Case Report

Underwater DVI: Simple fingerprint technique for positive identification

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A R T I C L E  I N F O

Article history:
Received 18 May 2016
Received in revised form 8 August 2016
Accepted 9 August 2016
Available online 17 August 2016

Keywords:
DVI
Underwater
Search and recovery
Fingerprints
Smartphone
Macro lens

A B S T R A C T

An underwater disaster can be declared when a maritime accident occurred or when an aircraft is plunged into water area, be it ocean, sea or river. Nevertheless, handling of human remains in an underwater recovery operation is often a difficult and demanding task as working conditions may be challenging with poor to no visibility, location of remains at considerable depths and associated hazards from surrounding water. A case of the recent helicopter crash, into a famous river in Sarawak, domiciled by huge crocodiles, is discussed in this paper. Search and recovery team as well as the combat divers from the Special Elite Troop Commando, known as VAT 69, were deployed to the scene to perform the underwater recovery to search for all the victims on board involving five Malaysians with a pilot of Philippines nationality. This paper highlights the limitations and challenges faced during the underwater search and recovery. All the bodies recovered were in moderate decomposition stage with crushed injuries and mutilated face and body. A simple and conventional fingerprint technique were used to record the fingerprint. The prints impressions were later photographed using a smartphone and transferred back to the RMP headquarters in Kuala Lumpur for fingerprint match by using WhatsApp Messenger, a phone application. All the first five victims were identified within an average of 10 min. The last victim recovered was the pilot. For foreign nationals, the Immigration Department of Malaysia will record the prints of both index fingers only. The lifting of the fingerprint of the last victim was the most challenging in which only one index finger left that can be used for comparison. A few techniques were attempted using the black printer’s ink, glass and tape techniques for the last victim. Subsequently, images of the prints impression were taken using the same smartphone with additional macro lens attached to it to enhance the resolution. The images were transferred to the RMP headquarters through WhatsApp Messenger. The prints were confirmed to be the pilot 20 min later.

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1. Introduction

Transportations by means of land, sea and air are not uncommon for us since the last two decades. With the availability of various budget airlines, people tend to commute more frequently through air particularly to reduce travelling time. In recent years, incidents involving aircrafts crashed into the ocean, sea or river were in an ascending trend. These type of mass fatality incidents generate large numbers of victims, often sudden and unexpectedly. 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]. An underwater disaster can be declared when a maritime accident occurred or when an aircraft is plunged into water area, be it ocean, sea or river. According to Winskog, an underwater disaster may involve a crime scene investigation which should be handled as if it was located above water, include detailed description and documentation of items, belongings and findings [2]. Nevertheless, handling of human remains in an underwater recovery operation is often a difficult and demanding task as working conditions may be challenging with poor to no visibility, location of remains at considerable depths and associated hazards from surrounding water. A case of the recent helicopter crash discussed below

http://dx.doi.org/10.1016/j.forsciint.2016.08.019
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focused on the underwater search and recovery in a river as well as successful identifications for all the victims using the primary identifier of fingerprint comparison.

2. Case: Eurocopter AS350 crash in Sarawak, Malaysia

2.1. Background

The Eurocopter AS350 with serial number RPC6828, owned by Hornbill Skyways, carrying five Malaysian passengers on board, went missing over the jungles of Sebuyau, approximately 80 km from Kuching, capital city of Sarawak, located in the East of Malaysia, after took off at 4.12 pm on 5th May 2016 from Betong. A Deputy Minister with her spouse, the Member of Parliament and a Ministry Secretary-General were among those on board the aircraft that went off radar with Air Traffic Control Centre (ATCC) 20 min after took off (Fig. 1). A few hours later, the search and rescue operation had been activated involving first responders from multi-agencies, such as the Fire and Rescue Department, Malaysia Civil Defence Department, Malaysia Armed Forces, Malaysian Maritime Enforcement Agency and the Royal Malaysia Police (RMP). The DVI operations were divided into four phases, which were the Scene, Postmortem (PM), Antemortem (AM) and Reconciliation.

