

Forensic Endodontics

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Abstract

Each human tooth is distinct in itself, which makes dental identification in forensic odontology an integral part of forensic studies. Identification of charred bodies or persons burnt beyond recognition, is next to impossible and endodontics has a very important role to play here, as, in such cases, identification is done with the help of the distinctive nature of human teeth and the study of roots, root canal anatomy and biomaterials with the help of advances in endodontic imaging, researches and practice.

Introduction

Human teeth are very important and extraordinary samples in identification caseworks. Endodontic root filling is a procedure that is used during life, for preservation of tooth, supporting a fixed rehabilitation. A major part of nuclear DNA is removed with the removal of the pulp tissues and the inner layer of dentine during endodontic procedures like root canal treatment. The pulp tissue is replaced by a biocompatible material. But the mitochondrial DNA is preserved in the odontoblastic processes in the dentinal tubules. This mitochondrial DNA from the dentinal tubules of endodontically treated teeth is an important sample in adverse forensic conditions and helps in identification of bodies which have been decomposed or burnt beyond recognition. Human teeth are one of the most indestructible part of human body and thus the features and dental treatment observed in a postmortem dentition of an unidentified body are compared to the ante mortem treatment and investigation records which may be available. In case of forensic Endodontics, the treatment records and the radiographs that were made during the endodontic procedures ante mortem and are available to be compared to the postmortem dentition, are of utmost importance.

History

- Lollia Paulina's body was the first human body to be identified using teeth in 66AD.
- Paul Revere was the first dentist who identified the bodies of fallen revolutionary soldiers in the United States and went on to become the first Forensic Dentist.
- In 1849, teeth were used to identify the bodies of the victims of Vienna Opera House Fire.

Discussion

Teeth are an important tool for identification when fingerprint records of the deceased person are not available for comparison. The DMFT (Decayed Missing Filled Teeth) records are of utmost importance in cases where the body to be identified in decayed, burnt beyond recognition or unclaimed. These DMFT records are measurable and

comparable at any fixed point in time.

Idea of tooth roots and root canal anatomy and variations

Human teeth show a wide range of anatomic and morphologic variations. These variations can be used for postmortem identification of a deceased identification. The variations can be seen in the number of roots, root canals, etc. This can be explained with the help of an example: Studies show a >30% occurrence of supernumerary roots in human dentition, with the highest prevalence seen in mandibular molars.

Also there is a high prevalence of middle mesial canals being found in mandibular molars along with the incidence of double and triple canals being found in the upper premolars and the anterior teeth. The technique of CBCT or Cone Beam Computed Tomography can be applied to identify these anatomic and morphologic variations.

Significance of Intra Oral PeriApical Radiographs in Forensic Endodontics

Postmortem periapical radiographs can be taken duplicating any antemortem radiograph which may be available of the suspected victim, both of which can later be superimposed and compared against each other. These IOPA radiographs can also be used to study the root canal filling materials like gutta percha, MTA, silver fillings, etc in endodontically treated teeth along with posts and cores and coronal restorations which impart a differentiating or distinguishing feature to the particular tooth concerned. Identification of the person becomes easier if any of these distinguishing features are present in the dentition and also antemortem treatment records are available for comparison.

Age determination of the deceased by using 3D imaging

With increase in age, there is narrowing of the pulp chamber and widening of the dentine due to the deposition of secondary dentine. This trend can be better studied by using 3D radiographic techniques

over the conventional IOPA or panoramic radiographs. Cone Beam Computed Tomography and micro-CT can be used to calculate pulp chamber volume accurately.

Identifying the filling materials used

The dental materials, i.e., the restorative materials and Obturation materials found in the teeth of the deceased individual postmortem, can be compared to accurate ante mortem treatment records which may be available, to confirm the identity of the suspected victim. Charring of dead bodies due to criminal acts of cremation, bombings, road traffic accidents, airplane crashes etc, destroys the soft tissues of the body, thus making the body unidentifiable. In such situations, teeth or its fragments may be the last resorts which are available for the identification of victims. The soft tissues protect the teeth from fire along with the resistant composition of teeth. Studies have shown that the Obturation materials can stand upto 1100 degree Celsius but show a honey comb above 600degrees with radiolucencies. Appearing in the endodontic filling material as a result of softening of the material. Sometimes instrument parts like broken files may be located in some particular tooth. Studies also showed that intracoronar restorations like amalgam filling or composite resins are also able to tolerate high temperatures and still maintain their integrity. But materials like gutta percha and ZOE, etc, change to a whitish chalk-like hue at temperatures above 800degrees, which becomes difficult to differentiate from the burnt dentine. Another study that used SEM or Scanning Electron Microscopy and EDX or Energy Dispersing X-Ray analysis showed that Nickel-Titanium files inside the root canals show a glacier like covering when exposed to high temperatures.

Dental radiographs play a valuable role as legal tools supporting the criminal demands on the daily forensic practice. Specifically in Endodontics, periapical radiographs are essential for a proper treatment. In forensics, these radiographs represent a solid source of ante-mortem data for human identifications. Despite the constant enhancement of dental techniques, materials and facilities, the conventional radiographs, routinely performed in the clinical practice, are still the most common source of forensic AM data for the human identification process [1-9].

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