

INTRODUCTION

- Forensic odontology is described as a legal field of dentistry that uses dental evidence to assist in the identification of victims or perpetrators as well as assisting in justice (Shamim, 2018).
- It is the evaluation and examination of injuries of the structures in the oral cavity. This can be due to abuse, accidents or injuries related to crime. Forensic odontology can also be used to examine marks left to potentially eliminate suspects or to identify the suspect. Lastly, it can be used to help identify unknown victims with the use of their dental records (Rothod, et al., 2017).
- This can assist in specifying the age and gender of a victim (Sharma, et al., 2021).
- This strategy is considered a primary method by the International Criminal Police Organization (INTERPOL) because it yields accurate, fast, and low-cost results (Curi, et al., 2017).
- Forensic dentistry was first accepted by law in 1849 in the George Parkman case where he was able to be identified by his partial denture (Rothod, et al., 2017).
- The Salem Witch trials in 1692 was the first case in the United States to use a bite mark to convict the perpetrator who would bite his victims (Starvrianos, et al., 2010).

GENERAL OVERVIEW

- As humans, we have certain characteristics that set us apart from other animals. An essential feature of human morphology is the dentition that is resistant to time and temperature (Balachander, 2015).
- Treatment given by a dentist significantly contributes to the individuality of the dentition and is key to identifying the oral cavity (Balachander, 2015).
- One of the most indestructible parts of the human body are the teeth. They survive and remain unchanged not only after death but thousands of years (Balachander, 2015).
- The forensic odontology of today consists of three important areas of activity
 1. Examination and evaluation of injuries to teeth, oral tissues and jaws resulting from various causes .
 2. The examination of marks contribute to the possible identification or elimination of a suspect as a perpetrator.
 3. Fragments or complete dental remains are examined, which include dental restorations, to a possible identification of the latter.

FORENSIC DENTISTRY IN DISASTER VICTIM IDENTIFICATION

- Following mass disasters, visual identification is not ideal as it has a high rate for error (Forrest, 2019). Forensic odontology is one of the most reliable methods and provides a rational and scientific basis for human identification, provided that dental records are well maintained, accurate, and of good quality.
- Dental hard tissues and dental materials are resistant to post mortem (PM) decomposition, for example palatal rugae are highly resistant to distortions and are therefore very useful for examining mutilated or altered bodies. They are considered the oral cavity's fingerprints (Putrino, et al., 2020).
- A recommended PM odontology exam consists of bitewing and periapical radiographs of molars, premolars, and incisors, as well as separate images of teeth with distinctive features such as root canals and crowns using the paralleling technique. Radiographs are reliable as it shows what cannot be seen in a visual examination, however it is a 2D image (Forrest, 2019).
- Among all the imaging modalities used in forensic dentistry, 3D scans such as CT, CBCT, and intraoral scans, are the most versatile because they aid in viewing anatomy from different angles (Forrest, 2019).

TED BUNDY

- Ted Bundy was tied to the murder of Lisa Levy, who was attacked in the Chi Omega Sorority house of Tallahassee's Florida State University. (Starvrianos, et al., 2010).
- Ted Bundy was convicted through bite marks that he inflicted on her body (Starvrianos, et al., 2010).
- One of the bite marks had sufficient detail for the forensic dentist to link the injury to Bundy. (Hinchliffe, 2011).
- The dental evidence helped secure the conviction before salivary DNA evidence could be used. (Hinchliffe, 2011).
- This was the first time that bite mark evidence entered the courts of Florida (Hinchliffe, 2011).
- Ted Bundy had highly irregular teeth which made it easier to identify him as the perpetrator (Starvrianos, et al., 2010).
- Bite marks showing good dental detail can be extremely useful in establishing a link between the bitten person and the biter or excluding the innocent. (Starvrianos, et al., 2010).
- Biological evidence can be retrieved with traces of saliva that are deposited during biting with DNA evidence. (Starvrianos, et al., 2010).

