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Review article

The basics of disaster victim identification

A.L. Brough [a,*], B. Morgan [b], G.N. Rutty [a]

[a] University of Leicester, East Midlands Forensic Pathology Unit, Robert Kilpatrick Building, Leicester Royal Infirmary, Leicester LE2 7LX, UK
[b] University of Leicester, Imaging Department, Leicester Royal Infirmary, Leicester LE2 7LX, UK

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ABSTRACT

Mass fatality incidents can occur due to an environmental, medical, vehicle, industrial or terrorist event. They can be major, mass or catastrophic in size and generally involve large numbers of victims. Identification of these victims is of upmost importance in these situations for legal and compassionate reasons. Whilst radiography has been used for this purpose since 1949, it has since been suggested that post-mortem computed tomography (PMCT) could provide a more rapid and logistically beneficial modality-reducing the number of on-site personnel and minimizing the number of different imaging modalities required. The International Society of Forensic Radiology and Imaging (ISFRI), who include disaster victim identification (DVI) as one of their six key areas of development, support this idea. The DVI sub-group of the ISFRI supports the use of radiology including PMCT in mass fatality responses through the DVI group's published positional statements. This review will discuss the basics of disaster victim identification and the role that radiology has in it, both in the past and in the future.

Contents

1. Introduction

In any fatality incident, irrespective of cause or number of casualties, victim identification is of primary importance. Human identification investigators have a humanitarian and legal responsibility to identify every individual, where possible, so that they can be returned to their families [1].

Mass fatality incidents (MFI) generate large numbers of victims, often suddenly and unexpectedly. They are classed as 'disasters' and victim identification is generally achieved by following disaster victim identification (DVI) protocols. A MFI can be subdivided into: *major*, *mass* or *catastrophic*, depending on the total quantity of victims. They may be *local*, *national* or more commonly these days, *international* based on the location of the incident and the country/countries of origin of the victims. They may also be *closed* or *open* incidents, depending on whether the number of casualties is known, and whether the identities of the group

* Corresponding author.
E-mail addresses: alb39@le.ac.uk (A.L. Brough), bm11@le.ac.uk (B. Morgan).

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involved are known. For example, an aircraft related incident is normally a ‘closed’ incident, as there is a manifest of those traveling on the plane; whilst in contrast, the attacks on the World Trade Centers in New York in 2001, and the Asian tsunami in 2004, represent two of the most complex ‘open’ MFI to date, with the precise number of victims still unknown.

MFI can be further categorised as *environmental* (e.g. earthquakes, tsunamis, hurricanes), *medical* (e.g. famine, disease; such as the 2014 Ebola outbreak), *vehicle* (e.g. aircraft, car, train, ship), *industrial* (e.g. explosions, fires) or *terrorist* (e.g. chemical, biological, radiological, nuclear, or explosive attacks i.e. so-called CBRNE). Human Rights (HR) violations may also be considered to be mass disasters; although they may occur diachronically over a larger geographical area [2]. These categories are important when planning the site and type of mortuary to be utilised e.g. a permanent site, temporary or CBRN mortuary. Incident-specific variables will directly influence the selection of victim identification methods employed [3]. For example, aircraft and industrial incidents, terrorist attacks, and natural disasters often present fragmentation, heat damage and commingling problems, which require a more extensive mortuary setup.

The complexity of victim identification in the aftermath of an MFI can vary tremendously and depends on the context, number of fatalities, extent of body fragmentation, decay and the availability of ante-mortem reference material related to missing individuals. To ensure that bodies are identified as quickly and efficiently as possible, a multidisciplinary team is generally deployed to work simultaneously to increase the productivity of the identification process. This usual consists of police, pathology and odontological personnel although with the recent trend in the use of PMCT the radiologist is becoming an integral part of the mortuary identification team.

2. Disaster victim identification (DVI)

MFI as stated above can be international in scope. As a result, international as well as national disaster victim identification (DVI) capability and standards are required. To date, the International Police Organisation's (Interpol) resolution on DVI is the only internationally recognised legislation, which functions under international law, to specifically address this issue. They recommend that all 187-member countries should adopt a common procedure for identifying victims in any type of disaster, regardless of its cause or scale [4].

