D25 A Comparison of Conventional or Plain Radiography Versus Computerized Radiography (CR) in Forensic Imaging

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After attending this presentation, attendees will have a better understanding of the two types of digital imaging systems that are being integrated into medical imaging, the advantages and disadvantages of each, and a comparison between one of the systems, Computed Radiography, CR, and conventional x-ray film. In addition, attendees will learn the benefits of an industrial CR in cases of suspected child abuse.

This presentation will impact the forensic science community by explaining why digital radiography should be integrated into forensic setting as it has been into the medical setting. Although the initial cost of the switch is considerable, the savings over time would be significant. In addition, the ability to adjust the appearance of the imaging following processing would eliminate the need for repeat exposures. However, dedicated medical CR systems may not provide optimal images in all situations. On the other hand, industrial CR would provide more imaging flexibility and the higher image resolution necessary in cases of suspected child abuse.

In medical imaging, film, the principle recording medium since 1895, is rapidly being replaced by one of two digital imaging systems: computed radiography (CR) and direct digital radiography (DR). Both systems have numerous financial advantages over film, but there may be disadvantages for forensic applications. This presentation will compare the image quality of one of the digital systems, CR, with conventional film in a forensic setting. In addition, a comparison will be made between medical and industrial CR image receptors, demonstrating the benefits of the latter.

Eliminating film as the recording medium in forensic imaging has a number of advantages, but care must be taken to avoid the limitations of digital imaging systems that have been designed for medical applications. Algorithms for medical applications are designed for hydrated living tissues and based on lower radiation doses. In order to achieve the low dose, pre-set algorithms sacrifice image detail. Because of this, medical applications are less than satisfactory for demonstrating forensically relevant defects such as a non-displaced rib fractures in deceased children. Also, because these systems were developed for hydrated tissue, images of skeletal material are less than optimal. An industrial CR system, in contrast, is based on five to ten times the radiation dose of a medical system. It produces an image with high image resolution and employs various algorithms developed for materials ranging from plastics and rubber to metals such as steel and aluminum.

All radiographs were taken at the Office of the Chief Medical Examiner for the State of Connecticut in Farmington, Connecticut. Anterior-posterior, AP, and lateral projections of the skull and chest were taken on a cadaver with three systems: conventional film in a cassette, Konica medical CR, and Fuji ST-VI CR plates. The conventional films were processed through a Kodak automatic processing unit, the Konica plate with a Konica CR reader with medical algorithms. The Fuji plates were placed into a Fuji high resolution (HR) CR reader capable of 50- micron resolution. A sudden infant death case was examined using the same three systems. Selected areas from each set of images were compared to determine the best resolution.

Digital radiography should be integrated into forensic setting as it has been into the medical setting. Although the initial cost of the switch is considerable, the savings over time would be significant. In addition, the ability to adjust the appearance of the imaging following processing would eliminate the need for repeat exposures. However, dedicated medical CR systems may not provide optimal images in all situations. On the other hand, industrial CR would provide more imaging flexibility and the higher image resolution necessary in cases of suspected child abuse.

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