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Review Article

Forensic Odontology: A Historic Review

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Abstract

Forensic odontology has played a major role in identification of persons in crime scenes, mass disasters, fire victims, abuse, and accidents. The various methods employed in forensic odontology include rugoscopy, cheiloscopy, photographic study, radiographs, and molecular methods. Despite the shortcomings, methods applied in forensic odontology are quite reliable. This paper is a review on the historical highlights of forensic odontology.

Key Words: *Bite marks, cheiloscopy, forensic odontology, rugoscopy*

Introduction

Forensic odontology can be defined as a branch of dentistry which deals with the appropriate handling and examination of dental evidence and with the proper evaluation and presentation of dental findings in the interest of justice. It is concerned with the application of science and technology in human identification, requiring the coordinated efforts of a multidisciplinary team. It is of great significance in the court of law. This paper is a review on historical landmarks in forensic odontology.

The first reported case of dental identification was that of an 80-year-old English warrior John Talbot, Earl of Shrewsbury, who fell in the battle of Castillon in 1453.[1] According to Keiser-Nielsen, forensic dentistry is defined as the "proper handling and examination of the dental evidence, in the interests of justice, so that the dental finding may be properly presented and evaluated.[2]

Applications of Forensic Odontology

- Evaluation of injuries to jaws, teeth, and oral soft tissue
- Identification of individuals in crime scenes and/or mass disasters
- Identification and evaluation of bite marks which occur with some frequency in sexual assaults, child abuse, and personal defense situations
- Age estimation.[3]

Rugoscopy

Palatal rugoscopy or palatoscopy is the study of palatal rugae to establish a person's identity.[4] They are also called "plicapalatinae" or "rugae palatine." According to the glossary of prosthodontic terms, rugae are anatomical folds or wrinkles (usually used in the plural sense); the irregular fibrous connective tissue located on the anterior third of the palate.[5]

Cheiloscopy

Cheiloscopy (quiloscopy) can be defined as a method of identification of a person based on characteristic arrangement of lines appearing on the red part of lips or as a science dealing with lines appearing on the red part of lips.[6]

The word cheiloscopy is derived from Greek *cheilos* means lips, *skopein* means see. It is applicable in identifying the living as it is usually left at crime scenes and may provide a direct clue to the suspect. Santos was the first person to classify lip grooves.[7]

Bite Marks in Forensic Dentistry

ABFO defines bite-marks as "a pattern left in an object or tissue by the dental structures of an animal or human."[8]

Bite marks often appear as round or elliptical areas of contusion or abrasion, occasionally with associated indentations. Despite the good number of cases in which bite mark evidence has been critical to the conviction or exoneration of criminal defendants, there is continuing dispute over its interpretation and analysis.[9]

For bites on human skin, a potential bite injury must be recognized early as the clarity of the mark may change in a short time span in both living and dead victims.

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Photographic Superimposition

When examining whether a denture left at an investigation scene belongs to an unknown set of skeletal remains is more difficult. To establish an identity between a complete denture and a skull is difficult as the morphological characteristics of the denture base have to be compared with those of the surfaces of the jawbones, which cannot be viewed from the outside. In such cases, superimposition and X-ray computed tomography are effective for establishing proof of identity.[10]

DNA Analysis

With the advent of polymerase chain reaction, amplification of DNA is possible at preselected and in specific sites. This biological material may provide the necessary link to prove identity when conventional dental identification methods fail.[11]

Comparison of DNA preserved in and extracted from the teeth of an unidentified individual can be made to a known antemortem sample or to a parent or sibling.[12]

Table 1 summarizes the historic breakthroughs in forensic odontology.

Table 1: The historic breakthroughs in forensic odontology

Year	Significance
1453	First case of dental identification; Earl of Shrewsbury who fell in the battle of Castillon
1684	Grew was the first person, in the western world, to study dermatoglyphics
1732	The earliest reference to rugae was in anatomy textbook by Winslow
1775	Dr. Paul Revere: the first forensic odontologist, who identified the remains of a victim based on the retrieval of a prosthesis constructed by him
1831	Leuchs discovered amylase in saliva
1849	The first conviction based on dental evidence of crowns from charred remains of the victim
1889	The first suggestion for the use of palatal rugae as a method of personal identification was suggested by Harrison Allen
1898	First treatise on forensic odontology written by Dr. Oscar Amoedo the father of forensic odontology
1902	The biological phenomenon of systems of furrows on the red part of human lips was first noted by anthropologists and first described by R. Fischer
1911	The first palatal classification system was put forth by Goria
1921	Mueller suggested that detection of amylase can be a presumptive test for salivary stains
1926	The term "dermatoglyphics" was proposed by Harold Cummins
1929	Ki performed the first comprehensive investigation in identification of isoantibodies in saliva
1932	Palatal rugoscopy was first proposed by a Spanish investigator called Trobo Hermosa
1932	Edmond Locard recommended the use of lip prints in identification
1937	Murder trial conviction based on bite mark evidence first time in history
1946	Welty and Glasgow devised a computerized program to sort 500 dental records
1967	Santos was the first person to classify lip grooves
1983	Kotze classification for rugae pattern
1985	Jeffrey's discovered DNA fingerprints

At present, personal identification is made by analyzing the DNA profile of deceased persons with that of their relatives DNA profile. However, this procedure is sophisticated and requires a long time and has limited availability. Hence, conventional methods may be followed.

Thus, to conclude, personal identification is very much necessary for unknown deceased person in suicide, homicide, accident, and mass disasters. Forensic odontology plays an important role in medicolegal investigations in mass disasters, accidents, murder cases, and assaults. Dental professionals have an important role in maintaining dental records and providing all necessary information so that legal authorities may identify unknown humans.

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Conflicts of interest

None declared.

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