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The Unexplored Diagnostic Aid in the Indian Armed Forces - Forensic Odontology

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Abstract:

Forensic odontology is that field of dental sciences which deals with handling of forensic evidence for presentation in the court of law. Military personnel are exposed to extensive range of adversities during their course of service which varies from natural calamities to wars and anti-terrorism operations. Identification of our army men in such cases is therefore imperative. Teeth are alleged to resist extremes of temperatures and conditions where general identifying features are damaged beyond recognition and it is hence of great succour to establish the identity of not only our military personnel but also of terrorists escaping in disguise. In disasters including aircraft wrecks, natural calamities this branch of forensic i.e. forensic odontology is often of great succour by establishing the Disaster Victim Identification (DVI). If dental records of the recruits also are kept along with other biometric records, it might demonstrate to be beneficial in identification of bodies even after a lag of time. Dental features and their countless combinations can be unique to an individual, a proper database of the ante mortem records can be maintained for comparison with the post mortem records as and when needed. Impression of dental arches, prepared dental casts and orthopantomogram (OPG) is used to view the dentition, alveolar bone & other adjacent structures. Identification of incinerated victims can be achieved using dental pulp which demonstrated to be great source of genomic DNA which is of high molecular weight. Digital dental record would hasten up the process of identification and would even have less human based errors. Forensic odontology is greatly employed by militaries of many countries and would be extremely beneficial if harnessed by the armed forces of India to it's maximal extent.

Keywords: *Military Personnel, Antiterrorism Operations, Disaster Victim Identification, Ante and Post-mortem Data, Digital Dental Record Keeping.*

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Introduction

Forensic odontology is that aspect of dental sciences which involves handling of forensic evidence for presenting it in the court of law. Teeth has the potential to endure post-mortem degradation and extreme changes in encompassing atmospheric temperature and pressure better than most human tissues. Dental pulp being a quality source genomic DNA of high molecular weight; it can therefore be used for identification from even those incinerated or carbonized remains of victim **(Sweet and Sweet, 1995).**

Teeth can survive a temperature of 16000C without any appreciable loss in the microstructure of the tooth thus making them a useful tool for identification **(Rothwell, 2001)**. In disasters like aircraft wrecks, natural calamities forensic odontology is often of great succour by establishing the Disaster Victim Identification (DVI). In Paris, in the after-effects of the hearth of the bazaar de la Charité in 1897 forensic identification by dentition for mases was done for the first time **(Taylor, 2009)**.

Severely incinerated bodies of both Adolf Hitler and Eva Braun were identified by the Russian troops on May 1, 1945, primarily on the basis of based dental evidence which were retrieved by Dr. H J Blaschke who was Hitler's dentist. Uniqueness of the frontal sinuses was thus established through his records **(Bruce-Chwatt, 2010)**. For the integrity of a classified operation there might be some occasions where there would be no indication of recognising the fallen soldier. Age estimation through dental evidence would narrow down the search in such cases **(Willems *et al*., 2002)**.

The sole purpose for writing this review was to establish the fact that Forensic Odontology is an inseparable aspect of Indian Military. Although the arena is not explored to its complete magnitude yet which amounts to the bare literature available on the topic, forensic odontology if exploited to its maximal limit would demonstrate to be of great virtue. It would also help in early identification of victim or can be an aid to the conventional identification methods. The methods described further in the article such as Orthopantomogram, Impression of dental arches will provide an ante mortem database for the serving or retired personnel and extraction of pulp from the tooth of the deceased will provide the genetic makeup of the casualty and thus form the post mortem database.

