D15 An Evaluation of Digital Radiography and Multi Detector Computed Tomography (MDCT) in Gunshot Wound Trauma

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After attending this presentation, attendees will recognize the principle differences between Digital Radiography and Multi-Detector CT Scanning (MDCT). Attendees will understand the relative advantages and disadvantages of each method for the documentation and evaluation of soft and hard tissue trauma resulting from ballistic injury. A case study demonstrating the use of both methods in the investigation of ballistic trauma will be presented.

This presentation will impact the forensic science community by increasing awareness of the potential offered by modern medical imaging techniques and afford a greater understanding of their application in the investigation of ballistic trauma.

Although radiography has long been the primary method used to evaluate ballistic trauma, interest is increasing in the use of Multi- Detector Computed Tomography (MDCT). Recent studies have demonstrated significant advantages of this method over traditional film-based radiography. However, advances in detector and computing technology used in digital radiography now offer an alternative to traditional radiographic methods. The portability and lower capital cost of such units make this an attractive alternative imaging method in situations where MDCT is not possible for logistical or financial reasons.

A case study in which three experimental subjects (pigs, humanely killed) were subjected to postmortem gunshot trauma via a series of controlled ballistic discharges is presented. All subjects were examined both prior to and following shooting using MDCT and digital radiography. Following postmortem imaging, the subjects were examined using a conventional necropsy. Postmortem and antemortem image data from both modalities was evaluated by a team of Consultant Radiologists and compared to the necropsy findings.

Many studies have demonstrated the advantages of MDCT for evaluation of postmortem pathology due to its high resolution digital acquisition permitting both sectional and 3D reconstructions. In this study, MDCT proved very effective at demonstrating entry & exit wounds, projectile pathway and the extent of both temporary and

permanent cavity. However, in order to demonstrate and evaluate this information, a complex and time-consuming computer post-processing sequence is necessary, requiring specific specialist skills. Equipment is both large and expensive and may be outside the budget of many jurisdictions. However, in certain situations the additional information acquired may significantly reduce the time taken for autopsy, thus providing a cost-effective solution in busy jurisdictions.

Digital Radiography (DR) enabled both hard *and* soft tissue trauma to be recorded, documented and evaluated, offering significant advantages over its film-based predecessor. Radiographs were rapidly acquired to determine the presence or absence of underlying fractures and to establish whether any ballistic material remained within the soft tissue. Despite these advantages over conventional radiography, DR is not a 3D imaging technique and proved less effective at evaluating projectile pathway or bullet fragmentation than MDCT. It is also subject to errors of magnification and distortion and complicated superimposition. It is however, a more cost effective and simpler technique offering the user greater operational freedom and improved workflow, decreasing the overall postmortem examination time when compared to film radiography. It may be particularly useful in field applications due to its portability.

Both MDCT and DR are effective methods of evaluating ballistic trauma. While MDCT offers significant advantages in providing a 3D demonstration of soft tissue damage from entry to exit, it is a complex and time-consuming process. DR offers a rapid and effective primary tool for such investigations which is significantly superior to its film- based predecessor and less complex than MDCT. It may prove to be a more versatile option in many circumstances.

Multi-Detector Computed Tomography, Digital Radiography, Forensic Imaging

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