Application of Radiology Techniques and Technologies in Forensic Investigations

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ABSTRACT

Forensic radiology is a specialized area of medical imaging which is used for the purpose of evaluation by the forensic experts, physicians, pathologists and anthropologists in cases related with the law. The imaging technologies and techniques can be potential and powerful tools in solving the medico legal cases in the field of Forensic Medicine & Toxicology. Here Forensic experts evaluate the medico legal cases by effectively utilizing their knowledge and experience of recent radiological techniques and technologies. In this article along with the brief history, different modalities of Radiology which have various applications in medico legal investigations with certain advantages and disadvantages, record keeping of data produced, the safety aspects of these technologies, economical aspect of using them along with its current status in a global perspective and its future role and challenges have been discussed.

Keywords: Forensic Radiology, MD-CT, Registered Radiographer Technologist (RRT), Virtopsy, Triage Tool

Forensic Radiology plays an important role in examination of the structure of materials by non-destructive methods, as modern science has made it possible to look beneath the tissues of human body in telling hidden mysteries (Myke Kudlas, Teresa Odle, Lisa Kisner 2010). This is particularly important in investigation processes and the identification of victims following mass fatality incidents such as transportation crashes, transit incidents and natural disasters (Mark Viner 2006). Radiology refers to the broad field of medical imaging while radiography refers to the “recording” or conducting of the examinations.

A BRIEF HISTORY OF FORENSIC RADIOLOGY

The incidental discovery by Wilhelm Rontgen in 1895, for the ability to produce images using radiation made him use the term ‘x-rays’ for radiation. He used ‘X’ as the symbol for the unknown as at the time he could not understand what the ‘rays’ were. Soon X-rays was used in a forensic investigation to help convicting an accused person for an attempted murderer in America.

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Perhaps an initial instance of forensic radiography occurred in the 1890s when Professor AW Wright of Yale University tested Wilhelm Roentgen’s newly discovered x-ray photography on a deceased rabbit. Of interest were small, round objects inside the rabbit that appeared as dark spots on the positive film. The objects were extracted and identified as bullets, thereby helping to determine the cause of the rabbit’s death. In the years since Roentgen’s discovery, the use of radiography and other medical imaging specialties to aid in investigating civil and criminal matters has increased as forensic investigators realise how radiologic technology can yield information that otherwise is unavailable. Radiologic technologists can play a key role in forensic investigations (Reynolds A 2010).

The application of the discovery of x-radiation by Dr. Röentgen of Würzburg, Germany, in 1895, provided an important new tool for medical practitioners throughout the world. Its application was also realized as a potential weapon by forensic investigators. Discovery of the location of foreign objects, including bullets, thus became a clinical as well as a forensic technique in support of the investigation of living and deceased persons. The early application of x-ray methodology in England in 1896 was done by Prof. Arthur Schuster of Owens College, Manchester, in a case of a gunshot wound of a woman (Eckert WG, Garland N 1984).

In 2007, the American Society of Radiologic Technologists (ASRT) formed a Forensic Radiography Task Force. The purpose of the task force was to gain recognition for forensic radiography in the United States and to encourage development of continuing education in forensic sciences for radiologic technologists (Myke Kudlas, Teresa Odle, Lisa Kisner 2010).

MODALITIES

The different modalities in Radiology which may be applied in the forensic investigations are:

- **X-Ray:** A basic technique which can be used for locating and retrieving foreign bodies like firearms bullets, broken glass pieces, knife in cases of stab wounds, bone age estimation, identification of person through superimposition technique.
- **Fluoroscopy:** It has a place of use for detection of stents, medical instruments, gauze pieces and other foreign bodies in cases of medical negligence.
- **Nuclear Medicine Scan:** Can detect radioactive substances in cases of radioactive poisoning.
- **CT & MRI:** Can be effectively used for detection of fractures, hematoma/internal hemorrhages, extent and dimension of injuries and Virtopsy. In recent years, MDCT (multi-detector computed tomography) has become more popular in forensic work. MRI is superior to CT in detecting sub acute and chronic extra cerebral bleeding &deep cerebral injuries.
- **Dental Imaging:** It is done for identification and age estimation of a person and evaluation of injuries to teeth as well as by teeth.
- **Angiography and Venography:** These type of techniques can be used for identifying cause of death in cases of stroke, heart attack, intraventricular/intracranial bleeding.
- **Ultrasound:** Can detect haematomas, occult injuries and extent of injuries.

APPLICATION IN FORENSIC INVESTIGATIONS

Forensic radiology includes both clinical and postmortem forensic radiology. Clinical forensic radiology deals with imaging of healthy people from a legal point of view, such as for determining age or to prove and document injuries in victims of crime. Postmortem forensic radiology deals
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