



# Digitization and Evolution of Forensic Odontology

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According to Federation Dentaire Internationale, Forensic Odontology is that branch of dentistry which in the interest of justice deals with proper handling and examination of dental evidence and presentation of dental findings.<sup>1</sup> Dental tissues are the strongest tissues in the human body as they are resilient to natural forces and trauma therefore they remain unchanged even after long periods of stay in extreme environments. These characteristics increases the importance of dental identification.

Forensic odontology has three major areas of utilization: (1) diagnostic and therapeutic examination and evaluation of injuries to jaws, teeth, and oral soft tissues, (2) the identification of individuals, especially casualties in criminal investigations and/or mass disasters, (3) identification, examination, and evaluation of bite marks which occur with some frequency in sexual assaults, child abuse cases, and in personal defense situations.<sup>2</sup> Identification is not an easy task in medicolegal cases in which answers by individuals are misleading or inaccurate to arrive at proper conclusion.<sup>3</sup>

In its application, analysis and reporting, Digital forensics has replaced the traditional forensic investigations. Digital forensics could be defined as “application of computer science and investigative procedures for a legal purpose involving the analysis of digital evidence.”<sup>4</sup>

Digital dental records or dental chart is an official document that contains all the patient related information. Using actual oral digital images and dental data recently digital dental chart (DCC) has been introduced. In cases of mass disasters, earthquakes, terrorism, etc. a rapid comparison of AM and PM records of deceased victims is done by computerized software.<sup>5</sup>

Digital radiographs have revolutionized forensic investigations as they allows immediate display of images on the computer screen. Optimal viewing and side-to-side comparison of AM and PM radiographs is possible with improved image quality thus accelerating the identification process.<sup>6</sup> 3D printing has wide forensic applications like palatoscopy, cheiloscopy, bite-mark analysis, tongue print pattern analysis, facial reconstruction, sex determination age estimation and illustrates pattern of bone injury. They are immensely helpful in solving crime cases and presentation of evidence to court.<sup>7</sup>

To collect and preserve evidence in forensic cases photography is the best method. Digital cameras capture the image that is digitized by the sensor within the camera and converted into computerized image file. Quick recording, exact duplication of images and immediate retakes could be made if required by digital photographic system.<sup>8</sup>

More sensitive, specific, and accurate results than that of the conventional autopsy are provided by advanced modalities such as CT and/or magnetic resonance imaging (MRI) by scanning dead bodies. Virtopsy is accomplished by

placement of markers on the surface of the body by the help of Virtibot, and then, surface scan of the corpse is done by the use of stereoscopic cameras for Forensic investigations.<sup>7</sup> The comparison microscope is a device which helps in analyzing the specimens simultaneously. It consists of two microscopes connected by an optical bridge, which has a split view window.<sup>9</sup> It is helpful in the criminal investigations and allow better comparison of two images, i.e., studies known sample against collected evidence.<sup>7</sup>

In recent years Deoxyribonucleic acid (DNA) is used as a reliable source for human identification, and in criminal investigations. Forensic robots have helped laboratories for automation of DNA sampling process that involves extraction, quantification, and dilution. Thus, they save the time by speeding up the DNA profiling process and also reduce the human errors.<sup>7</sup>

## Conclusion

Digital forensics has revolutionized the traditional forensic investigations in terms of collection and analysis of data. For better forensic investigations there is a need for practice and implementation of the software in an effective and legal way. Available technologies and its use in forensic dentistry should be made aware to practicing dentists and the dental students. For incorporating newer technologies in forensic dentistry new researches have to be encouraged. In coming years, digital forensics will become an integral part of forensic investigative process and reduced costs of technology will enhance their utilization by various specialties.

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