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SENSITIVITIES OF VARIOUS IMAGING MODALITIES IN DETECTING SKELETAL TRAUMA IN SIMULATED VIOLENT CRIME AND PHYSICAL CHILD ABUSE: A PIG MODEL

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Abstract

Radiology is frequently used to detect skeletal blunt (BFT) and sharp force trauma (SFT). Forensic anthropologists may therefore be required to interpret radiological images when evaluating skeletons for trauma. Computed tomography (CT) and conventional X-ray scans have traditionally been used but more recently, low-dose full-body X-rays, or Lodox scans, are being increasingly utilized in medico-legal institutions, particularly in South Africa. The sensitivity of this modality to detect trauma must be compared to more traditional methods. Moreover, the trauma detection abilities of the specialists performing these virtual assessments must be established.

Fracture detection rates of a novice forensic anthropologist (NFA) with some radiological training, and two experienced forensic anthropologists (EFA) with no radiological experience, were compared against a radiologist. CT, X-ray and Lodox scans of five piglet carcasses with BFT were assessed. Fracture detection rates between the NFA and radiologist were comparable and were on average 22.0% higher than the EFA. Even brief radiological training substantially improves an observer's trauma detection ability using radiological means. It is recommended that forensic anthropologists required to perform virtual trauma assessments receive some radiological training.

The second aim was to compare the abilities of CT, X-ray and Lodox for detecting skeletal BFT and SFT. Piglet (5-15 kg) and adult-sized pig (47-82 kg) carcasses were used as proxies for human children and adults. To determine the sensitivity of each method, the defleshed skeletons were the gold standard. Ten piglets and ten adult-sized pigs were subjected to BFT, and ten separate adult-sized pigs were subjected to SFT. CT had the highest sensitivity for both types of trauma in both pig samples. It is therefore suggested that during post-mortem investigations of skeletal trauma, CT be the preferred radiological method. X-rays may be an alternative when imaging children with suspected BFT, while Lodox may be an alternative for BFT and SFT in adults.

Results showed that broadly determining the class of sharp weapon used, namely a kitchen knife and a panga, was possible radiologically by interpreting the macroscopic characteristics of the associated SFT.

This study added valuable new information on the ability of various imaging modalities to detect trauma.