot Defects in Skeletal Remains: A Preliminary Study

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Learning Overview: The goals of this presentation are to aid in the understanding of how forensic anthropologists utilize radiography for trauma interpretation of gunshot defects and to test the reliability of using radiography in trauma interpretations.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by investigating how the decomposition and maceration processes of human remains affect radiographic detection of Radiopaque Material (ROM), which may be useful in trauma interpretation.

Understanding trauma patterns provides forensic anthropologists with necessary contextual information about cause and manner of death. A difficulty in forensic cases for the medical examiner or forensic anthropologist is distinguishing trauma as a Gunshot Wound (GSW) or Blunt Force Trauma (BFT). This difficulty occurs when the remains are incomplete, are highly fragmented, present atypical trauma patterns, or have been exposed to taphonomic processes.[1-4] In some of these cases, ROM (e.g., metallic fragments from the bullet observed on radiographs) can serve as an indicator of a gunshot defect, aiding in trauma interpretation.

While radiographs are commonly used by forensic anthropologists in the detection of opacities to confirm the presence of a GSW, the validity of pursuing opaque material as an indicator of GSW in skeletal remains has not been extensively examined. Specifically, few studies have examined how often opaque materials are observed on radiographs of GSW, and fewer studies have focused on lead particles embedded in the gunshot defects as evidence in cases presenting atypical trauma patterns. The aim of this study is to validate the use of opaque materials detected using radiographs as an indicator of gunshot defects in forensic anthropological investigations involving skeletal remains. This study helps to determine if radiopacities are a reliable indicator of gunshot trauma.

To examine how frequent opacities are present in GSWs, a total of 13 donors from the Texas State Donated Skeletal Collection were radiographed. The donors were radiographed using a portable X-ray machine, or MinX-Ray, at the Osteological Research and Processing Lab at Texas State University. The regions of trauma include cranial, intraoral, and chest and torso. Twelve of these donors were radiographed after the decomposition and maceration processes, resulting in a detection frequency of ROM of 25% (3 donors presented material). One of the donors exhibited material after decomposition, but appeared negative in the radiographs after it was macerated and processed.

Understanding the frequency of ROM detection in GSWs is valuable to the forensic professionals who are involved in trauma interpretation. It is further necessary to understand how the decomposition and maceration processes affect radiographic detection of these materials. This preliminary study exhibits a 25% frequency of ROM detection after both decomposition and maceration, compared to a 33% detection rate only after decomposition. This difference shows that maceration affects detection. Variables that could not be controlled in these real-world cases include shooting range, ammunition type, weapon used, and exposure of remains during the postmortem interval. Further research should include radiographs of GSWs before decomposition, as well as a greater sample and more controlled variables, which may also affect detection but could not be controlled for in this study.

Reference(s):

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