In 1984, Interpol published the first DVI manual. The aim was to provide information relating to mass disaster handling in general, and the identification process in particular, to increase the efficiency and effectiveness of DVI [4]. In order to achieve, maintain and improve standards, and to facilitate international liaison, Interpol recommends that each member country establish one or more permanent disaster victim identification Teams. They should have a responsibility not only for disaster response, but also for the vital functions of pre-planning and training of key personnel. The Interpol DVI guide (http://www.interpol.int/INTERPOL-expertise/Forensics/DVI-Pages/DVI-guide) assumes that post-mortem intervention will be organised and therefore describes the DVI process including 3 key steps. These are *recovery and examination* of bodies to establish post-mortem evidence from the deceased, *search* for ante-mortem information for possible victims and the *comparison* of ante-mortem and post-mortem data [5].

In order to ensure that a thorough search is conducted and photographically documented, recovery and victim identification teams should first acquire an accurate map of the disaster site. Ideally, this map should then be overlaid with a grid in order to facilitate a logical search operation. The grid and search area should, where possible cover the entire disaster site and should be searched systematically for body recovery, evidence collection and victim identification reasons. Matching the gridded location of remains to identities, and using that match as a reconstructive approach to create a cartographic understanding of the event, is one of the key elements of forensic DVI. Interpol has devised specific forms for recording the ante-mortem (AM) and post-mortem (PM) information to assist this process [1] and have also provided an official ‘Victim Identification Report’; completion of which generally acts as a prerequisite for issuing a death certificate and the final conclusion of the identification process. The AM team collects data of suspected victims, prepares corresponding missing persons files and notifies the relevant authorities regarding successful identifications. The PM team collects all the relevant dental, medical, and forensic data from the deceased bodies for the purpose of identification of said victims. The AM and PM data is then processed by the reconciliation team, who attempt to match the information collected by both teams and identify the victims. This process is summarised in Fig. 1.

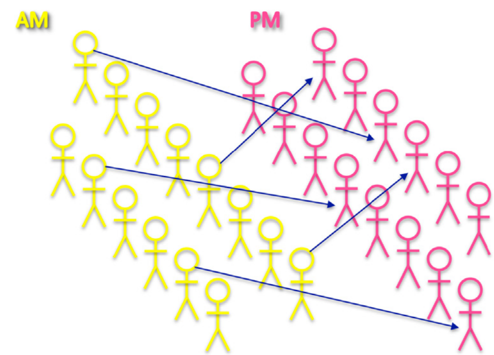

Fig. 1. Yellow AM forms (completed by the AM team) are matched to Pink PM forms (completed by the PM team), by the reconciliation team. The aim is a positive identification. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

The identification of individuals involved in a mass fatality incident is not always reliable or possible, but is dependent on the availability and quality of ante-mortem information for each victim [6]. Interpol categorises this information into circumstantial and physical evidence. Circumstantial evidence relates to personal effects, such as clothing, jewellery and pocket contents [7], and should never be used alone for proof of identity. Physical evidence is acquired through external or internal examination of the body, and is considered as admissible evidence [7]. External examination may reveal individuating characteristics such as tattoos, scars, and fingerprints, which can be extremely useful when confirming identity [8]. Likewise, internal examination may expose evidence of surgical procedures, including natural disease, prosthetics, or evidence of previous trauma; all of which may be exclusive to the individual [8]. The credibility of information therefore increases as the human identification expert passes from circumstantial evidence into physical evidence [9]. It is because of the importance of this physical information that Interpol have enforced standard operating procedures for the gathering of this information.

