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Understanding Forensic Dentistry: The Role of Dental Evidence in Identifying Victims and Solving Crimes

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Abstract: ***A subfield of forensic sciences called "forensic dentistry" makes use of the dentist's expertise in identifying victims of sexual assault, child abuse, and mass disasters. When dental remains are the sole available evidence, this branch, which is not new to many, has been Expanding. Because of its Rapidly expanding role and significance in the judiciary, it appears more than justified to have in - depth understanding of this area. In some situations, the tooth may reveal the identify of the person who bit it, and it has been used as a weapon.***

Keywords: Forensic dentistry, Bite marks, DNA Analysis, Identification, Dental Records

1. Introduction

In the interest of justice, forensic odontology involves the appropriate management, analysis, and assessment of dental evidence. the identification of the individual to whom, the teeth may belong, the age (in children), and the evidence that can be obtained from the teeth. Being a forensic dentist necessitates knowledge of a variety of fields because dental records can be used to identify a person or provide the information authorities need to prove the case.

This will provide you a comprehensive overview of the development, different approaches, and uses of forensic odontology, which is crucial to maintaining accurate dental records and supplying the necessary data to enable law enforcement to identify unidentified persons and identify cases of malpractice, negligence, fraud, or abuse.

Identification Unknown Remains:
When postmortem alterations, traumatic tissue injury, or the absence of a fingerprint record render the use of ocular or fingerprint procedures ineffective, dental identification takes over as the primary means of identifying remains. When a deceased individual is skeletonized, decomposed, burned, or dismembered, it is crucial to identify their dental remains.

Because the hard tissues are preserved after death and can be heated to 1600 degrees Celsius without losing their microstructure, and because a person's teeth change over the course of their life and can have decay, missing teeth, or fillings at any given time, dental evidence can be used to identify remains.

Odontological identification is based on a methodical comparison of a person's pre and post mortem dental characteristics using dental records and related radiograph. However, inadequate dental data and jaw injury complicate this approach.

Determination of Species
Because the dentinal fluids provide specific information, species can be distinguished by dental tissues when evidence from the crime scene consists of a single tooth or a piece of the jaw.

Age Estimation Based on Dental Data:
As a subfield of the forensic sciences, age estimation ought to play a significant role in the identification process, particularly in situations where information about the deceased is not accessible. Due to minor differences in tooth formation and eruption, the main technique for determining age in younger people is dental estimation of chronological age. Beginning at four months after conception and continuing until the start of the third decade of life, when all of the permanent teeth have developed, the human dentition follows a dependable and predictable developmental schedule. Techniques involving the observation of the morphologically diverse stages of mineralization are characterized by the use of radiography.

DNA Analysis in Forensic Dentistry:
Saliva, teeth, bone, tissue, hair roots, blood, and semen are among the biological materials from which the DNA analysis sample is extracted.

Mass Disaster Identification:
The majority of instances requiring dental identifications are sports accidents, especially those involving airplanes, where trauma and fire are frequently severe. Building collapses and fires in densely populated areas are additional causes of numerous identification issues. The investigating team, whose makeup varies based on the type of disaster, typically includes the forensic odontologist. In addition to forensic odontologist, the team often consists of a coordinator or leader of the team, a pathologist, and other experts with knowledge of the specific disaster

Facial Reconstruction and Facial Superimposition: -
Reconstructing the deceased's appearance during their lifetime can be required if the postmortem profile is unable to provide a provisional identification. This is the responsibility of forensic artists, who use the dental profile to support facial reconstruction. Antemortem images that enable the superimposition of facial features, such as skeletal and dental characteristics, have been used in identification instances.

Comparison of Dental Records and Anomalies in the Teeth: -

In DVI, the dental evidence is examined with the antemortem records that the dentists have access to in order to identify the deceased. The accessible antemortem photos of the family members, which typically display the anterior teeth, can occasionally be compared with the dental evidence. The global dental numbering system serves as foundationfor the dental records, which include a wealth of data regarding the patient's teeth. Comparing certain significant tooth features—such as dental fillings, extractions, root configuration and surface structure, neighboring teeth, crowding of specific teeth, and diastema—is part of the forensic dental comparison process.

Dental traits have the same potential to result in a positive identification as physical fingerprints and DNA analysis. However, if there are no ante - mortem dental data or if it is not feasible to compare the post - mortem dental records, these characteristics could not be of much use to the investigator. The investigator can still refine the information based on the existing dental records by estimating the deceased's biological profile, which includes guessing their age, sex, race, and other characteristics.

Healing Process:

In situations when death has occurred, the healing process of bite marks might be helpful in establishing when the mark was caused in relation to the time of death. The dentist's part in forensics due to strangulation. Given that all healing processes stop when a person dies, the bite mark's redness in relation to the neck bruises' redness reveals when the bite mark was caused in relation to the murder.

Cheilo - Scopy:

Lip prints are the distinctive pattern created by the several elevations and depressions on the outside of the lip. . Forensic odontology's use of lip prints for human identification is a recognized technique in the global criminal justice system. The center part of the bottom lip, which is always visible in any trace, is used to make impressions, and the distinctive patterns are examined. Among the several patterns found are reticular, branching, vertical, intersecting, and unidentified.

Rugo - Scopy:

About three to seven ridges that radiate out tangentially from the incisive papilla make up the palatal rugae. These ridges fall into one of four categories: wavy, branching, straight, or curved. These rugae patterns are said to be specific to each person. When it is not possible to identify teeth after death, such as in edentulous mouths, palatal rugae might be used as a supplement.

Examination of Bites Marks:

Bite mark identification is a relatively recent discipline that has potential applications in forensic inquiry. Depending on the situation, bite marks may appear on the victim's skin, inside food items, or on other things. Bite marks are ovoid or circular patches of contusion or abrasion that sometimes have accompanying indentations. It could consist of two Ushaped arches with a gap between them at the bases. Usually, the injury's diameter falls between 25 and 40 mm, and a bruise is frequently visible in the middle.

Radiographs:

Since dental characteristics do vary over time, dental - based identification is regarded as less reliable than other biometric methods like fingerprints. However, radiographs can be the sole biometric technique accessible for victims with complete decomposition. The radiographs allow for the examination of various pathological and morphological alterations. Root morphology typically makes identification easier than crown morphology in morphology - based studies. Identification is aided by the degree of root formation, the bone trabecular pattern in the jaws, and different stages of wound healing in extraction sockets, in addition to standard findings such as decaying, missing, filled, and cracked teeth.

2. Limitations

Even while forensic odontology has advanced significantly in recent years, there are still restrictions on the many methods used in the field. When answering questions in court and prosecuting an accused person, these restrictions must be kept in mind because a wrong answer might change and ruin the hopes and lives of the accused as well.

3. Conclusion

When it comes to identifying people who cannot be identified by sight or other means, forensic dentistry is crucial. When the procedures are used appropriately, accuracy is guaranteed by the special characteristics of our oral anatomy and the positioning of custom restorations

Unfortunately, forensic dentistry is underdeveloped and forensic dentists' skills are underutilized in developing nations like India. The Indian Dental Association and other relevant organizations should be directed by the government to advise the nation's dentists to preserve dental records and tooth fragments in the event that patients receive restorations from dental surgeons. Therefore, it may be possible to identify deceased people using the preserved material.

It is the duty of every practitioner to comprehend the forensic ramifications of applying their trade. Understanding the forensic sector should encourage dental professionals to keep legally compliant and readable records and help law enforcement identify suspects and victims.

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