Case Report

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Oral Autopsy in Forensic Odontology as an Effort for Human Identification in Medico-legal Investigations

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Abstract

Forensic science including forensic odontology deals with the dental evidences and its examination. Human identification is of utmost importance in medicolegal investigations. Teeth, physical injuries, bitemarks, lip prints and oro facial structures are the normal evidences used in forensic odontology investigations. Dental evidences include dentition, oro facial characters and DNA profiling for personal identification. DNA is an excellent means for identification of unidentified human remains. Oral autopsy refers to an elaborate examination of the oral cavity. In difficult cases where oral examination cannot be completed due to accessibility, for proper visualization of teeth and its structure, oral autopsy is necessary. This is a case study where oral autopsy was done using a simple effective technique for the extraction of tooth for DNA Fingerprinting for the identification of unknown. It is an ongoing need and is essential to ensure that crime investigators deliver the best possible service to the criminal justice system. Currently, forensic dentistry plays a major role in forensic research and identification of humans worldwide. The role of teeth in providing age estimation, sex determination, race and misidentification is undisputed.

Keywords: Forensic Odontology; Oral Autopsy; DNA fingerprinting; Personal Identification.

INTRODUCTION

Forensic science including forensic odontology deals with the dental evidences and its examination that is used in recognition of the crime and positive identification of an individual.[1] Identification of individuals in mass disaster and also tracing unidentified human remains are challenges to the investigating team.[2] The field of odontology involves the "identification, documentation, recovery and preservation of all signs in soft and hard oral tissues to making available the legal evidence".[3] The nature and type of the evidence used for identification is of significance in the past dental evidences including bite marks, lip prints, tooth fragments, dental prosthesis as well as the DNA obtained from saliva or teeth have been overlooked and under estimated.[4] The major reasons for such omitances were lack of adequately specialized doctors; incomplete investigations including sampling and scheme or

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further investigations; lack of quality control; lack of independence of the investigating doctor; and lack of an internationally binding protocol. Lately, forensic dental and oral evidences are gaining gravity and are used as an adjunct for the human identification in living as well as identification of unknown cadavers and disaster victims.[3] Different techniques of identifying individual through dental means are available. Currently there are four types of personal identification circumstances that use teeth, jaw and orofacial characteristics, which include comparative dental identification, reconstructive postmortem, dental profiling and DNA profiling.[4,5] Dental factors aiding forensic investigation in individual person identification are occupation and dental considerations, medical conditions and treatments, habits and dental appearances, abnormalities of tooth formation and eruption, Location of residence and dental considerations, Sex determination and dentition.[6]

Oral autopsy refers to an elaborate examination of the oral cavity, as teeth are most resistant to decomposition and can be used as a reliable means of human identification.[4] In difficult cases where oral examination cannot be completed due to accessibility, for proper visualization of teeth and its structure, oral autopsy is necessary.[2] It is the investigator who faces the question whether or not to carry out oral autopsy.[4] Primarily, the main aim of the investigative team is identification of the individual, which may solve many legal and administrative issues. Any procedure can be followed with the prime consideration of preparing a proper postmortem dental record, which may facilitate identification of the individual.[2] The role of teeth in providing age estimation, sex determination, race and misidentification is undisputedly well documented.[7] DNA is an excellent means for identification of unidentified human remains. As dental pulp is surrounded by dentin and enamel, which forms dental armor, it offers the best source of DNA for reliable genetic type in forensic science. DNA from hard tissues like bone and teeth are most stable even after putrefaction of bodies.[5] DNA can be successfully extracted from dentin and pulp. Abundant quality DNA can be extracted from a tooth which is an important advantage in DNA analysis.[8]

Oral Autopsy Techniques

The forensic odontologist decides whether to do an oral autopsy as and when required in a case for the dental examination or for extraction of tooth for DNA Fingerprinting. All signs of old and recent dental and/or surgical intervention has to be described. Forensic dental photography of all injuries, fractures and dental findings has to be done prior to the oral autopsy. Extra oral and intraoral photographs have to be taken for proper documentation. All tooth injuries, fractures, contusions, bruises, abrasions, lacerations on skin, mucosa or lips along with maxillary, mandibular or skull fractures that are presented have to be properly documented and described by size, shape, direction, edges, angles and location relative to anatomical landmarks.

The mandibular resection and jaw separation are done by techniques such as Stryker Autopsy Saw Method, Pruning Shears Method and Mallet and Chisel Method (jaw resection). On the other hand, Archemides screw method, extraoral incisions (facial dissection), inframandibular incision are the most conservative approaches. Conservative approach was also suggested by Fereira *et al* which preserved the facial anatomy even after dissection. In this approach, adequately identified photographs are taken.[9] Another conservative approach had been put forwarded by Heit OF *et al* and is comprised of performing bilateral "C -shaped" incisions in the retromandibular region. Gowda CBI also introduced a simpler technique to obtain access to oral cavity for examination.[4,9]

