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Review Article

Person's Identification through Dentistry – An Overview

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Abstract: Despite immense investigations in science and technology, natural calamities and crimes keep persisting in human life. Detection of human remains is essential for various reasons including legal, criminal, humanitarian and social grounds. Forensic odontology is a branch of dentistry that analyzes dental evidence to overlap the dental and legal profession. Dental remains can be used for identification as using them is cost effective, reliable and fast. Forensic information from soft tissues of the oral cavity, forensic methods of age estimation, therapeutic and molecular aspects of Forensic odontology has been enlightened. The present article highlights the role of dentist in identification of human, dental remains and crime investigation.
Keywords: Dentists, Forensic odontology, Forensic evidence, Human identification.
Abbreviations; Forensic Odontology (FO), American Board of Forensic Odontology (ABFO), Ante-mortem (AM), Post-mortem (PM)

INTRODUCTION

Forensic Odontology, a branch of dentistry that deals with the appropriate handling and examination of dental evidences with the proper evaluation and presentation of such findings in the interest of justice [1, 2]. Recognition of human remains is essential for multiple reasons, when the body is disfigured to a great extent or mutilated beyond detection as a result of barbaric crimes, motor vehicle accidents, aviation and navy disasters, wars, fire, flood, manmade and natural mass disasters and when the body is in unrecognizable, disintegrating state. However, dental remains can be used for identification because it is cost-effective, reliable and fast [2].

HISTORY

The exercise of teeth as evidence is not recent. As early as 49 A.C, there are historical reports of identification by recognizing specific dental features. However, Forensic Odontology, as a science, did not appear before 1897 when Dr. Oscar Amoedo wrote his doctoral thesis entitled *"L'Art Dentaire en Medecine Legale"* describing the worth of dentistry in forensic medicine with particular emphasis on identification. The use of dentition in recognition of a person for the first time, dates back to 49 A.D when *Agrippina*, wife of *Claudius-Roman emperor*, identified the body of her

rival *Lollia Paulisa* by the peculiar features present in her teeth, after getting her beheaded [3]. The first case of identification of a person, by the dentition in India was perhaps in 1199 A.D, when Rahtor Raja of Conouj, Jei Chandra was recognized by his artificial anterior teeth, after he was defeated and killed in a battle. The late Prime Minister of India, Mr. Rajiv Gandhi who was assassinated in a terrorist attack, was also identified by his dental records [4].

Tooth - A Tool for Forensic Evidence

Dental Identification: Aids in a classification of statement on certain proven facts, which corresponds to those of a specific person and also to identify a person, living / dead to establish his / her individuality [5]. Dental identification has constantly played an important role in situations pertaining to natural and manmade disasters. Because of the lack of a comprehensive fingerprint database, dental identification continues to be crucial [2].

According to the American Board of Forensic Odontology (ABFO), identification can be reported as:
   a. Positive identification - records that matches with no discrepancies
   b. Possible identification - AM and PM records that have consistent features but doubts the quality of evidence

c. Insufficient evidence - without sufficient evidence to land at a conclusion and

d. Exclusion - records that evidently do not match.

Dental identification is performed by two means

a. To examine previous dental records of the person suspected as deceased, and looking for these dental characteristics in the deceased person for similarity and confirmation

b. PM dental profiling is carried out, if there are no former dental records that offer clues to narrow the search required for AM materials to identify the deceased person.

Age Estimation: It is one of the fundamental tools in identifying a person. Since the dental maturity is not affected by nutritional and endocrine status dental age can be used as a tool for identification [6]. Various methods are involved in the age estimation in human identification; Clinical methods, Biochemical methods and the Radiographic methods. Age estimation is done in three groups using dentition namely prenatal, natal and postnatal period, children and adolescents and adults. For estimating the age of neonate's maceration, CT scan, dry weight of teeth and neonatal line are used [7]. In children as well as young adults, age estimation is carried out by clinical methods such as eruption sequence, radiographic methods such as Schoulr and Masslers method, Moorer, Fanning and Hunt method, Demirijian, Goldstein and Taners method and Nolla's technique [2, 6, 7]. The eruption of third molars is of great significance to distinguish juveniles and adults [8]. In adults, regressive alteration of teeth, periodontal status like attachment loss, dentin translucency histologic variations like incremental lines of cementum, radiographic assessment like root resorption, cementum apposition at the apex aids in age estimation [7-9].

