

Dentistry and Mass Disaster – A Review

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ABSTRACT

Mass disaster situations may arise from natural or manmade circumstances like bioterrorism and dentists or dental responders have significant roles in human identification, following such occurrences. The various roles of dentists in mass disaster management, that include bio surveillance and notification, diagnosis and monitoring, triage, referrals of patients, immunizations, decontamination and infection control would be considered. The varying extents of use of forensic dental techniques and the resulting positive impacts made on human identification will also be included. The importance of preparation by way of special training for the dental personnel, mass disaster rehearsal, and use of modern day technology will be stressed on.

Keywords: Bioterrorism, Dentist, Identification, Mass disaster

INTRODUCTION

TAIPEI, Taiwan — The most powerful typhoon of the year was sweeping through Luzon Strait on Saturday, Aug. 22, 2013, battering island communities and drenching southern Taiwan and the northern Philippines [1]. A number of high profile disasters have also dominated news headlines in the past decade, which have raised the media and community awareness regarding disasters. In the past decade, more than 2.6 billion people have become casualties of natural disasters [2], amongst which are flash floods, hurricanes, cyclones, earthquakes and tsunamis, that have affected various countries over the seven continents.

A bioterrorism attack is the deliberate release of viruses, bacteria, or other germs (agents) which are used to cause illness or death in people, animals, or plants. Biological agents can be spread through the air, water, or food. Terrorists may use biological agents because they can be extremely difficult to detect and as they do not cause illnesses for several hours to several days [3].

Examples of such agents include organisms which cause Tularemia, Anthrax, Smallpox, Bubonic plague, Viral-haemorrhagic fever, Brucellosis, SARS, HIV/AIDS, H1N1 virus, Botulinum toxin, etc. These biological weapons date back to ancient Rome, where faeces were thrown on the faces of enemies [4].

Morlang was the first to discuss the potential roles of oral health care providers in both military and civilian disaster response support [5]. Often, the roles of oral health care providers were thought to be of no importance and to be non-existent. However, it has been proven otherwise through the field of forensic dentistry or forensic odontology, which has played a vital role in the recovery of the mass disaster or mass causality events, when the identification of victims could not be established by conventional means. For example, during the 9/11 disaster strike, an entire dental team which was assisted by the DMORT, which is part of the National Disaster Medical Service (NDMS), played a relatively significant role in disaster response.

Dr. Allan Warnick has mentioned in one of his articles “ It is important to be prepared before a disaster occurs” [6]. As other medical related fields are vital in responding to disaster, odontologists or rather oral health care providers also play an immense role in disaster response as well. The contents of this review further describe the roles that oral health care providers or dental responders play in disaster response.

DENTAL TEAM SET-UP

As of January 1, 2009, the Dental Practice Act was modified, which said that in a declared emergency, the dentists who were part of the local emergency response team or Dental Emergency Responder (DER), and / or had received proper training could assist during an emergency, provide services for which they had been trained.’[5].

The Dental Identification (ID) Team consists of a ‘GO TEAM’, ‘SUPPORT TEAM’, and the ‘COMPARISON UNIT’, which deal with the post mortem, ante mortem and compare these records in computer by using WinID Computer System [6]. In order to avoid human error, a computer assisted post mortem identification (CAPMI) was developed. This Dental Team played a vital role in the recovery of the September 11, 2001, victims. They were assisted by the Disaster Mortuary Operational Response Team DMORT which is part of the NDMS.

Common roles of dental responders [7]:

Treating oral, facial and cranial injuries

- Providing Cardiopulmonary Resuscitation (CPR)
- Obtaining medical histories of the patient
- Providing or administering anaesthesia
- Starting IV lines
- Suturing and doing appropriate surgeries
- Assisting patient stabilization
- Assisting shock management.

DENTAL IDENTIFICATION

The ID which highlights the role of teeth, is based on pathological conditions such as disturbances of tooth eruption, malocclusions or previous dental treatments [8]. The tooth, being the hardest structure of the body, is able to withstand heavy forces and temperatures, etc. Therefore, the roles of teeth or the dentition or dental treatments in the identification of the victims, are said to be more reliable than any other methods. As has been mentioned earlier, the dental tissue is resistant to trauma, incineration, mutilation and decomposition, and it acts as an excellent reservoir of DNA materials [9].