3. A brief history of imaging in identification

The first reported use of radiology for human identification was by Culbert and Law in 1927, when investigators compared ante-mortem and post-mortem radiographs of the frontal sinus of a homicide victim [10]. In 1918 they had reported a case of a man whom they had treated for chronic sinusitis. Some years later, this patient was believed to have been murdered while travelling from

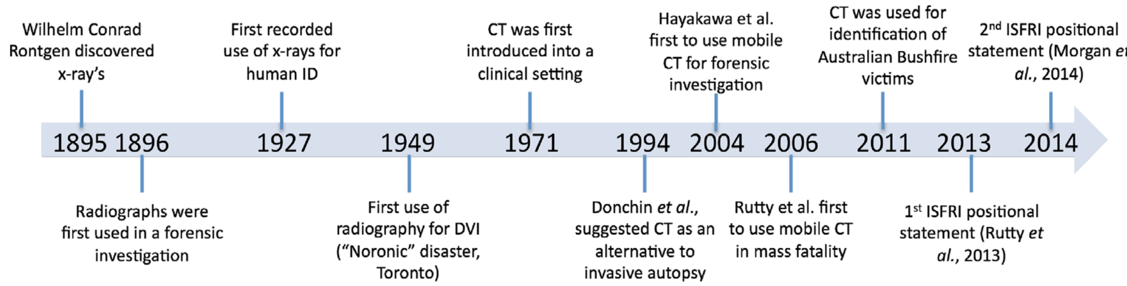

Fig. 2. Brief summary of the history of radiology in relation to identification and mass fatality incidents; a timeline of major contributions to the field.

India to Tibet. A body was found in a river in India and the relatives of the missing traveler convinced them to attempt to identify the male victim. The body was dismembered and when it reached them in New York, 260 days after the traveler had been reported missing, identification by normal means was impossible. However, by comparing unique biological features of nasal accessory and mastoid sinuses, visible on both sets of x-rays, they were able to confirm the identity of the deceased man as their patient. The comparison of ante and post-mortem radiographs is still considered by forensic investigators to be one of the most accurate techniques to establish identity.

In terms of mass fatality examinations radiography established a role in 1949, when it was used to help identify of the victims of the Great Lakes liner "Noronic" disaster in Toronto, Canada. This was the first recorded disaster that used x-rays for the identification of multiple casualties. The fire that engulfed the Noronic ship resulted in the deaths of 119 passengers. A large proportion of the victims suffered such severe burns that they were visually unrecognisable. Plain film radiographs were taken of 79 of 199 fatalities, and of these corresponding ante-mortem radiographs were obtained for 35. To begin with, antero-posterior and lateral x-rays of the skull and the extremities were acquired, for a preliminary survey of the bodies. Many additional radiographs were subsequently obtained after images that had been taken during the lifetime of some of the suspected victims had been sourced, to provide more comprehensive comparisons. This process contributed to the eventual positive identification of 24 of the most severely disfigured cases by radiology alone [11]. In this investigation, due to the severe disfigurement of the casualties, investigators reported that fractures were not of much evidentiary value but that congenital abnormalities and chronic conditions were of great value. Four of the individuals were identified by abnormalities of the spinal column, seven by arthritis of the spine, one from arthritis of the knee and one by arthritis of the calcaneus; all of which were distinctive enough on x-ray to produce positive identifications. Dr Singleton, a professor and head of the radiology department at the University of Toronto, was the chief radiological investigator for this incident. In many other cases, x-rays provided supporting evidence or were used to exclude identification suggestions produced by other techniques. Since then, radiology's role in human identification and mass fatality examination has developed enormously and forensic radiology is now a key component in any multi-disciplinary team dealing with casualty identification [12]. This brief history is summarised in Fig. 2.

4. Radiology in mass fatality incidents

Radiology is used for a number of purposes in a mass fatality incident. It can provide information to help with the detection of foreign bodies that may pose hazard to on-site investigators, be used to uncover and pinpoint the exact location of material evidence and to aid victim identification. The rapid and accurate identification of individuals is of primary importance for both judicial reasons and for relatives' peace of mind. This is typically achieved by comparing post-mortem and ante-mortem information, on the assumption that each individual exhibits unique features [9].