2.2. Search and recovery

Rescuers converged the search particularly in three areas, which were Betong, Sri Aman and Simunjan. Parts and pieces of helicopter were found. The search and rescue operation was converted into the search and recovery operation when the first victim was found in Sungai Lingga, Batang Lupar the following day on 6th May 2016. The search and recovery operation in this mission was the most challenging one. Batang Lupar, a natural habitat for crocodiles, is a huge murky river, famous for its tidal bore, in which rapid incoming tide forms waves of water travelling up the river against the direction of the river’s current. The search and recovery was again narrowed down to the vicinity of the Batang Lupar and the Special Elite Troop Commando under the command of RMP, known as VAF 69, trained in combat diving were deployed to the scene to perform the underwater recovery. Subsequently four other victims were recovered from the river on the 7th May 2016 and finally the pilot, a Philippines nationality, was recovered on the 9th May 2016 (Fig. 2).

2.3. Mortuary operation

At the same time when the search and rescue was initiated, the Disaster Victim Identification (DVI) operation had been triggered to gather the various DVI team and mortuary set up to be put on
standby mode. The priorities of this DVI operation were to positively identify victims and to provide closure for family members and next-of-kin, followed by the determination of the cause of death of victims to facilitate police investigation. Expert teams from various agencies were made up from Forensic Pathology, Fingerprint, Forensic Odontology, Radiology and the DNA team. Since the mortuary operation was conducted in the Department of Forensic Medicine, General Hospital Sarawak, a mortuary manager was appointed to take charge of the whole mortuary movement and the overall coordination with other teams. AM and PM were conducted simultaneously.

2.4. Fingerprint comparison

Fingerprint recovery was conducted during the PM phase in the mortuary. Once external examination has been completed by the Pathology team, the fingerprint team, comprised of special trained RMP officers, commences to work on the prints recovery. All the bodies recovered were in moderate decomposition stage with crushed injuries and mutilated face and body. The skin slippage condition enables the fingerprint expert to slip the degloved digit over his own gloved finger to take a print after spraying of the fingerprint ridge builder (Figs. 3–5). The fingerprint ridge builder spray is developed by TriTechForensics and is used to add definition and clarity to fingerprint ridges (Fig. 6). The fast drying, antiseptic ridge builder was sprayed on the victim’s fingertips and proceeded with the conventional ink technique. Since the early days of fingerprinting, the conventional method for recording fingerprints has been the application of a thin layer of black printer’s ink to the fingers and then recording the friction ridges impressions onto a fingerprint card [3]. The fingerprint impressions were then photographed using an Apple iPhone 6 plus smartphone and the images were transferred back to the RMP headquarters in Kuala Lumpur for fingerprint match (Fig. 7). The images were transferred to the RMP headquarters through WhatsApp Messenger, a phone application. The headquarters will then sent confirmation of the identity to the team in the mortuary. All the first five victims were identified within an average of 10 min. Since all the first 5 victims were Malaysian, their fingerprints AM data were obtained from the National Registration Department of Malaysia database.

The last victim found were headless with missing of both lower and upper left limbs. The fingerprint team was quite fortunate in
which the right arm was still attached to the body. With wet decomposition of the skin, the epidermis layer of the degloved fingers were missing leaving only the dermis layer of the prints. As the last victim was a pilot of Philippines national, the Immigration Department of Malaysia will record both index fingers only. Having said that, the fingerprint expert team only had one finger to recover the fingerprint. The first attempt was completed by using the conventional ink technique (Figs. 8–12). However RMP headquarters failed to identify the prints images transferred by the team. The second attempt was conducted using the glass technique as well as the tape technique. The glass technique done was actually similar with the ink technique except the use of the fingerprint card was substituted with the microscope glass slide to capture the ridges impression (Fig. 13). Subsequently, the tape technique was adopted by using a normal transparent cellophane tape obtained from stationery shop. The adhesive surface was applied onto the finger which was already been inked, leaving an imprint on the tape. The tape was carefully peeled off the surface and placed the adhesive side onto the fingerprint card (Fig. 14). This tape technique was modified from the recommended recording strategy for recovering impressions from deceased individuals using black powder and white adhesive lifters [3]. Instead of using black powder to coat the finger with a traditional squirrel hair fingerprint brush or sponge-type paintbrush, the black ink was used by the fingerprint team.

