

Research Article

Beyond DVI: Future identification, research and archiving

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Abstract

In the context of mass fatality incident, it is of utmost importance to identify the victims rapidly and accurately, both for judicial reasons and to provide closure for family members. DVI teams work in an interdisciplinary manner, engaging the services of experts in various disciplines, comprising of pathologists, anthropologists, odontologists, radiologists, fingerprint and DNA experts to work collaboratively towards the identification of victims. The DVI process is conducted by adopting the fundamental principle where the highest possible quality standards should be applied and victims are to be treated with dignity and respect, in accordance to the internationally recognised INTERPOL DVI guide. The DVI process used extensively by many countries in numerous disasters consists of four phases namely, Scene, Postmortem, Antemortem and Reconciliation. DVI is not a new discovery in which identification procedures have evolved and developed particularly in its application going beyond identification, to recording and documenting for future referencing by the victim's family to researchers. This paper focuses on the dynamic and continuous evolution, particularly the application of the DVI process in setting up a procedure for temporary controlled burial for all the unidentified remains in the two cases of Malaysia mass fatality. The two cases discussed conveys the importance of expanding the DVI process to include procedures for future identification and archiving. This extended version of the DVI protocol can be used for temporary controlled burial for all the unidentified remains as means of forensic humanitarian reason as well as for criminal investigation.

Introduction

Cases of mass fatality generate large numbers of victims, often involve incidents that occur either suddenly or unexpectedly or cases where incidents that go undiscovered for many years due to circumstances where elements of crime are involved. They are classified as disasters and victim identification is generally achieved by following the standard disaster victim identification (DVI) protocols. A DVI process refers to an internationally recognised sequence of identifying multiple dead bodies after a mass fatality incident in an organised manner [1]. In the context of DVI, a disaster causes sudden, violent, unexpected, indiscriminate and significant loss of life or injury following the calamitous events that usually produces more fatalities that can be handled using local resources. The complexity of victim identification in the aftermath of a disaster can vary tremendously, depending on the types of disaster, number of fatalities, extent of body fragmentation and decomposition, availability of antemortem reference material related to missing individuals as well as the setting up of a temporary cold storage and mortuary facility. To ensure that the victims are identified as quickly and efficiently as possible, a multidisciplinary expert team comprising of the pathologists, anthropologists, odontologists, radiologists and DNA experts deployed to work simultaneously to increase the productivity of the identification process.

Victim identification has been the primary role for forensic pathologist since the 19th century. The fire in the Ring-Theater of Vienna, Austria in 1881 with 449 victims of which 284 were subsequently identified marked the beginning of forensic autopsy use in identification [2]. DVI enables the expansion of the forensic medicine services with the birth of forensic odontology in 4th May 1897, when a dentist named Davenport, first used teeth to identify the one of the victims, the Duchess of Alencon, in a fire broke out in Bazar de la Charite' in Paris, France killing 126 victims [3]. Later on,

radiography was used by Culbert and Law by comparing antemortem and post-mortem radiographs of the frontal sinus of a homicide victim. Thus, forensic radiology was first reported for human identification in 1949 [1]. Identification of more than 70 victims of Waco siege fire outbreak in 1993 with DNA typing indicated the beginning of Forensic Genotyping [4]. As a matter of fact, Anthropology has been involved in DVI activities for more than a century [5]. The development of DVI has demonstrated that simple victim identification has evolved into the complex integrated approach particularly on the expanding role of individual disciplines in DVI process.

The DVI process

To date, the INTERPOL resolution on DVI is the only internationally recognised legislation, which functions under international law, to specifically address this issue. They recommend that all 190 member countries should adopt a common procedure for identifying victims in any type of disaster regardless of its cause or scale. The INTERPOL's Disaster Victim Identification Guide [6] provides the standardized DVI process adopting the fundamental principle to treat victims with dignity and respect in accordance with the highest possible quality standards. There are four phases in the DVI process namely, Scene, Postmortem, Antemortem and Reconciliation. Malaysia adopts the INTERPOL DVI guide to conduct any cases of mass fatality for victim

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identification. There is no treaty or convention for Malaysia to be bound by these processes.

Scene phase

After the completion of the search and rescue task by the first responders, the recovery process commences. The access to the site will be controlled and the extent of the scene will be evaluated. During the recovery phase, the temporary equipment at scene, methodology used to remove the bodies according to the types of hazard involved, body tagging, photography and the transportation of bodies need to be conducted systematically.