While bodies can be transported to clinical CT scanners following an MFI, this can present a number of logistical issues, particularly if the incident occurs in a remote area, a country that does not routinely use CT in general practice, or the disaster is so catastrophic that the medical infrastructure of the country is drastically affected. In or around 2004 Rutty suggested in meetings in the United Kingdom (UK) that a truck based mobile CT scanner could be deployed to the scene of the incident or mortuary for use in a mass fatality incident. The use of mobile PMCT scanners in a forensic setting was first reported in Japan [13]. Two years later in February 2006, Rutty and colleagues were the first group to implement the use of a mobile CT scanner in a small MFI [14]. As a result of this experience, this research group later developed a tele-radiology system for remote data reporting in MFI's, which they termed the FiMAG system [15]. This system allows secure global distribution of PMCT scans and international evaluation of images for identification purposes in a DVI event. The FiMAG system was primarily implemented by the authors to address the risks involved with a contaminated mass fatality scene and provided a remote radiological diagnostic service. A mobile CT scanner was deployed at the European Union funded, multinational CBRN and conventional mortuary exercise, Operation Torch in 2008 and the FiMag system was internationally tested during Operation Hounslow in 2011, During the exercise PMCT data was sent to reporting teams in Europe, Scandinavia, Japan, Australia and South America. PMCTs potential for DVI has also been considered by the Virtopsy® group, Switzerland, in two theoretical papers. They illustrated the benefits of mobile PMCT as a mass fatality-screening tool, and its ability to collect information to complete the Interpol DVI forms [16,17]. PMCT was also utilised in the Victorian Bush Fires, Australia [18–20].

In 2012, the International Society of Forensic Radiology and Imaging (ISFRI) was founded, with the aim to strengthen and develop the field of forensic radiology and imaging worldwide. This includes promoting best practice and developing international quality standards and guidelines for imaging. Society members have a professional involvement in forensic radiology and imaging. The second congress was held in Zurich, May 2013. During this conference, several important areas of development were identified. As a result, six working groups were formed to produce recommendations regarding: (a) data acquisition, (b) reading and reporting of images, (c) education, (d) certification and accreditation (e) networking and (f) disaster victim identification.

A positional statement was then released from the ISFRI DVI sub-group, outlining the issues facing the field of forensic radiology and the key areas of development on which the working groups would focus [21]. This publication recommended that, where possible, a radiological examination should always form part of the DVI process and that the modality used would be dependent on the equipment available at the time and the individual requirements of each DVI scenario. The ISFRI membership suggested that the modalities used should include radiographs (plain film, computed or digital radiography), fluoroscopy, computed tomography or dental radiography, either singularly or in combination. Furthermore, they considered that although MRI has been considered for post-mortem imaging, its utility in DVI events is limited by additional cost, extended scan time and mobility implications, and is therefore not considered suitable for DVI unless the only ante-mortem comparison image is MR.

In May 2014 a consensus document written on behalf of the members of the ISFRI and supported by the International Association of Forensic Radiographers (IAFR), regarding the use of PMCT in DVI, recommended that it should be used for: (1) identifying the cause of, and contributory factors to death; (2) disaster victim identification (DVI); (3) identifying potential hazardous materials within the body; (4) gathering evidence for criminal justice procedures [22]. This document also provides a detailed description of recommended body handling, PMCT scan, image data handling and image interpretation procedures. These protocols have been designed by the group to be applicable to both mobile (lorry based) and fixed site CT scanners and therefore include procedures for both at the scene of the incident or within a permanent or temporary mortuary.

This commitment from the ISFRI highlights the significant role radiology now plays in forensic casework and mass fatality incidents. The formation of a dedicated team of experts working towards a common goal emphasises the urgency and dedication of researchers within this field towards producing a standard approach to reporting, to maintain professional quality and standards.

5. Process pathway

The current standard approach, as used in previous incidents such as the terrorist bombings in London in 2005, involves moving fatalities through three separate radiological stations: fluoroscopy, to screen for potential contaminants or evidence prior to autopsy; standard radiography, principally used for anthropological and pathological examination; and dental radiography, for dental identification. This process requires the procurement and installment of three different imaging modalities in a temporary mortuary, sufficient staff to operate them and subsequently a number of health and safety implications.

5.1. Fluoroscopy

Mobile fluoroscopy units require the operator to be positioned next to the body throughout the imaging process, to capture images when necessary as they move the machinery systematically along the length of the body. They may also need to open the body bag and manipulate the body to obtain a good imaging plane, exposing them to potential contamination and often disturbing sights. This surface investigation takes approximately 15 min and pathologists, who are not specifically trained to report radiological images, normally interpret the images.

