A93 An Assessment of the Ability of Forensic Anthropologists to Detect Skeletal Trauma Using Radiological Methods

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Learning Overview: After attending this presentation, attendees will have gained insight into the role of radiological methods in modern forensic anthropology, as well as the ability of forensic anthropologists to accurately detect skeletal trauma using imaging modalities.

Impact on the Forensic Science Community: This presentation will impact the forensic science and anthropology communities by highlighting the ability of forensic anthropologists, in terms of fracture-detection sensitivity and specificity, to identify blunt force trauma using various imaging modalities.

Forensic anthropological analyses are increasingly being conducted using radiological methods. These anthropological examinations often include the assessment of skeletal trauma, which is common in cases of physical abuse and violent crimes. However, while forensic anthropologists may be required to detect and comment on fractures using radiological material, they generally have very limited, if any, radiological training or experience. The aim of this study was therefore to assess the ability of forensic anthropologists to detect skeletal trauma using radiological means.

The skull, trunk, and limbs of five piglets were subjected to blunt force trauma using a mallet and were then scanned using Computed Tomography (CT), X-ray, and Lodox®. Each scan was read by a Senior Radiology Resident (SRR), a Novice Forensic Anthropologist (NFA) with brief training in the basics of radiological image interpretation, and more Experienced Forensic Anthropologists (EFA) with limited-to-no radiological training. Each observer recorded the number of fractures detected using each imaging modality, and the level of agreement between each of the observers was calculated using Cohen's kappa. In order to calculate the fracture detection sensitivity and specificity for each observer, the number of fractures identified by each observer using each radiological method was compared to the number of fractures detected on the dry bone, which was recorded following skeletonization of the piglets.

The level of agreement between all observers was considered fair to almost perfect, with kappa values ranging between 0.37 and 1.00. However, while sensitivities were similar between the SRR (73.6% for CTs, 52.1% for X-rays, and 46.5% for Lodox®) and the NFA (77.8% for CTs, 55.3% for X-rays, and 48.2% for Lodox®), an average of 22.7% less fractures were detected by the EFA. All observers detected more fractures using CT scans than either X-rays or Lodox®, which suggests that, irrespective of the level of observer experience, CT scans are easier to interpret than plain radiographs. All observers had very high specificities, which ranged between 95.1% and 99.2%, and were comparable between each radiological method. This suggests that level of training or experience does not influence the rate of false-positive fracture identifications using any imaging modality.

The results of this study indicate that training in the basics of interpreting radiological images improves the ability of the observer to detect skeletal trauma using virtual means. Without this training, the ability of forensic anthropologists to virtually detect fractures during forensic anthropological analyses may not be sufficient. It is therefore suggested that all forensic anthropologists should receive radiological training prior to conducting forensic anthropological examinations that include skeletal trauma assessments using radiographic material.

Forensic Imaging, Forensic Anthropology, Virtual Trauma Assessment

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