Sex Determination: A range of features of teeth such as morphology, crown size and root length are characteristics of males and females [10]. According to the method devised by Barr & Bertram, a more fresh method of sex determination from teeth is the existence of sex chromatin or Barr bodies in the pulp of the teeth [10]. Amelogenin (AMEL), a chief protein found in the enamel of humans has different patterns of nucleotide sequence in the enamels of males and females. Two different AMEL genes, one located on chromosome X and one on the Y chromosome are evident in males; however, females have two identical AMEL genes located on X chromosome [9].

Race Determination: Certain morphological features of the teeth are well-known to show population variation which can be used to discriminate the ethnicity or ancestry such as the shovelling or scooping of the upper incisor (mostly in Asiatic Mongoloids and Amerindians), taurodontism, chisel shaped incisors, Carabelli's cusp, hypocone, and protostylid, peg shaping of the teeth can be used to establish the ethnicity of the individual [10-13].

Bite Marks: The teeth are distinctive to an individual; even a single tooth of a person is greatly individualist to a person. Bite marks inflicted by the teeth are equally considered to be highly individualistic to a person [13]. Bite marks may be evident on the body of the victim on sites such as cheeks, buttocks, legs, lips, or any other part of the body or can be visible on the arm or face of the defender against whom the victim has tried to defend. The bite marks can also be established on the eatables like hard cheese, butter, fruits *etc*. The cast of the bite marks can be made or photographs of the surface can be taken and compared with the original or the cast of the teeth [14]. Missing teeth, malformed teeth, fractures, crowding of the teeth, diastema and other peculiar characteristics of the teeth are useful in the assessment on these individualistic characters [12].

DNA Profiling: The investigation of the DNA is known as DNA Profiling or DNA typing, is a biological tool which allows the researchers to compare samples of DNA material and can reveal the genetic profile of an individual. This helps to compare with samples from a crime scene to determine whether or not he/she may be the source of the biological material [11].

Cheiloscopy: The wrinkles and grooves in the labial mucous membrane (sulci labiorum) outline a distinctive pattern, known as "lip prints," and this study is identified as cheiloscopy. There are numerous elevations and depressions on the external lip surface which are exclusive to individuals. This feature helps to identify an individual's gender [11].

Palatal Rugae (Plica palatine): These are the irregular and asymmetric anatomical folds that are situated on the anterior third of the palate behind the incisive papillae. They are considered to be unique to an individual. They can also be studied in burnt and decomposed bodies where the other feasible means of identification are destroyed [14].

Recent Concepts in Forensic Dental Identification

1) Facial Reconstruction: It plays a foremost role in forensic sciences because of the fact that if the face of the deceased person remains unchanged, the identity of the person can be easily made without any need for forensic professionals [15]. 3D-CT imaging has been institute to be more accurate than imaging performed directly on CT slices and 2D-CT image reconstruction [11, 16].

2) Denture Identification Methods: The dentures can disclose the positive identity of a person, only if it is marked. Labeling the denture is one of the easiest and reliable methods of identification. Denture

labeling methods falls under two categories: the surface marking method and the inclusion method. The surface marking methods include scribbling or engraving the denture and marking with embossed letters. Inclusion methods include metal identification bands, computer-printed denture micro-labeling system, lead paper labeling, embedding the patient photograph, denture bar coding, T-bar, laser etching, lenticular card system (using a polyethylene terephthalate, in which the first flip shows patient's name, sex, and age, and the second flip shows address and driving license number, when viewed from a different angle), radiofrequency identification tags, electronic microchips [17-20].

3) Tongue Printings: Tongue is unique to each person in its shape and surface textures. Application of tongue prints for forensic identification is at growing stage nowadays. The ante-mortem photograph or impression of the tongue should be made available for this technique. The lingual morphological aspects can be conserved using the alginate molding technique for duplicating the minute details which are distinctive for each and every individual. The lingual impression, together with its photographic image, may constitute secure methods for forensic dentistry identification [21].

Implication of Forensic Odontology
Recognition and classification of corpses, Social, emotional & legal point of view, crowd fatalities, criminals, victims, forensic archeology, death certificate for claims & insurance, to carry out the investigation and monitoring its own parent profession against malpractice.

CONCLUSION

Forensic odontology, fieldworks requires an interdisciplinary knowledge of dental science which is an upcoming branch of dentistry. Most often, the role of forensic odontology is to establish a person's identity. Teeth, with their physiologic variations, pathology, and effects of treatment, record information that remains throughout life and beyond. Dental profession has a major role to play in keeping accurate records and providing all necessary information so that legal authorities may recognise malpractice, negligence, fraud or abuse, and identify unknown humans. The practising dentists and the dental students should be made aware of the available technologies and its use in forensic dentistry. New researches have to be encouraged in the field of forensic dentistry which will pave way for incorporating newer technologies in establishing the human identity.

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