DNA IDENTIFICATION

Hence, a DNA-based identification is a powerful tool for victim identification. The ability to distinguish a person’s physical

characteristics from his/her genetic material, such as identifying eyes, hair or skin colour from a bone fragment or a drop of blood, was not possible until recently. This new application of DNA technology, which is currently being researched and performed at the New York City Office of Chief Medical Examiner (NYC OCME), may provide an additional tool for investigators to help in solving a crime or in identifying an individual from the smallest amount of remains or evidences which are left behind [10].

DENTAL IDENTIFICATION HARDWARE AND SOFTWARE

The DMORT is one of the five teams that comprise the federal NDMS, which supports the United States' medical response capability. DMORT offers mortuary assistance in the case of a mass fatality incident or a cemetery-related incident. DMORT, in addition to the Unified Victim Identification System (UVIS), a New York-based online database, has been designed to assist in the handling of mass fatalities and to recommend that all forensic teams have access to computers or laptops which are equipped with a CD drive/burner, a USB drive, Windows XP, a broadband internet connectivity, a USB cable to connect digital cameras, scanners, laser colour printers, telephone/fax capabilities, and web camera technology, to effectively transfer and archive data [11].

Dental identification software which is used by forensic odontology teams enables collected data to be electronically catalogued and filtered, so that ante-mortem and post-mortem information can be easily compared. The American Board of Forensic Odontology (ABFO) and DMORT, both utilize the WinID software system [12]. WinID is a paperless ID system that contains digitized ante-mortem and post-mortem dental charting, radiographs, and photographs, and it enables specific comparisons to be made on a tooth-by-tooth basis. Similar international software options which are used, include DVI System International® (used by Interpol, the world's largest international police organization) and DAVID®, which is popular in Australia and other Asian continents [13].

CHALLENGES AND CONSIDERATIONS

Certain challenges are faced by dental responders or odontologists and their teams while they encounter mass disaster situations, such as the lack of knowledge and experience of dentists towards mass disaster and casualties, regional variations, financial considerations, management of the basic science curriculum, and sometimes, the pressure exerted by the media, as they tend to know the outcomes of the identification process.

Improving dental coding system

Due to previous difficulties faced in collecting ante-mortem dental charting, forensic odontologists are advocating for a universal dental coding symbols database [14]. Currently, dental charting done by ante-mortem oral health professionals is subject to the dentists preferred annotation styles. Additionally, symbol coding and dental terminology vary from country to country, thus creating the difficult and time-consuming task of decoding and interpreting ante-mortem information. Such challenges force forensic odontologists to decode the information prior to entering it into the identification software, so that comparative analyses can be made.

One of the primary challenges faced during decoding of information, is that confusing notations or illegible handwriting may be misinterpreted, which can result in identification errors. The Forensic Dental Symbols® and Dental Encoder® Database was created to resolve decoding problems. This system is compatible with Interpol's disaster victim identification form and it allows international use of uniform graphic symbols and nomenclatures [15].

Using and improving DNA

DNA analysis, combined with anthropologic expertise, has become the standard method for identification of victims since the September

11, WTC disaster. DNA techniques are usually employed as a last attempt for mass fatality identification, only after quicker methods such as dental comparisons and traditional fingerprinting have been tried [9]. As dental comparisons and finger printing are not possible in many mass fatalities, DNA testing becomes the most conclusive mode of identification for fragmented remains. The process of extracting DNA has been refined to give the greatest possible yield of DNA from bone fragments. These improvements are currently being used to obtain DNA results from badly degraded and fragmented human remains.

Additional DNA technologies and softwares will further enhance future identification projects. Equipped with a staff of scientists who have experience from the decade-long massive identification effort, the (NYC OCME) is prepared to optimize and implement these new tools and to disseminate this knowledge to other agencies [9].

Role of dental curriculum

The role of dental curriculum should be highlighted, as dental schools should train all students in a core set of competencies of mass disaster and bioterrorism. In June 2002, the American Dental Association (ADA) held a meeting in order to identify the specific areas in which the dental profession could provide emergency assistance and to prepare dentists adequately [16]. Dentists and their dental auxiliaries can augment the existing medical professionals in responding to declared medical emergencies [17].