5.2. Plain film

Plain radiograph stations require a separate team of operators. As with fluoroscopy, the body bags often need to be opened to optimise the imaging procedure. The radiographs are normally examined by either radiographers or forensic pathologists and communicated verbally. A formal radiological report is often not generated.

5.3. Dental radiography

Dental x-rays are generally undertaken by an odontology team, rather than a radiography team [23]. They face similar issues regarding body manipulation, contamination and staffing. In addition, all of these imaging modalities normally need their own specific electrical power supply and a dry working environment, which presents a number of logistical problems in a chaotic temporary mortuary.

5.4. Mobile CT

Using mobile post-mortem computed tomography (mobile PMCT) has the potential to replace these three modalities, and therefore could improve issues relating to equipment sourcing, operational personnel and health and safety. Although mobile PMCT is relatively new to forensic practice, protocols are already well established in clinical medicine and could theoretically simply be adapted to the needs of post-mortem imaging.

Mobile PMCT would be extremely valuable when dealing with mass fatality events involving chemical, biological, radiological or nuclear materials (CBRN). These types of incidents require particular procedures and specialist equipment in order to minimise the potential contamination. The risk management strategy in these scenarios dictates that the number of individuals who may potentially become exposed to the hazardous substance must be as minimal as

Table 1
A summary of Interpol requirements.

Sections PMCT could assist/complete	Sections PMCT could not complete
B (22): State of body	B0: Checklist of operations for mortuary
B (22A): Important ID information	D5 (1–4): Fingerprint information
C (24–25): Clothing and footwear[a]	E4: DNA information
C2+C3 (26–30): Personal effects[a]	
D1 (31–55): Physical description[b]	
D4 (described in 22 and or/31,53): Body sketch	
E2 (71–75): Medical conclusions[c]	
E3: Skeletal inventory	
F1 (83–85): Dental findings	
F2 (86–91): Dental inventory	
G (92): Further information	
E1 (60–65): Internal examination	

[a] Clothing and footwear, personal effects; PMCT would be able to identify general items for inventory but for more specific details e.g. travellers cheques, type of credit card; a physical examination of the item would be required. However, in scenarios where the bodies can be scanned in sealed body bag to minimise contamination exposure, PMCT would be able to map the exact location of these items for rapid retrieval.

[b] (33) Except weight.

[c] (73) Except samples taken.

Fig. 3. *Osteology.* PMCT method of osteological reporting, virtually removes soft tissue and muscle and allows a fast inventory of the remains to be presented. In comparison with traditional methods, which involve manual maceration of each bone and lengthy reconstructions of the remains. Soft tissue reconstructions could also be extracted, if required, for an external examination.

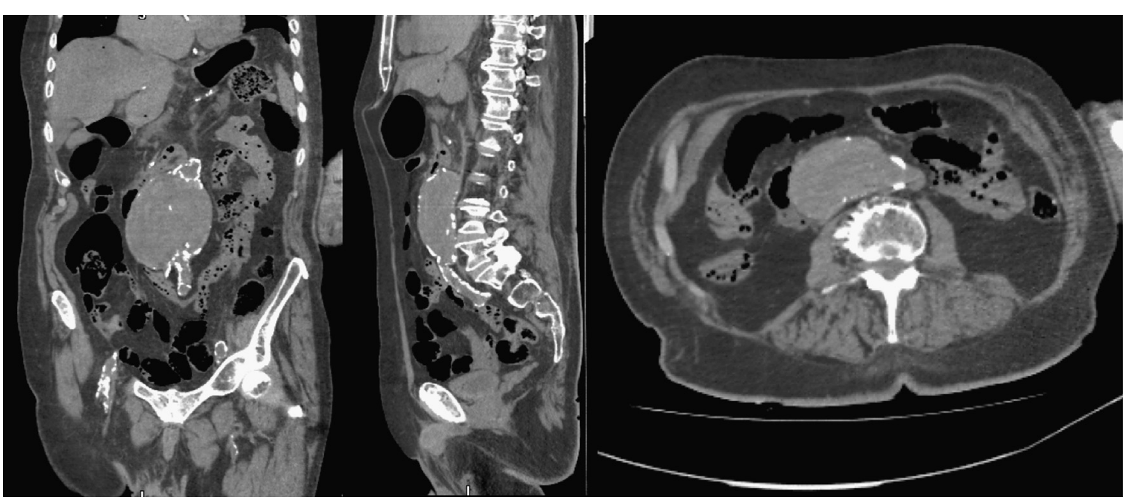

Fig. 4. Example of PMCT used to identify an internal natural disease of an abdominal aortic aneurysm, which can be used in the identification process.

