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## RESEARCH ARTICLE

**Forensic odontology and its limitations: review.**

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### Abstract

Forensic odontology is a field of dentistry which analyses dental evidence in the interest of justice. The data obtained from the oral cavity can help in identifying individual or providing information needed in a legal process. Use of dental evidence in forensic investigation has given rise to the concept of using forensic odontology as a tool to identify and solve certain forensic conflicts. The discrepancies associated with various methods are to be weighed cautiously to make forensic odontology a more accurate, reliable, and reproducible investigatory science. This article reviews the role of the dentist in identification of human, dental remains and crime Investigation and our understanding of the limitations in various methods employed in forensic odontology.

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### Introduction:-

Forensic odontology has been defined as that branch of dentistry that deals with processing, reviewing, evaluating and proper handling and examination of dental evidence. Forensic odontology requires an interdisciplinary knowledge of all dental specialities. Methods like rugoscopy, cheiloscopy, bite marks, tooth prints, radiographs, photographic study, and molecular methods are included in forensic odontology. In order to make forensic odontology a more accurate, reliable, and reproducible investigatory tool to be presented at the court of law, the limitations though very few, has to be identified. This branch has been used for identification of victims and suspects in mass disasters, abuse and crimes. In this paper, the role of forensic dentistry in human identification is discussed.

### Materials and methods

#### Tools for identification:-

##### Teeth:-

Morphology and arrangement of teeth is unique for every individual. Dental evidence such as dental caries, missing teeth, restored teeth, prosthesis, alterations in shape of teeth such as taurodontism, talons cusp, developmental defects such as amelogenesis imperfecta, dentinogenesis imperfecta, changes in colour of teeth like dental fluorosis collected from human remains is a tool for identification. Hence it's imperative to maintain records of the patients by the dentist. Morphologic features of the skull such as frontal, parietal eminence, forehead, supraorbital ridge, glabella, orbits, nasal aperture, zygomatic arch, occipital, mastoid process, glenoid fossa, foramen magnum, palate, condyles, shape of chin, gonial angle, and height of mandible body are indicators of gender. Metric traits of teeth such as buccolingual and mesiodistal dimensions of teeth and morphology of canine and molars can also be used in gender identification.

##### Palatal Rugae:-

Pattern of palatal rugae is unique for every individual and hence could provide forensic information. It also helps in gender differentiation and race differentiation.

The limitation in applying rugoscopy- Rugae patterns that cannot be classified under one particular group, can cause intra or interobserver errors. Kapali et al. have observed that denture wear, tooth malposition, and palatal pathology can cause alterations in rugae patterns. Further, Thomas et al. have stated that rugae patterns are genetically determined, and so can be rather used in population differentiation than individual identification.

**Lip prints:-**

It is an important forensic tool. The study of lip prints is called cheiloscopy. Impressions are made from the middle portion of the lower lip. Various factors can alter lip print recording. Lip prints have to be obtained within 24 hours of the time of death to prevent erroneous data that would result from post-mortem alterations of lip.

Limitation- Any pathology of the lip can change the lip print pattern. Also, loss of support due to loss of anterior teeth can cause changes in lip prints. Any debris or fluid on the lip surface, application of a thick layer of lipstick, or over stretching of cellophane tape can alter lip print recording. Although lip prints are unique to an individual, when the lines are not clear, individual identification based on this trace is extremely difficult unless the trace contains more individual characteristics like scars, clefts, etc

**Bite marks:-**

The science of identification of bite marks is relatively new in the field of forensic investigation. Bite marks may be deposited within food stuffs, other objects, or on the skin of the victim.

Limitation- The limitations in recording bite marks are many. Due to inherent alterations, the shape and clarity of bite marks found on the skin of the victims change in a relatively short duration (10-20 minutes) both in living and dead, and this necessitates their recording as soon as possible. Though photographed immediately, the three-dimensional bite marks on the two-dimensional photograph will be associated with changes in color and spatial relations.

Skin has curved surfaces and also is a poor medium for impression. It has the intrinsic property of distortion leading to variation in the precision of representation of bite marks. Thus, bite mark recording of skin has to be weighed with caution. Bite marks are associated with hemorrhage and post injury edema, which together can alter bite marks evidence. Also, there are instances in which two sets of teeth can match identically with the bite marks. Thus, forensic dentists need to approach bite marks with a certain degree of scepticism and continuously acknowledge their limitations.

**Tooth prints:-**

Ameloblasts lay down the enamel rods in an undulating and intertwining path. This is seen on the outer surface of the enamel as patterns. Study of the enamel rod end patterns is termed as amelogliophics.

**Limitations-**

This study needs antemortem records. Fractured, decayed, attrited, abraded, and eroded teeth cannot be included in this method.

**The Role of DNA in Dental Identification:-**

The oral cavity is a useful source of DNA. It is obtained from saliva, the oral mucosal cells and the teeth. The main DNA source is blood. In teeth, DNA is found in the pulp tissue, dentin, cement, periodontal ligament and alveolar bone. Pulp tissue is easy to prepare and analyze than other sources. But in many case the analyzed tooth lacks pulp tissue or may have been endodontically obturated. It also may be contaminated by microorganisms or by non-human DNA. In such cases dentin or cement is used for DNA extraction. Forensic dentists should incorporate these new technologies, since a number of methods are available for the extraction of DNA from biological samples, though no standardized protocols for their use have been established to date.

**Conclusion:-**

Forensic dentistry is not a recent branch of dentistry. It has always been a part of forensic science. Forensic odontology can therefore be regarded as one of the most important areas of forensic science for personal identification. Various techniques used in forensic odontology have their own limitations. These limitations should be borne in mind when answering queries in the court of law while prosecuting an accused, because an improper conclusion can alter and shatter the dreams and lives of alleged accused too.

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