CONCLUSION

Disasters are events that can't be controlled or predicted. These malicious events will happen every now and then. We can never be prepared enough; hence, measures such as have been stated above, should be taken, in case of medical emergencies, when disaster strikes. Oral health care providers and governmental bodies which are related to emergency medicine, rescue and natural disasters, should always be on the alert, to be able to provide help during such events. There is a need of a disaster team organization that follows continual education on mass disaster management and bioterrorism, and that works in co-operation with a dental team. Dental professionals form an integral part of the health care community and they can provide care to the public by playing various health care roles, following natural mass disaster events.

Dr. Allan Warnick stated, "It is important to be prepared before a disaster occurs".

REFERENCES

- [1] Newsarticle on typhoon in Philippines available at <http://newsinfo.inquirer.net/492069/powerful-typhoon-hits-taiwan-philippines>.
- [2] World Bank (2005). Hazards of Nature, Risks to Development. <http://www.worldbank.org/ieg/naturaldisasters>.
- [3] Deepak Bhargava, Kalyani Bhargava, Imran Sabri, M. Siddharth, Aparna Dave, Jagadeesh H, et al. Bioterrorism-"My role as a Dentist". *J Indian Acad Forensic Med.* 2011; 33:3.
- [4] Steven Block. The Growing Threat of Biological Weapons. *American Scientist.* 2001; 89(1):28.
- [5] Morlang WM. Dentistry's vital role in disaster preparedness. *J Calif Dent Assoc.* 1996; 24:63-6.
- [6] Allan Warnick. Dentistry's role in mass fatality incidents. *Manual of Forensic Odontology.* 2010; 3:236.
- [7] Ipseetha Menon, Ramesh Nagarajappa. Role of Dentists in Disaster Response: Indian Perspectives. *Journal of the Indian Assoc. of Public Health Dentistry.* 2011; 17: 271-75.
- [8] IA Pretty, Sweet D. A look at forensic dentistry-Part 1: The role of teeth in the determination of human identity. *British Dental Journal.* 2001; 190:359-66.
- [9] Bruce Budowle, Frederick R. Bieber, Arthur J. Eisenberg. Forensic aspects of Mass Disasters: Strategic considerations for DNA-based human identification. *Legal Medicine.* 2005;7:230-43.
- [10] <http://www.nyc.gov/ocme>.
- [11] Unified Victim Identification System. UVIS Information Guide. Available at: [nyc.gov/html/ocme/downloads/pdf/Special Operations/UVIS Information Guide_20090917.pdf](http://nyc.gov/html/ocme/downloads/pdf/Special%20Operations/UVIS%20Information%20Guide_20090917.pdf). Accessed December 10, 2013.
- [12] American Board of Forensic Odontology. Diplomates Reference Manual. Available at: abfo.org/wp-content/uploads/2012/08/ABFO-Reference-Manual-1-22-2013-revision.pdf. Accessed December 10, 2013.

- [13] Pittayapat P, Jacobs R, De Valck E, Vandermeulen D, Willems G. Forensic odontology in the disaster victim identification process. *J Forensic Odontostomatol.* 2012;30:1–12.
- [14] Nuzzolese E, Di Vella G. Future project concerning mass disaster management: a forensic odontology prospectus. *Int Dent J.* 2007;57:261–66.
- [15] Martinez-Chicon J, Valenzuela A. Usefulness of Forensic Dental Symbols© and Dental Encoder© database in forensic odontology. *J Forensic Sci.* 2012;57:206–11.
- [16] Chmar JE, Ranney RR, Guay AH, Haden NK, Valachovic RW. Incorporating bioterrorism training into dental education: report of the ADA-ADEA Terrorism and Mass Casualty Curriculum Development Workshop. *Journal of Dental Education.* 2004; 68:1196-99.
- [17] Ipseetha Menon, Hari Prakash G, Srivastava BK, Ramesh Nagarajappa. Predeep Tangde. "Bioterrorism" – Knowledge, Attitude and Practice among Faculty Members of Dental Schools of Uttar Pradesh, India. *Journal of the Indian Assoc. of Public Health Dentistry.* 2010; 15: 141-48.

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