possible. Therefore, as part of the most recent simulated exercise, funded by the European commission to hone the response to all major incidents involving such hazardous materials, a process was developed to manage contaminated fatalities safely and reduce the number of identification experts present at the scene. The first step of this protocol involves securing the contaminated bodies into body bags. These are specifically designed to prevent any further exposure of contamination. In this scenario, examination in situ and radiological techniques that involve body handling would not be possible due to the high risk of contamination to trained operators. Mobile medical imaging units would greatly reduce the number of on-site personnel. In theory, an individual could be scanned on-site using mobile PMCT scanners delivered by lorry, and the subsequent images could then be sent to a suitable identification expert anywhere in the world (teleradiology). Radiological reporting could therefore be performed at any number of different remote sites, without the need to expose investigators to the contaminated disaster scene. PMCT may in the future provide an all-encompassing radiology facility, acquiring all the necessary data in one, more time efficient station [17].

6. Potential role of PMCT in DVI

The current official DVI Interpol form provides guidelines for the correct handling of remains and evidence in a disaster event. To date, this recording form does not contain a PMCT section. However, on inspection of the current Interpol form, it appears that the several aspects of the information required could indeed be retrieved from PMCT data although it should be realised that an inspection of the body and the personal items removed from it will always be required as PMCT clearly cannot inform us of the words on labels, the inscriptions on rings or the natures of inked tattoos.

A review of the most regularly used anthropological identification techniques, by Brough et al. [24], demonstrated that all the measurements and morphological features required for these methods can be extracted from PMCT data. In a more recent publication [25], the same authors also suggested that it would also be possible to complete the majority of the current DVI Interpol form using only PMCT, an external examination (including recovery and documentation of personal possessions), fingerprints and DNA (Table 1). For example, an external body description and osteological report of the remains could be conducted from 3D

Fig. 5. *Use of PMCT to examine victims of an aircraft incident*, with emphasis on the presence of clothes/personal artefacts and osteological trauma. (1) The first victim (a) shoes and (b) belt; location and presence identified on PMCT for identification purposes. (c) and (d) Illustrate the numerous osteological trauma sites which can be used to consider cause of death and position in the plane. (2) The second victim (a) shoe; used for identification purposes. (b) and (c) Illustrate extensive trauma to the skull, arms and lower limbs.

reconstructions (Fig. 3). Personal effects, clothing and medical implants/interventions can be located for further inspection. Natural internal disease which could be known within a person's medical history can be identified without the necessity for an invasive internal examination (Fig. 4). In terms of ascertaining a cause of death then PMCT has a potentially powerful use and could remove the necessity for an invasive examination (Fig. 5).

In addition, PMCT dental reconstructions could be used in the same manner as traditional OPT's for the estimation of age and identification of unique dental features, with the added advantage of producing a 3D data set as apposed to a single 2D image (Fig. 6). Using PMCT for dental identification would also minimise the number of medical imaging modalities required onsite. However, it is important to note that when dealing with adult remains,

