D49 Forensic Radiography: Response to the London Suicide Bombings on 7th July 2005

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After attending this presentation, attendees will understand the role of radiography in the investigation of mass fatality incidents, the range of imaging technologies available and their application to the identification of the deceased and the forensic investigation of terrorist incidents. This presentation will present a case study of the application of radiography in the investigation of mass disasters. It is recommended that all mass fatality plans provide for rapid mobilization of radiological services using fluoroscopy and digital imaging.

Methods: On 7 July 2005, 56 people were killed and over 700 injured when suicide bombers staged four simultaneous attacks upon the London Transport system.

Positive identification of human remains is one of the most important tasks in mass disaster investigations and the London Mass Fatality Plan was immediately put into operation. A fully equipped emergency mortuary was established on a Military site in the City of London and was operational within 48 hours after the attacks. In accordance with the plan, the Association of Forensic Radiographers initiated its national response, mobilizing 27 forensic radiographers from throughout the United Kingdom who worked 12 hours per day in teams of 4-8 equipped with two digital fluoroscopes, direct digital and computed radiography systems and dental radiography equipment.

Radiological examinations followed the same established principles of the management of trauma, with primary, secondary, and tertiary surveys being undertaken at different stages of the investigation, making use of the most appropriate modern technologies available.

Over a sixteen day period, 56 bodies and 1162 body parts were examined. Primary surveys of whole bodies in unopened body-bags were undertaken using fluoroscopy by teams of two radiographers and a pathologist. The aim of the primary survey was to establish the nature of the contents of the bag, identify any hazardous material that may present a danger to mortuary workers, note any distinguishing features that may aid in establishing the identity of the victim, record the presence of jewelry and personal effects, note obvious injuries and, as the event was known to be a result of terrorist action, to search for any clues such as weapons or bomb fragments that might lead to a better understanding of the attack. Hard copy image was provided by means of a thermal film printer.

In the case of body parts, the primary survey was undertaken using direct digital and computed radiography. This technology offers a wide dynamic range, affording the pathologist, anthropologist, and crime investigator the facility to review the images under a variety of display settings to determine bone detail, soft tissue detail, and the presence of both metallic and non-metallic objects from the same examination.

Secondary surveys were undertaken following removal of clothing and external examination by the pathologist. The purpose of the survey was to document anatomical features that may be used for identification by undertaking radiographic examinations using standard projections for comparison purposes. In this particular incident, the secondary surveys were mainly limited to intra-oral dental radiography in conjunction with the odontological examination.

Tertiary examinations of both bodies and body parts were undertaken at the request of the pathologist in a number of cases.

Results: Fluoroscopy facilitated rapid location of jewelry and personal effects and allowed for documentation of injuries sustained by the victims. A number of foreign bodies were noted at primary survey and those that proved difficult to locate at postmortem examination were rapidly retrieved under fluoroscopic control.

Intra-oral dental x-rays undertaken on-site as part of the odontological examination enabled rapid and non-invasive acquisition of postmortem data for comparison with available ante-mortem records.

All 56 bodies were identified within six days from the start of the investigation. Identification by dental records was the primary identification method in 74% of these cases.

All 1162 body parts were examined using digital radiography. The rapidity of examination and the wide dynamic range offered by digital imaging enabled bone fragments and teeth to be recovered for further examination and DNA testing. In many cases, the high resolution of the initial radiographs eliminated the need for further skeletal or dental radiography. Alteration of viewing parameters enabled visualization of both skeletal and soft tissue structures from the same image and enabled location and retrieval of both metallic and non-metallic foreign bodies and minimized the need to undertake more invasive physical examination of the

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soft tissues.

Conclusion: Use of modern radiographic imaging technologies contributed greatly to the speed of the pathology examination and identification process. Fluoroscopy and digital radiography enabled items of forensic evidence to be located and recovered very rapidly whilst minimizing the need for invasive procedures to be undertaken.

Radiology, Mass Disasters, Terrorism

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