SEPTEMBER 11 ATTACKS

- On September 11, 2001, four planes were hijacked. Two of which were flown into the World Trade Center (WTC), another one into The Pentagon, and the fourth into a field in Pennsylvania.
- This tragedy took approximately 3,000 lives many of which would have been left unidentified if it were not for the identification process of forensic odontology (Furnari, 2021).
- Following the attacks on September 11th, multiple volunteers of the dental community teamed up to help in the identification process of the victims.
- Dental professionals were divided into four teams: "The Go Team" which was responsible for retrieving dental evidence, "The Antemortem Team" which helped gather dental records, "The Postmortem Team" which performed hands-on exams, and "The Comparison Team" which helped compare antemortem and postmortem records (Furnari, 2021).
- DNA, which includes teeth, helped identify 91% of the victims when used with other modalities (Furnari, 2021).
- The WTC site is probably one of the largest forensic cases in history and helped develop new methods in DVI (Butler, 2021).

CONCLUSION

- An individual's oral cavity can be compared a persons finger print. The uniqueness of the rugae presented on the hard palate and identification markers on teeth allow for the forensic odontologist to identify specific individuals during natural disasters, terrorist attacks and even assist in identifying perpetrators
- Advancements in technology has allowed the human dentition to be a source of DNA as well as allowed a comparison to radiographs have proved to play a major role in identification of people who cannot be identified by other means.
- In 2001, Farmingdale State College's own professor Dr. Henry Dondero worked with many other odontologist to identify hundreds of victims of 9/11 allowing efficient and accurate identification.
- Forensic Odontology has undoubtedly changed many lives with its technology and with further advancements in DVI and technology , it can be expected to increase the amount of cases being solved with the use of the oral cavity.

REFERENCES

- Curi, J. P., Beaini, T. L., da Silva, R. H. A., Melani, R. F. H., Chilvarquer, I., & Crosato, E. M. (2017). Guidelines for reproducing geometrical aspects of intra-oral radiographs images on cone-beam computed tomography. *Forensic science international*, 271, 68-74.
- Rathod, V., Desai, V., Pundir, S., Dixit, S., & Chandraker, R. (2017). Role of forensic dentistry for dental practitioners: A comprehensive study. *Journal of forensic dental sciences*, 9(2), 108.
- Shamim, T. (2018). Forensic pediatric dentistry. *Journal of Forensic Dental Sciences*, 10(3), 128.
- Sharma, S. R., Karjodkar, F. R., Sansare, K. P., Saalim, M., Sharma, A. H., & Chavan, S. A. (2021). Awareness towards forensic dentistry- A questionnaire-based cross-sectional study. *Journal of Indian Academy of Oral Medicine and Radiology*, 33(4), 385.
- Putrino, A., Bruti, V., Enrico, M., Costantino, C., Ersilia, B., & Gabriella, G. (2020). Intraoral scanners in personal identification of corpses: Usefulness and reliability of 3D technologies in modern forensic dentistry. *The Open Dentistry Journal*, 14(1).
- Forrest, A. (2019). Forensic odontology in DVI: current practice and recent advances. *Forensic sciences research*, 4(4), 316-330.
- Balachander, N., Babu, N. A., Jimson, S., Priyadharsini, C., & Masthan, K. M. (2015). Evolution of forensic odontology: An overview. *Journal of pharmacy & bioallied sciences*, 7(Suppl 1), S176-S180. <https://doi.org/10.4103/0975-7406.155894>
- Furnari, W. (2021). *Pathology - registered dental hygienists*. rdhmag.com. Retrieved June 10, 2022, from <https://www.rdhmag.com/pathology>
- Butler, John (2021, November 5). *Reflections on assisting with the 9/11 World Trade Center DNA Identifications*. NIST. Retrieved June 10, 2022, from <https://www.nist.gov/blogs/taking-measure/reflections-assisting-911-world-trade-center-dna-identifications>

