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Recent Advancement In Forensic Odontology – A Review

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ABSTRACT
Forensic odontology is the branch of dentistry that described as one that deals with the appropriate management, examination, and presentation of dental discoveries as well as the appropriate handling and handling of dental evidence in the interest of justice. Human teeth are the strongest and hardest tissues in the body. They frequently resist deterioration even in the most extreme circumstances and they are most valuable tool for forensic study. The forensic odontologist makes use of the knowledge of dentistry in bite mark analysis, fixation of identity in mass disaster, age determination, domestic violence, and child abuse cases. Therefore, the duty and responsibility of forensic odontologist have enhanced in recent times in various medicolegal cases. In this we are going to discuss about the recent techniques used in forensic odontology
KEYWORDS: *Forensic Odontology, Bite Mark Analysis, Medico legal Cases.*

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I. Introduction:

Forensic odontology is the branch of dentistry that deals with the appropriate management, examination and presentation of dental discoveries as well as the appropriate handling of dental evidence in the interest of justice (1). Dr. Ascor Amoedo is the father of forensic odontology, is credited with documenting the first dental identification case were more people perished in a disaster (2). Human teeth are the strongest and hardest tissues in the body, they frequently resist deterioration even in the most extreme circumstances, such as accidents, crimes, burials, or other extreme weather exposure (3). Identification of specific individuals is significantly aided by forensic odontology because uniqueness of each person's tooth pattern makes it as a useful tool for easy identification, especially when traditional soft tissue records are inadequate.(1,4). Three major areas in use of forensic dentistry is (1) Examination and evaluation of injuries to the jaws, teeth, and oral soft tissues for both therapeutic and diagnostic purposes,(2) Identification of people, especially those who have been victims of crimes or large-scale disasters and (3) Identification, analysis, and assessment of bite marks that are occasionally present in sexual assault cases (5). Personal details like height, build, age, hair color, and medical details like scars, tattoos, birthmarks, implants, and prosthetics are among the other techniques used to identify an individual. Also other techniques such as fingerprint records from podiatrists and chiropodists, clothing, personal belongings, fingerprints, DNA, and dental identification are identified recently. In forensic odontology, traditional techniques include bite mark analysis, dental imaging, cheiloscopy, rugoscopy, and dental records filing (6). This review article is aimed to focuses on the major recent advances in forensic dentistry and their significance.

RECENT ADVANCES IN FORENSIC DENTISTRY:

- DNA analysis
- Facial reconstruction
- Denture identification methods

- Comparison microscope
- Tongue prints
- AI in forensic dentistry

DNA analysis:

The field of forensic dentistry has made significant advances in the identification of human remains. The primary external factors that could hinder the recovery of data from remains of bodies and affect the identification procedures of humans includes objects that are connected to or exist near fire, like flames, heat, and explosions. Because of the extreme uniqueness of dental traits and the comparatively high level of chemical and physical resilience of the tooth system, teeth are considered significant tools for identification in criminology. It is possible to use mitochondrial and genomic DNA, were teeth are a great source of genomic DNA. In forensic situations, the application of polymerase chain reaction-based (PCR) techniques has become increasingly significant for DNA postmortem analysis (6, 7, 8).

Facial reconstruction:

Scientific techniques and artistic talent are combined in forensic facial reconstruction. It can be used to recreate the soft tissues on the skull to create an image of a person so that they can be recognized and identified (9). Methods of facial reconstructions are photographic superimposition, video superimposition, 2D and 3D facial reconstruction (10). A computational technique for reconstructing faces was created to acquire three-dimensional (3D) surface data of the human face. The laser video camera is used to capture the cranium. After this, a completely shaded 3D surface is imaged using the skull data analysis. A computer program (such as the volumetric visualization program Vitrea 2.3 version) can be used to draw the face. It has been discovered that 3D computed tomography (CT) imaging is more accurate than 2D CT image reconstruction and imaging done directly on CT slices (6).

Denture identification methods:

Denture marking, also known as labeling, is not a novel idea in prosthetic or forensic dentistry, and forensic dentists worldwide have long advocated for its regular implementation (11). In the field of forensic odontology, information that goes beyond a dental description can be useful. For example, labeled dental prostheses are essential for identification purposes following significant mass disasters (12). Some of the methods of denture labelling are engraving, scribing and inclusion.

Engraving- In order for the denture to carry the marked information, this approach entails marking the models during production

Scribing- Using this procedure, the denture is marked after it has been constructed. One way is to use a graphite pencil or water proof marker to write one's name on the denture base after the surface has been filed smooth. An alternative technique involves imprinting personal identifying labels directly into denture surfaces without requiring the denture base material to be removed.

Inclusion- it’s a method by placing of microchips or metallic or nonmetallic labels to the denture, with the name and service number engraved on them (13)

Comparison microscope:

When comparing two images, or studying a known sample against a collection of evidence, forensic comparison microscopes are particularly useful in criminal investigations. The forensic expert can observe both samples through the central eye piece of the apparatus, which comprises of two compound microscopes set side by side. It uses a digital camera system to see and compare the two photos at the same time to determine if they are the same or different (14).

Tongue prints:

Tongue prints are a valuable tool for person identification since they ensure originality and have certain characteristics. One of the few things that can make using the tongue print difficult is illnesses and deformities of the tongue. Everybody's tongue's dorsal surface is unique.There are noticeable variations in the typical tongue features even amongst identical twins. In forensic dentistry, lingual imprints have proven useful when combined with methods such as cheiloscopy and rugoscopy (15).

AI in forensic dentistry:

In forensic dentistry, artificial intelligence is being applied more and more. Computer technology, machine learning, deep neural networks, and artificial neural networks are examples of AI-based technologies utilized in forensic dentistry. There are several ways that artificial intelligence can be applied to enhance

forensic dentistry including dental identification, age and sex examination, facial reconstruction, bite mark analysis and dental data bases (16).

Virtopsy:

VIRTUAL+AUTOPSY come together to make VIRTOPSY. The term "virtopsy" refers to a non-invasive, scalpel-free method of conducting autopsies. Many bodies in poor condition are brought in for autopsy as part of forensic investigations; nevertheless, this can be a challenging one for forensic professionals during postmortem procedures. After introduction of virtual autopsies it can take less time than traditional autopsies, they have made life easier for forensic experts (18).

In virtopsy, the exterior surface of the body is mapped using a combination of medical 3D imaging technology and a 3D surface scan used in automotive design. It precisely captures and preserves the 3D image of the body's surface area (19). Even though the method is highly reliable, virtual autopsy is unable to identify a little amount of forensic significance. It is impossible to differentiate between all clinical diseases, infectious states, and Antimortem or Postmortem wounds (20).

II. Conclusion:

Dental and supporting structural knowledge is essential for forensic odontology. It can play an important role for identifying people who are difficult to identify visually or through other methods. It is a rapidly expanding discipline in the forensic sciences with great prospects. It is essential that dentists maintain current knowledge in this field because they have undoubtedly strengthened the specialty's foundation.

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