Postmortem phase

All human remains recovered from the scene are to be processed, examined and stored at a mortuary which has been selected for the operation. This mortuary may be an established mortuary or one which has been constructed temporarily for the operation. In this phase, postmortem examination will be conducted by the pathology team with detailed documentation of the human body or remains from a body bag. Photographs taken and remains will be cleaned for further examination. If victims recovered were mostly skeletonised remains, the role of a forensic anthropologist will be more prominently seen in post-mortem examination. Forensic anthropologists assisted in the investigation of mass grave by determining the minimum numbers of individual present, establishing a biological profile (ancestry, sex, age and/or stature) of those individuals as well as providing opinion on the ante-, peri- and post-mortem trauma [7]. Amongst other information that can be recorded and can be useful are the position of the remains, proximity of the remains to other remains, where remains are found to be commingled and even the estimation of the time since remains were placed in the ground. The pathologist will perform examination to look for possible injuries or fractures caused before the death. Then samples were taken from the body and fragmented body parts systematically to obtain material for DNA typing. The DNA technique allows identification of an individual, distinction between fragments and enables fragments to be assigned to an already identified body [8]. Subsequently, the forensic odontologist in disaster operations will ensure collection, collation and preservation of the maximum amount of available dental data and the appropriate interpretation of the data to achieve outcomes to a standard expected in DVI operations. In this operations, forensic odontologist is advisable to identify jaw, tooth, dental restorative components as well as post-mortem dental charting, radiography and photography of the human remains [9]. The fingerprint expert team and the DVI property team will be actively recovering prints from the victims and managing the personal belongings of the victims respectively in this phase. The information is recorded on the pink INTERPOL DVI postmortem forms.

Antemortem phase

An antemortem team, mainly composed of investigators, needs to search for and to select the most relevant identification data. In order to collect missing person data to match against victim data, an antemortem collection process needs to be established. This process can involve many complex dimensions as the task involves interviewing families, relatives or friends to obtain sufficient facts on a potentially deceased loved one. In addition to this difficult and confronting task, representatives from this phase may need to closely coordinate their activities with other agencies, jurisdictions or nations, to secure antemortem data from remote locations. This information is recorded on the yellow INTERPOL DVI antemortem forms.

Reconciliation

The identification of victims is realized by a process of comparison between antemortem data given by the families and post-mortem data coming from the examination of the bodies during the post-mortem phase. The function of the Reconciliation Centre is to match post mortem data with ante-mortem data with the view to identifying the deceased. In cases where there are reliable primary identifiers available, such as dental, ridgeology (fingerprints) or DNA and those identifiers meet the requisite standards, these cases can be prepared for presentation to an identification board for determination.

Case 1: Lahad Datu armed intrusion

A military conflict in Lahad Datu, Sabah started from 11th February 2013 and ended 24th March 2013, involved a self-declared throne of the Sultanate of Sulu, making a territorial claim of Philippines. Lahad Datu is a district in the East of Sabah, Malaysia, located approximately 165 km from Tawi-Tawi, Philippines (Figure 1). The confrontation between the self-declared Royal Security Forces of the Sultanate of Sulu and North Borneo and the Royal Malaysia Police (RMP) had caused 54 Sulu Sultanate armies and 10 Malaysians were sacrificed. During the captive, 4 Malaysian policemen were tortured and mutilated with one beheaded. At the end of the battle, the affected villages were then declared safe from threats and secured by the Eastern Sabah Security Command. The relevant authority and the DVI team were assembled and Lahad Datu Hospital was set up as the DVI mortuary operation centre (Figure 2). Dead bodies were being recovered from the conflict areas, however, were badly decomposed. Most of the bodies were already collected and piled up by the villagers. The DVI expert team, comprised of the forensic pathologist, forensic anthropologist, forensic odontologist, fingerprint expert as well as the DNA expert were mobilised and deployed to Sabah for the postmortem examination. The mortuary operation lasted for one month.



Figure 1. Map of Sabah, East Malaysia.



Figure 2. Dead bodies found in the village.

In this mass fatality incident, majority of the deceased were non-Malaysian and were considered the enemy of the country. However, post-mortem examination were conducted ethically and professionally on all the 64 bodies. Antemortem data were collected for 10 missing persons and later all the Malaysians were identified and given proper burial (Figure 3 and 4). On the other hand, the Sulu Sultanate armies were not identified. However, a proper temporary controlled burial was performed for all the remaining unidentified bodies.

Case 2: Clandestine multiple graves

In May 2015, several human trafficking camps were discovered in Wang Kelian, north area of Peninsular Malaysia under Perlis state, along the Thai-Malaysia border. The remains of 165 individuals were discovered, mostly ethnic Rohingya fleeing inter-religious strife in Myanmar. The Police unearthed 28 human trafficking transit camps comprised of 139 graves, in which some were empty, atop a hill, some hundreds of metres above sea level. A DVI response was triggered where all the expert teams comprising of pathologists, anthropologists, odontologists, radiologists and DNA experts were gathered at the identified DVI centre, which was the Department of Forensic Medicine, Hospital Sultanah Bahiyah, Alor Star, Kedah, approximately 75 km away from Wang Kelian (Figure 5). In this DVI operation, the INTERPOL DVI process were in compliance. An additional triage was added by using the X-ray procedure of all remains before postmortem examination. Although the human remains were non-



Figure 3. Government officials paying respect to the fallen comrades.



Figure 4. Burial ceremony for the Malaysian.

