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ABSTRACT

Despite the breakthrough in science and technology natural calamities and crimes continue to persist in the life. Human identification is essential for various reasons including legal, criminal, humanitarian, and social grounds. Forensic odontology is a specialized field of dentistry which analyses dental evidence in the interest of justice. This article reviews the role of the dentist in identification of human, dental remains and crime investigation.

KEYWORDS:

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INTRODUCTION

Forensic Odontology, or forensic dentistry was defined by Keiser-Neilson in 1970^[1] as “that branch of forensic medicine which, in the interest of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of the dental findings”. The human body becomes disfigured to a great extent in case of burns, accidents and mass disasters like earthquake so much so that identification of the individual becomes a challenge. However dental remains can be used for identification as using them is cost effective, reliable and fast. This article sheds light on the role of the dentist in identification of human and dental remains along with recent advances in the field of forensic odontology.

History of forensic odontology:

In the year 66 A.D a female associated with Emperor Nero, who was identified after her death through the unique arrangement of her teeth. The first formally reported case of dental identification was that of the 80 years old warrior John Talbote in 1453. The first forensic odontologist was Dr. Paul Revere who identified the disfigured body of Dr. Joseph Warren in 1775. In 1867 Oscar Amoedo known as a father of forensic odontology helped to identify victims of the great fire of Paris. In 1977, the body of Hitler and his wife Eva Braun were identified.^[2]

Use of teeth in personal identification:

Proper identification of dead is required for legal and humanitarian reasons. Comparative dental identification is a procedure by which dental

evidence such as dental caries, missing teeth, restored teeth, prosthesis, alterations in shape of teeth, talons cusp, developmental defects, changes in colour of teeth collected from human remains is compared with previous records for establishing identity of the decedent. Morphology and arrangement of teeth is unique for every individual almost 1.8×10^{19} possible combinations were calculated.^[3]

Dental profiling:

Dental profiling refers to the making of a dental profile which comprises a group of more or less specific individual characteristics relating to the oral cavity and/or the teeth. Acharya et al have demonstrated that dental profiling aids in person identification by identifying ethnicity, gender and age.

Identifying ethnic origin from teeth:

Physically humans are diverse species. This diversity is the result of genetic influences as well as environmental factors such as climate and geographic location. Dental features used to describe population differences are broadly categorized as metric (tooth size) and non metric (tooth shape). Metric features are based on measurements and non metrics in terms of presence or absence of particular features like Carabelli's cusp, shovelings, three cusped maxillary second molar, mandibular molar groove pattern.^[5]

Identifying sex from teeth:

Sex determination becomes the first priority in the process of identification of a person by a forensic investigator in the case of mishaps, chemical and

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nuclear bomb explosions, natural disasters crime investigations. Sex determination analysis can be done either by morphological analysis or by molecular analysis. In morphological analysis Mesiodistal dimensions and buccolingual dimension of teeth Tooth dimension is the most simple and reliable method to analyze sexual dimorphism. MD dimensions of teeth in male are more than that of female because of the Greater thickness of enamel in males due to the long period of amelogenesis compared to females or because of Y chromosomes producing slower male maturation. In case of molecular analysis sex can be determined by the DNA analysis, Bar bodies bodies, and AMEL gene.^[6]

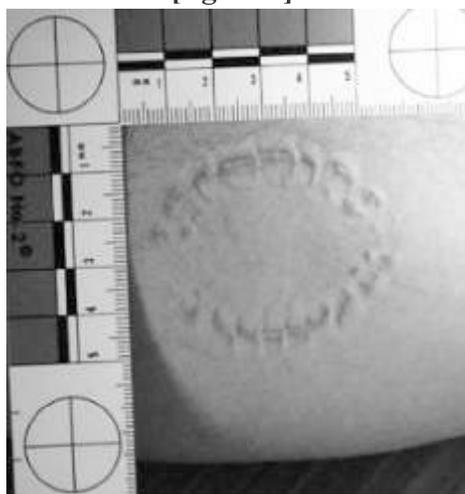
Identifying age from teeth:

Age estimation can be done from dentition by clinical methods such as eruption sequence; radiographic features like appearance of tooth germs, commencement of mineralisation, degree of mineralisation of various teeth, degree of crown and root completion, degree of root resorption of deciduous teeth, open apices, pulp to tooth ratio, volume of pulp chambers and root canals, third molar eruption, digitization of available radiographs; histologic features like neonatal line, incremental lines of cementum, dentin translucency, dentin predentin interface using scanning electron microscopy and biochemical characteristics like C14 levels and racemization of dentin.^[7]

Use of teeth in crime investigation:

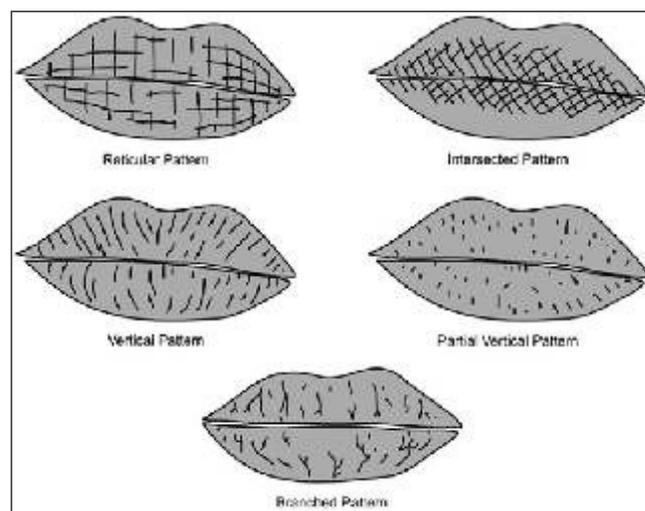
Crime investigation includes the investigation of bite marks child abuse and lip print.

Bite marks: [figure 1]



A bite mark is defined as 'a mark caused by teeth either alone or in combination with other mouth parts' and serves as a good source of forensic evidence in crime investigation. Based on etiology McDonald has classified bite marks as tooth pressure, tongue pressure and tooth scrape marks. Various steps in bite mark investigation include preliminary questions, evidence collection from the victim, case demographics, visual examination, photography, saliva swab, impression making, evidence collection from suspect, bite mark analysis, comparison and drawing conclusion.^[8]

Lip print: [figure 2]



Lip prints are an important forensic evidence in the scene of crime similar to finger prints. The study of lip prints is called cheiloscopy. Tsuchihashi et al have proposed six different types of groove patterns in the lip which could be useful in crime investigation. They are Type 1- with clear-cut vertical grooves that run across entire lip; Type I' similar to type I but not covering entire lip; Type II with branched grooves; Type III with intersected grooves; Type IV with reticular grooves and Type V with grooves that are not morphologically differentiated.^[9]

Scope for research in forensic odontology:

The use of molecular techniques and amelogliophics for person identification, biochemical methods of age estimation requires standardization. Moreover very few studies have been carried out in the Indian population. This warrants further studies to be carried out in our country so that regional variations could be assessed.

Limitations of research in forensic odontology:

Limitations of research include

- * Ethical issues in sample collection in crime investigation.
- * The application of molecular and biochemical techniques in Forensic Odontology are expensive.

Challenges in the Indian scenario:

In our country awareness about the importance of record maintenance among Dental Professionals is not satisfactory which poses a great challenge for person identification both in crime investigation and mass disasters.

- * Most of the dental professionals in our country do not pursue research or career in this field due to

social and cultural reasons.

Conclusions:

An analysis has been made of the literature published during the last 5 years, offering a description of the novelties referred to buccodental studies in comparative identification, reconstructive identification (determination of age, rugoscopy and cheiloscopy, determination of gender), human bites as a method for identifying the aggressor, and the role of DNA in dental identification. The oral cavity is a rich and noninvasive source of DNA, and can be used for the identification of individuals and for providing information needed in legal processes.

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