CASE PRESENTATION

A case of unknown male dead body was brought to the mortuary of VMMC & Safdarjung Hospital for post mortem examination with request for extraction of tooth for DNA fingerprinting from the Investigating officer. The maxillary first molar tooth was decided to be extracted because morphologically it has bigger pulp chamber size as well as due to the ease of access, root configuration and density of surrounding bone. The extraoral photographic records were taken. In this case, mouth opening was restricted due to rigor mortis as the muscles of mastication were stiff. Oral autopsy was done using Gowda CBI technique which provides most of the information and causes minimum intervention with anatomy. This procedure of oral autopsy is simpler, faster, and preserves facial configuration, which may help in the visual recognition of the remains by family members. In this case, an incision was made from the angle of the mouth to the tragus of the ear on either side. Fig. 1 shows the initial incision

on the left side. A careful folding of lip and cheek tissues were done as shown in Fig. 2. Sectioning of the muscles and the capsular ligament of the temporomandibular joint was done. Opening of the oral cavity by traction allowing visualization of the lower and upper dental arches were done after complete oral autopsy bilaterally. After obtaining the intraoral access, intraoral photography of the maxillary and mandibular jaws and occlusion were done followed by description of the anomalies and charting of the occlusion. The left maxillary first molar tooth was extracted as shown in Fig. 3 for the DNA Finger printing. The tooth was properly sealed and handed over through proper chain of custody to be sent to the forensic laboratory for DNA Finger printing, thus helping in the identification of the unknown by the investigating agencies.



Fig. 1: Initial incision was done from the angle of the mouth to the tragus of the ear of left side



Fig. 2: A careful folding of lip and cheek tissues were done for proper visualization



Fig. 3: The left maxillary first molar tooth was extracted or DNA Finger printing

DISCUSSION

Forensic dental fieldwork requires an interdisciplinary knowledge of dental science. Most often the role of the forensic odontologist is to establish a person's identity. Teeth, with their physiologic variations, pathoses and effects of therapy, record information that remains throughout life and beyond.[10] Each type of trace evidence requires a unique systematic approach, and even these approaches are significantly based on the size and morphology of the evidence being examined.

Description and careful investigation of the head and the facial orifices includes: color, length, density and distribution of hair; nasal skeleton; oral mucosa, dentition and tongue; ears, retroauricular areas and external meati; eyes; skin; and if fluids have been evacuated from facial orifices, their colour and odour.[2]

The Interpol has given a disaster victim identification (DVI) guide in 1997 and revised it in 2009, which states that, "where appropriate, the examination of teeth and jaws should be carried out by a dentist with medico-legal experience".[9] An orientated and correct examination of the oral cavity requires specific knowledge of its anatomy and physiopathology, and of the procedures most adapted for its study, and thus the participation of a qualified odontologist is advisable (Sánchez & Fonseca, 2010).[2] The forensic dentist is responsible for making radiological examinations and postmortem dental records.[4] The analysis of various evidence collected and studied in different forms to

find the most relevant information can eventually lead to a proper conclusion. Thus it requires a multidisciplinary approach to come to a proper conclusion about the identity.[2]

The teeth and associated oral structures are used for Dental Identification, Dental DNA, Dental, Age Estimation, Hanging or strangulation, Drowning/ Immersion, Sexually motivated murder, Death from child abuse and neglect, Sudden death, Shorting fatalities, Death caused by explosives, Blunt and/ or sharp force injuries, Fire deaths, Suspicion of intoxication, Decomposed bodies, Electrocution, Chemical burns/ Acid ingestion and Road Traffic Accidents.[9,11] It is very much necessary to have good access to the oral cavity to record complex finding by oral autopsy as a part of identification without disfiguring facial configuration. An attempt can be made to help the investigating team by performing oral autopsy of an unknown deceased individual and providing the complete dental picture to the team, requesting them to contact the dentist in and around the location in which the deceased person was found.[2] Although many researchers such as Fereira *et al*., Luntz (cited by Vale and Noguchi), and Jakobsen *et al*. have suggested their own methods for obtaining access to the oral cavity, each method has its own advantages and disadvantages.[4,12]

Virtopsy technique is new technique which can be used. It uses the modern radiographical aids like computed tomography (CT) and/or magnetic resonance imaging (MRI) to scan the dead bodies. Dental virtual autopsy is used in cultures where conventional autopsies are not accepted.[13] Schwartz (1991) isolated HMW DNA from teeth at 4°C upto 6 weeks. At 25°C, HMW DNA can be isolated after 19 years. At 37°C, teeth can yield HMW DNA following storage for 6 months. TC Boles (1995) could successfully extract DNA from teeth that had been buried up to 80 years. In a study conducted by Pötsch, *et al*. (1992), the total production of genomic DNA obtained from a dental sample ranged from 6 to 50 µg DNA. The results were obtained from DNA extracted from the dental pulp and did not show any difference when compared to the patterns obtained from DNA isolated from blood samples or available lung tissues.[6,14] As forensic odontologists are playing a major role in DVI and other medico-legal cases, there is an urgent need to promote this specialty. The initiatives such as sensitizing the dental science graduates towards this specialty and mandating the dentists with related casework experience and encouraging them to be a part of investigation and identification teams can help to establish forensic odontology as a separate specialty under Forensic Sciences or Dental Sciences.[15]

CONCLUSION

There are different methods used by forensic experts in identifying the dead. The skeletal remains as well as teeth are considered very useful in the process of identification. It is the need of an hour that all the possible techniques should be combined to provide the best possible service to the justice system. Radiographs and intra oral findings as well as teeth provides good evidence for age, gender, and personal identification by the use of uniques features and individual variations. Teeth are subjected to DNA analysis because the dental hard tissue encloses the pulp which offers great durability. The odontologist should use the knowledge, experience, skills and case history to decide and perform oral autopsy in cases as and when required to provide dental evidences. Forensic odontology presents as an adjunct in the investigations and help in the major research and positive human identification. Thus, forensic odontologist should be present in each team for forensic identification to help provide important dental evidences in medico-legal cases.

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