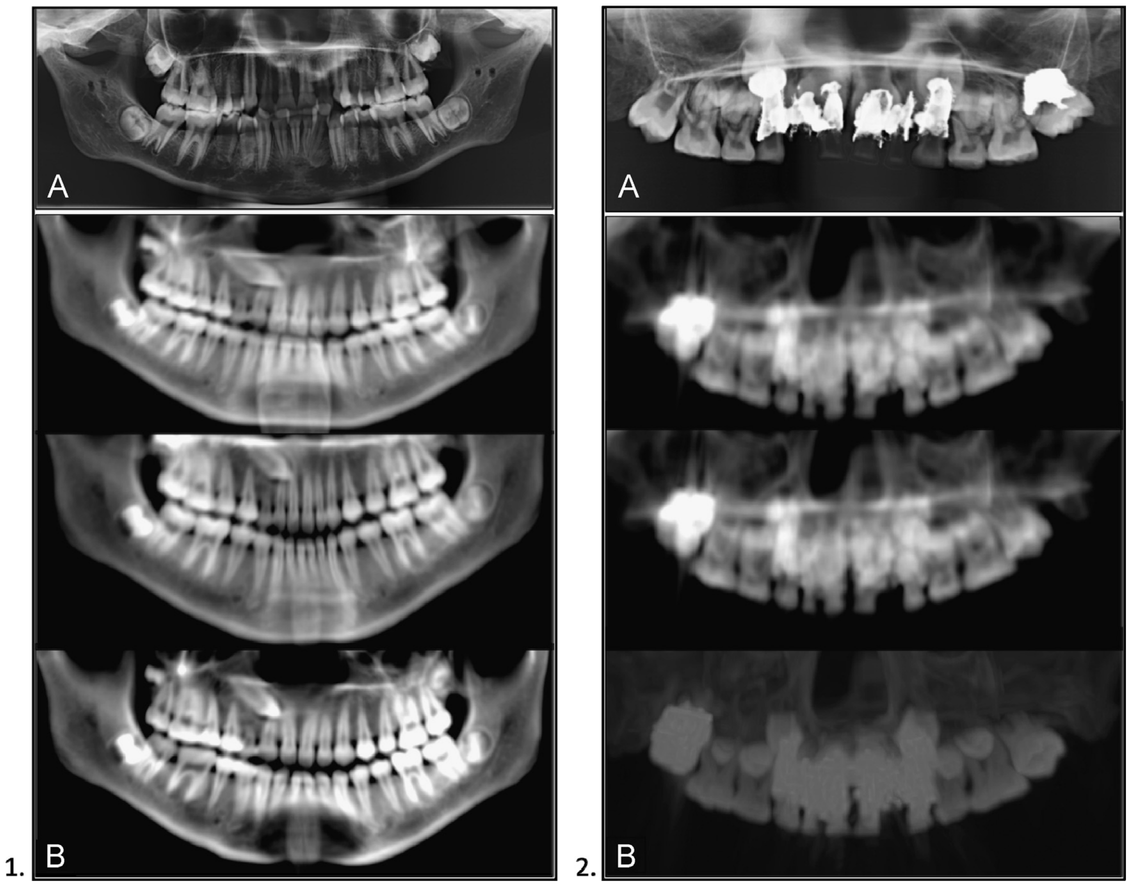

Fig. 6. *Odontology*. Images 1 and 2 are from different individuals. 1A and 2A are OPT's. 1B and 2B are PMCT images. The PMCT images (1B and 2B) are mirrored images of the dental OPT's (1A and 2A). Dental restorations can create image blurring using PMCT and result in less clear curved MPRs. This is a limitation that has to be taken into consideration when using PMCT. However, as illustrated in image 2B the general pattern and position of the dental restorations can still be deciphered.

Table 2
Advantages and limitations of PMCT.

Advantages

- CT is also available as a mobile modality
- CT is not restricted to a single area of the body
- No need for lengthy preparations of bones
- No need for lengthy preparations of teeth
- CT data can be obtained and transferred virtually "as is", i.e. without language interpretation/translation
- Storage requirements for CT data are far less problematic than whole body or tissue storage—from both an ethical and practical standpoint
- Less chance of information or evidence being lost
- Fast scan and analysis time
- Expert analysis can occur remotely and at any time
- CT is non-invasive, therefore virtual forensic procedures are likely to be culturally more acceptable
- An online, remotely accessible PMCT database could be created—providing researchers with an opportunity to improve traditional anthropological, odontological and forensic techniques

Limitations

- Access to CT scanners may be limited, particularly those that are used for PMCT scanning as well as clinical scanning
- Equipment is expensive
- Continuous excessive use of scanners can cause damage which is expensive to repair
- Metal might cause metal artefact (particularly evident in the dentition)
- Not all pathologies that could potentially be used for identification from ante-mortem medical records can be detected

image artefacts produced from dental amalgam in fillings may limit PMCT's evidentiary value. Although other metal work causes fewer problems and these are clearly less common in a younger age group, it is an important consideration in individuals with extensive dental restoration.