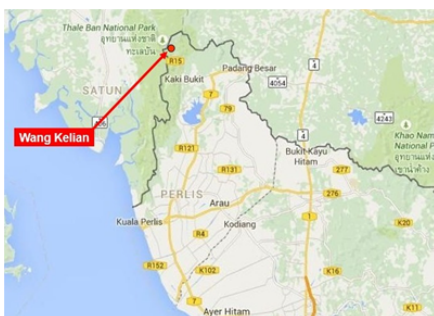


Figure 5. Location of Wang Kelian.

Malaysian, but were properly examined and managed with dignity and respect. There were no antemortem data collected for the human trafficking victims resulting in no reconciliation and consequently no identification. Although the human remains were non-Malaysian, but were properly examined and managed with dignity and respect. There were no antemortem data collected for the human trafficking victims resulting in no reconciliation and consequently no identification. The mortuary operations were successfully perfected until the final phase of temporary controlled burial for all victims (Figure 6).

Discussion

The two cases discussed above conveyed the importance of the DVI process to hold the role as future identification, data recording and archiving of information. Winskog mentioned “*no antemortem data means no identification*”, where that the collection of antemortem data as important as a foundation for successful DVI [10]. Without relevant antemortem data, DVI effort will still stand significant, proven by the extended DVI process up to the temporary controlled burial in the two cases.

Temporary Controlled Burial (TCB)

The TCB is a method for a long-term temporary storage of unidentified bodies. Temperature underground is lower than at the surface, therefore providing natural refrigeration [11]. It is done by performing a burial procedure for all human remains, where each body will clearly be marked with Global Positioning System (GPS), to facilitate future exhumation in the event of the presence of the next-of-kin. Each grave should be 6ft in depth where each individual were placed side-by-side 2ft apart to one another. Last rites were performed for all the individuals before placing into the body bag and later into the coffin. Three pieces of stainless steel tags were fixed to the body shroud, the coffin and the GPS coordinate plate in front of the grave (Figure 7). The International Committee of the Red Cross’s contribution to the



Figure 6. Temporary Controlled Burial.



Figure 7. Stainless steel tag on the coffin.

2004 16th meeting of Interpol's Standing Committee on Disaster Victim Identification states that "identification represents the fulfilment of the right of human beings not to lose their identities after death and, overall, the right of families to know what has happened to their relatives in all circumstances" [12]. Although there is no missing person data collected to be compared with the postmortem data as to date, there may be family members who might come forward for identification in future. The TCB provides a fundamental solution for the unidentified victims to be treated with dignity and respect (Figure 8). It is also essential to respond to relatives' needs with compassion, respect, and honesty, to provide answers and certainty as soon as reasonably possible.

Cataloguing and archiving of information

DVI is not a new discovery where identification procedures have been evolved and developed [8]. Radiology is used for a number of purposes in a mass fatality incident as 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. Although radiology has not been officially accepted to be included in the INTERPOL DVI guide, post-mortem computed tomography (PMCT) scan and X-ray have been introduced into DVI as a screening tool since 10 years ago [13]. All of the images generated from the PMCT or X-ray are digitized and kept in an electronic file for long term archiving (Figure 9). Apart from this, odontology examinations have advanced the dental imaging technology that enables the storage of dental records of the human remains made available in softcopy (Figure 10).



Figure 8. The TCB site.



Figure 9. X-ray image of a victim with an orthopaedic plate.



Figure 10. Dental Imaging (1).

The photos of the human remains taken during postmortem examination as well as the personal belongings were well kept in digital files for future reference. For countries that engaged the DVI software will be able to upload all photos taken at scene and during postmortem. The software mentioned was the *PLASSDATA*® DVI built for INTERPOL. This software has the ability to compare between antemortem and postmortem data as well as to expedite the process of matching and identity verification. Details from the antemortem data as well as the postmortem examination findings will be kept permanently in the archiving system. The proper documentation in the system enables future improvement, reference and long lasting record keeping.

Research

With the proper data recording, data cataloguing and long lasting record keeping, these information are crucial that can be used for the sake of good research. The outcome from the research can be used for education purposes and training of personnel involved in DVI operations. Advances of new techniques during postmortem examination as well as a more effective sampling technique can be established from the research of the disaster database. At the moment, time since death cannot be given exactly as when the deceased die. Future development in research could make a breakthrough and devise a formula to estimate time since death precisely.

Conclusion

Disasters and serious incidents, whether or not caused by human intervention, often lead to large numbers of casualties and fatalities. Mass disasters with a large number of unknown victims are among the biggest challenges for the police and forensic disciplines. The fundamental protocols for the DVI operations should not change, instead be intensified and institutionalised challenges. The two cases of mass fatality incidents in Lahad Datu and Wang Kelian have proven the dynamic and continuous evolution of the DVI process. The extended version of the DVI protocol can be advanced up to the temporary controlled burial for all the unidentified remains as means of humanitarian reason as well as the criminal investigation needs.

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