Use of Forensic Odontology in International Military

United States Armed Forces Institute of Pathology have supported multiple DVI activities which provided a helping hand at disaster scenarios and even in repatriation services. Armed Forces of Malaysia employed dental officer for victim identification from the disaster of Highland Towers and even in the Malaysian Airlines Fokker 50 air crash at Tawau in Sabah. In the humanitarian effort following the earthquake of 2010 in Haiti Canadian Forces were deployed for conducting several DVI operations. Canadian specialist forensic odontology teams were also deployed in Afghanistan in the year 1998 in September for identifying casualties of the Swissair 111 air crash **(Hugh and Gray, 2013).**

U.S. military and British Forces assessed the parts such as frontal sinuses and even the knees to identify air crash and IED victims in wars of Iraq and Afghanistan **(Quatrehomme *et al*., 1996; Mann, 1998).**

Use of Forensic Odontology in the Indian Armed Forces

Indian armed forces have an agile participation in helping the country out from crisis situations apart from the regular military work. They help the fellow countrymen at the hour of natural calamities, mass disasters, severe human made accidents and even in the war against the COVID 19 virus. Apart from the regular autopsy, the methods used as identification of military personnel include the redundant techniques of using DOG-TAGS or even mustering. Both these techniques come with disadvantages of its own kind. The dog tags being made of small square stainless-steel bars can be misplaced easily. Mustering on the other hand is a method which is liable to human errors. It is infelicitous that a qualified forensic odontologist who are most likely called upon in cases of mass casualty or disasters are still not nominated as a part of disaster management team of any sort. **(Dinakar, 2014).**

The various methods of identification that can be used by Armed Forces of India in future are:-

Orthopantomogram: Orthopantomogram (OPG) of each & every military personnel should be recorded and even updated on a regular day to day basis. If an

OPG is not feasible such as in instances of remote areas an intraoral peri apical radiograph of the entire oral cavity could be taken which can further be displayed in the sequence of OPG and further a digital record of each individual can be made from it. All of this can be achieved by a simple X-ray unit which is usually portable **(Arora and Kaur, 2016).**

Impression of Dental Arches: One can take the Alginate impressions of the dental arches of Indian armed forces personnel and castes be prepared and preserved for forming an ante mortem data base. The same methodology can be followed while structuring post mortem profile. The contrast of the ante mortem with one post mortem set of data will then just be a simplified procedure **(Arora and Kaur, 2016).**

Setting Up Laboratories: An absolute overhaul of our dental record keeping process in the laboratory will be an outrightly essential phenomenon with respect to enumerable stages of the soldier's service schedule, viz., recruitment, occurrence of any dental morbidity, annual and periodic dental examinations, and conditions such as before deployment to strategic areas and regions for secretive military missions usually performed undercover. The particulars of s projects like these have to be thoroughly contemplated and elaborated upon. On a primary trail basis dental centre at military establishments could start documentation procedures involving hard tissues using radiographs such as the full mouth IOPAs or OPGs, for all the soldiers which are under the dental cover **(Indu *et al*., 2021)**.

DNA Identification of Incinerated Personnel: All the conventional sites of obtaining DNA for the purpose of analysis can be destroyed beyond recognition at all levels by high temperatures of gasoline-based fire. Nevertheless, the teeth does survive the blaze. Dental pulps which can be used to extract the genomic DNA prove to be an outstanding source of genomic DNA which is of high molecular weight **(Sweet and Sweet, 1995)**. An endodontic access cavity is prepared by a high speed rotating handpiece, the pulpal content is then extirpated from the tooth using an endodontic barbed broach. In cases of any delay in processing the pulp sample can be stored in phosphate buffer saline.

Conclusion

In conclusion, dental officers of the Armed Forces can play a decisive role in victim identification not only during a war but also during flood relief, air craft accidents, mass casualty during fire tragedy, etc. Dental officers can thus prove to be a readymade, effortless and capable team members of any relief force. Relief force of this kind can be stationed and set in motion at the shortest notice of time. They react in the most adroit manner whilst even understanding chain of command and following a solid code of conduct. A committed Forensic Odontology laboratory will be an asset not only for the Indian Armed Forces but also inspire curious minds within the entire dental community. It will serve as an ideal platform for the officials of the government and decision-makers to familiarize them with the significance of this upcoming field of Forensic Odontology.

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