Using CT on teeth with restorations or implants will produce artefacts using current technologies. Distortion of tooth morphology, occlusal plane, and unique features of the restorations and surrounding anatomic structures can occur. This can affect the precision of measurements used for various identification techniques, such as age estimation and comparison identifications. Beam hardening occurs when the low energy portion of the x-ray spectrum is absorbed more than the high-energy portion, resulting in the central part of a uniformly dense object being subject to harder x-rays than the outer portion. Subsequently, the periphery of the structure appears more radiodense than the center. Artefacts resulting from phenomena such as beam hardening are undoubtedly limitations of the technique, which highlights the necessity to develop improvements in the technical domain of PMCT. For example, beam hardening could possibly be dealt with using x-ray filtering, to approach monoenergetic x-ray beams.

7. PMCT reporting

Over the last decade, the frequency of PMCT scanning has increased rapidly and therefore its role in DVI events has also increased. This presents the important question of whether PMCT reporting should follow an official structured reporting format, or alternatively whether a free reporting format should be used. This might be dictated by legal requirements as set out by law and landmark court decisions.

The core task of any post-mortem examination of a body is to provide a comprehensive account of all the relevant findings. Therefore, all data gathered, as well as case relevant significant findings within of any of the data (including PMCT data with reports of the presence as well as absence of relevant findings) have to be explicitly reported. Without a structured reporting format in place, the readers of PMCT currently use their judgment in what they want to report, and how they want to formulate their written reports.

In a report by Schweitzer et al. [26] a structured report format was directly compared with a free report format. In this investigation forensically relevant items were missed by the reporter in critical subject areas in 25–79% of free form PMCT reports. Conversely, for the specific purposes of forensic pathology, structured reporting contained all key features. With PMCT gaining increasing acceptance worldwide it is important to consider how measurements and results can be appropriately recorded to ensure that critical evidence is not missed, whilst not wasting time on irrelevant findings. Structured reporting in PMCT would provide a technically reliable basis for good PMCT reporting. It would help experts that report on PMCT findings to construct complete reports, as a structured form would ensure that all angles of a comprehensive medico-legal investigation were covered. This structured report would therefore have more credibility, especially if the template was created in conjunction with experts in Law.

To ensure that PMCT is considered for the next DVI Interpol update it is essential to develop an adequate PMCT recording format, which includes an identification reporting section. In a DVI event, although it is possible to transfer large quantities of raw PMCT data between different countries [27]; this process currently takes approximately 20 min per case (or longer, if there are security measures such as firewalls in place), requires a large computer memory and storage facility, and post-processing of the raw data can be labour intensive (depending on the case). In addition, despite it being possible to transfer the data, there is no guarantee that the recipient has access to sufficient post-processing facilities or adequate knowledge of how to use these imaging systems. This being said, global distribution of competence centers are now available, to help individuals or institutes who acquire post mortem derived CT data that they do not know how to deal with. The ISFRI for example, as well as other more local bodies, now prioritises education as a key component in the development of the field of forensic imaging. However, using a 'minimum data-set' recording form, completed by a central investigator, which can be sent to numerous practitioners for independent analysis, would still be considerably beneficial in DVI scenarios where time is of an essence and victims must be identified accurately. A standard PMCT reporting form would also ensure that an adequate amount of information about each case was recorded in a standard format; for multiple practitioners, using numerous anthropological identification techniques to use remotely.

8. Future of DVI

As PMCT is being accepted more and more into autopsy practice it is anticipated that it will, as Rutty suggested nearly 10 years ago, become a significant, if not the main radiological examination modality for MFI's. The advantages and limitations of PMCT are summarised in Table 2. As radiologists and pathologists alike become more exposed and inclined to use PMCT in autopsy practice, so others such as the police and judiciary will come to learn of its potential significant role in MFI DVI processes. There will currently always remain the need for an external examination of the body along with a dental examination but as we move into a new era of DNA technology, with the potential offered by next generation sequencing (NGS), PMCT and NGS may become the principle technologies used in MFI investigations as suggested by Rutty and Sajantila at the Interpol DVI Steering Group meeting, Lyon, 2014.

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