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TEETH AS AN AID TO PERSONAL IDENTIFICATION

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Forensic Odontology plays an important role in human identification, especially when damage has been caused by heat. When we talk about forensic odontology, the first thing that crosses our mind is the unique features of the teeth and the dental treatments which are unique to an individual. Teeth are the strongest part of the human



body which can withstand high explosions and are not damaged by such incidents. Thus, teeth are likely to be recovered in mass fatality incidents where other means of identification such as fingerprints and facial features are destroyed. The common questions that are to be answered by a forensic expert while handling the exhibits are:

- i) If the exhibit under examination is a real tooth
- ii) If the teeth belongs to a human or any other animal
- iii) Is it milk or permanent teeth?
- iv) Does it belong to the lower jaw or upper jaw?
- v) Does the individual suffer from any particular disease?
- vi) What is the age and sex of the individual?
- vii) Does the tooth establish the race of the individual?

Such questions, when answered, can narrow down a single piece of evidence to a definite direction. The basic morphology of a tooth consists of enamel (outer covering), dentine (forming the bulk of tooth beneath the enamel), and the pulp (the connective tissue that resides within the center of the tooth). The examination of the components of a tooth will

help to understand if the handled evidence is the real tooth. The species origin of teeth can be determined by comparison of the exhibit with the teeth of known species of animal for their morphological characteristics. Sometimes examining the pulp cavity by using a range of species-specific antisera can help to further conclude the origin of the teeth. Milk teeth can easily be differentiated from permanent teeth by their milky white color, smaller size, sharpness, and small and shallow roots. Permanent teeth, on the other hand, are quite yellowish in color, larger in size with deep-rooted longer roots. Adult human dentition comprises incisors, canines, premolars, and molars that vary in shape, size, and inter-spaces between the teeth among different individuals. The way these teeth are arranged in different oral cavities is unique in every individual. The discussed parameters may be defined as the class characteristics observed while analyzing the obtained exhibit (tooth/ teeth).

Dental maturity plays an important role in the estimation of age in children and adolescents.

The age of an individual can be easily determined from the eruption sequence of teeth up to the age of about twenty-five years, and their condition and decay such as attrition by mastication, alteration of the level of gingival attachment, amount of secondary dentin formation in the pulp cavity, the thickness of cementum around the root, translucency of the root and root resorption via a method developed by Gustafson method used for age determination from a single tooth way back in 1950. Further, radiographic methods can elaborate on the various stages of mineralization and further help in a more accurate estimation of age from teeth.

Although sex determination from teeth is not conclusive, in the absence of other evidence, teeth can give a clue regarding the sex of the individual. Odontometrics, a technique to take measurements on the teeth, has been used by scientists for sex determination. This method is based on sexual dimorphism of the size of the teeth such as mesiodistal and buccolingual tooth dimensions. Certain dental indices such as Incisor Index, Mandibular-Canine Index, Crown Index, etc., derived from linear measurements of

the teeth to show sexual dimorphism in the teeth have been widely used in the past few years for sex determination. However, to date, the presence of sex chromatin or Barr bodies in the pulp of the teeth (according to the method devised by Barr and Bertram) has been adopted as a more reliable and accurate method for sex determination. Further, studies have also been carried out to extract DNA from the pulp as well as dentine and use it for sex determination through biochemical assays. Another interesting fact is the presence of a unique protein Amelogenin or AMEL, a major protein found in the enamel of teeth. The uniqueness of AMEL is that it has a different pattern 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 found in males. However, females have two identical AMEL genes located on the X chromosome.

The determination of race by examination of the morphological features of the teeth remains debatable. Unique features such as shovelling or scooping of the upper incisor (most common among Mongoloids), chisel-shaped incisors (most common among African) can be used to determine the ethnicity of the individual. Dental restorations may indicate the ethnicity of the individual. Sometimes methods of restorations used in certain regions may be unique and may not be used at any other place.

At the same time, every tooth possesses a set of unique characteristics called 'tooth individual characteristics', which form the basis of its unique identification. Dental anomalies and variation such as microdontia (smaller teeth than normal) and macrodontia (larger teeth than normal); disturbances in the number of teeth such as anodontia (congenital absence of teeth), polydontia or hyperdontia (having extra teeth); disturbances in the eruption of teeth such as impacted teeth (failed to erupt and remain buried in the alveolar bone) and ectopic eruption (when a tooth cannot complete its eruption because it is blocked by an adjacent tooth or by a misplaced orthodontic band--usually on a first molar tooth) defines the individual character of teeth.

Such anomalies help a forensic odontologist to analyze the exhibit and

form an opinion confirming the link of the evidence with the source (suspect/ victim). It is worthwhile to mention that dental evidence can be potential evidence of identification, just as in the case of DNA profiling and morphological fingerprints. The unique morphological variations of the teeth can provide a good lead to personal identification. Dental records play a significant role in the identification of the deceased in mass fatality incidents such as airplane crashes and natural disasters. Forensic Odontology has a good role to play in medico-legal cases, and promoting this section of forensic would be of great advantage to investigation and identification teams.

References-

- Masthan, K. M. K. Textbook of forensic odontology. Jaypee Bros. Medical Publishers, 2009
- Senn, D. R., & Weems, R. A. (Eds.). Manual of forensic odontology. CRC press, 2013
- Shah, P., Velani, P. R., Lakade, L., & Dukle, S. Teeth in forensics: A review. Indian journal of dental research : official publication of Indian Society for Dental Research, 30(2), 291–299. https://doi.org/10.4103/ijdr.IJDR_9_17, 2019
- Chidambaram R. Forensic Odontology: A Boon to Community in Medico-legal Affairs. JNMA; journal of the Nepal Medical Association, 54(201), 46–54, 2016

Myth - Offenders are insane.

Fact - Insanity is a legal term. Very few offenders (2%-4%) are legally insane.