By using the same smartphone attached with the Ztylus Metal Series Camera kit for iPhone 6 with 4-in-1 lens attachment; the macro lens, wide angle lens, fisheye lens and circular polarizing filter lens, images of the prints from the microscope glass slide as well as the adhesive tape were taken and transferred back to the RMP headquarters for matching (Fig. 15). The macro lens was used to enhance the resolution of the images taken by the smartphone. The images were then transferred to the RMP headquarters through the WhatsApp Messenger. 20 min later, the prints were confirmed to be the pilot.

The duration of the fingerprint identification and confirmation were calculated based on the time differences obtained from the time fingerprint images sent to the RMP headquarters and the time confirmation of identity sent by the headquarters back to the DVI team in the mortuary (Table 1).
3. Discussion

The DVI operation was successfully conducted within a duration of 4 days from 6th May to 9th May 2016 in which all the victims were successfully identified by the fingerprint AM-PM comparison, as one of the primary identifier. In a study done after the tsunami disaster, majority of positive identification of victims from a maritime disaster are achieved by dental examination, where an average of 60% of victims can have dental results as primary identifier [4]. However, in this particular case, all victims were successfully identified through fingerprint comparison as the primary identifier. Since the helicopter crash tragedy was of national interest involving country’s leaders, identification need to be confirmed as soon as possible. The enhanced method of taking the photographs of the fingerprints using smartphone and smartphone with macro lens had actually speed up the positive identification. The macro lens enables images to be captured in a fine tuned manner to enhance the ridges of the fingerprints in this case. The fingerprint expert team were from Sarawak state and thus the fingerprint database under the control of the RMP headquarters in Kuala Lumpur was unable to be set up in the mortuary operation in a short period of time after the crash. Thus the decision made to transfer images of the fingerprints using phone application for the comparison were indeed a faster way and incur zero operational cost.

Malaysian citizens have fingerprint records (thumb print) on file with the National Registration Department of Malaysia. For foreign nationals, the Immigration Department of Malaysia will record both index fingers only. Lesson learned from this incident was to give recommendation to the Immigration Department of Malaysia to capture all the 10 fingers of the foreign nationals who enter Malaysia to enhance the fingerprint AM data record.

The International Committee of the Red Cross’s contribution to the 16th meeting of Interpol’s Standing Committee on Disaster Victim Identification 2004 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” [5]. With this principle of respect and rights of the victims, the search and recovery team did not give up and were determined to continue searching despite the fact that Batang Lupar river is domiciled by crocodiles. According to the underwater recovery process by Winskog [2], location of the body need to be marked before bagging the human remains found in water. However, in this operation, there were many limitations and risks associated with the search and recovery as the divers’ lives were at stake as they were in close vicinity to the crocodiles. Bagging of the human remains should also be carried out in a proper way so as not to lose the evidence for identification. Handling of the fragile human remains found in water has to be performed taking into consideration of detached limbs, head and lower jaw with potential loss of teeth or other identifiable features such as implants, fillings and prostheses. Close coordination between the scene team and the PM team are very crucial in all DVI operations be it land or water related.
Acknowledgements

The National Institute of Forensic Medicine (NIFM) greatly acknowledges the tremendous support from the Director General of Health, the Director of the State Health Department and the Director of the General Hospital of Sarawak particularly on the emergency disaster funding. NIFM also indebted to all forensic pathologist, odontologist, radiologist, DNA specialist and mortuary technicians for making this operation a success. NIFM would like to express gratitude towards the Combat Divers of the VAT 69 troop of the Royal Malaysia Police (RMP), Fire and Rescue Department, Malaysia Civil Defence Department, Malaysian Maritime Enforcement Agency and other first responders involved in the search and recovery operation as well as the transportation of human remains to the mortuary. Special thanks also extended to the Royal Malaysia Air Force for their repatriation assistance to bring back all the deceased back to their hometown for ceremony burial. Finally, the NIFM would like to advance appreciation to the work provided by all staff of Department of Forensic Medicine, General Hospital Sarawak for their full support in the DVI mortuary operations throughout the entire duration.

References