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The Journal of Dental Panacea

Journal homepage: <https://www.jdentalpanacea.org/>

Review Article

Tongue print and its role in forensic odontology- A review

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ARTICLE INFO

Article history:

Received 23-07-2022

Accepted 06-09-2022

Available online 30-09-2022

Keywords:

Tongue print

Forensic Odontology

Identification

ABSTRACT

With advancement of science and technology new methods of biometrics are being developed which aids in identification of individuals during time of disasters or in any legal matters. One of the most recently developed technology includes the use of tongue print in which human tongue serves as a source of evidence in human recognition. The human tongue is considered as one of the most reliable source of evidence as it is well protected in the oral cavity and can be easily stuck out of the mouth for inspection and along with this another great advantage of using our tongue as a source of identification is its uniqueness as no two same individuals have same tongue.

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1. Introduction

Forensic odontology is a rapidly flourishing science that has a greater scope of amplification in the field of forensics. There are many ways to elucidate forensic odontology and one of them is given by Federation Dentaire Internationale (FDI) which says "Forensic odontology is that branch of dentistry which, in the interest of justice, deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of dental findings". One of the most extensively acknowledged categorization of forensic odontology was offered by Avon which classified forensic odontology into civil, criminal and research on the basis of their major field of venture.¹ Forensic odontology have various implementations which includes age estimation, identification of human remains, assessment of bite marks, identification following mass fatalities, assessment of abuse cases which include child abuse, spousal abuse, elderly abuse, civil cases involving malpractice, rapes and murders. There are different types

of techniques used in forensic odontology which include:-

Dental document superintendence-A dental document is an authorized document that contains all the subjective and objective information about the patient. This document contains information regarding the history of present illness, clinical examination, diagnosis, prognosis and treatment given to the patient by the dental surgeon. Maintaining dental records plays a major role in forensic odontology, as it is seen that during mass disasters a large number of unidentified victims are found and it becomes difficult to correctly identify each victim, in such cases these preserved dental records are considered as one of the most reliable and much more cheaper source for identification as dental remains of individuals are difficult to be destroyed during such mass disasters.²

Dental imaging- Nowadays dental radiographs have started to play a very vital role in dental practice as it enhances the level of investigation performed by the dentist and also helps in better diagnosis of any condition suffered by the patient. In forensic odontology, dental radiography is used in identification and age estimation. Dental radiograph shows the dental as well as skeletal anatomy of an individual

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which cannot be seen in clinical examination.³

Bite marks–“A bite mark may be defined as having occurred as a result of either a physical alteration in a medium caused by contact of the teeth, or a representative pattern left in an object or tissue by the dental structure of an animal or human”. Bite marks in forensic odontology are mostly used as vital evidence in murder, rape or child abuse cases, also DNA of the criminal can be extracted from the bite mark site.⁴

DNA analysis–Human identification is one of the major field in forensic odontology and DNA analysis is one of the most reliable source when it comes to identify a living or dead organism. In DNA analysis, a forensic odontologist can extract DNA from multiple sources such as bone tissue, hair bulb, biopsy samples, saliva, blood and other body tissues and this DNA sample helps in identification of the individual as each individual has unique DNA.⁵

Cheiloscopy– In forensic odontology, cheiloscopy is used for identification of humans using their lip traces. Cheiloscopy can be defined as “a method of identification of a person based on characteristic arrangement of lines appearing on the red part of lips or as a science dealing with lines appearing on the red part of lips”.⁶

Rugoscopy– Rugae are elevations of the mucosa located in the anterior third of the palate that are asymmetric and irregular in nature, they are first seen in the third month of intrauterine life .Rugoscopy can be defined as “the study of palatal rugae pattern for human identification”⁷ Rugae are an important and stable source for identification in edentulous patients and also are difficult to destroy during mass disasters.

Facial reconstruction– Facial reconstruction is considered as the last resort for identification in forensic odontology when other conventional methods fail in identifying the individual. In facial reconstruction we reconstruct the human face from unidentified skull remains in 2 dimension or in 3 dimension using special software or it can sometimes be done manually as well.⁸

Denture identification –Victims usually have all their teeth present in their oral cavity but sometimes when the victim is partially or completely edentulous the artificial dental prosthesis that the victim wears help in identification of the individual. In such cases the denture reveals the positive identity of the patient when the denture is correctly marked by either the surface marking method or inclusion method.⁹

Comparison microscopy–Microscopy is one of the recent advances in forensic odontology as with the help of comparison microscopy, we can compare two specimens simultaneously. Also, it is seen that with the microscopic examination of teeth we can identify the sex of an individual by seeing the presence or absence of the Y chromosome.¹⁰

Tongue print– Tongue is an indispensable organ present inside our oral cavity which execute various tasks

such aiding mastication, articulation of speech, providing gustatory sensation and is well protected from the exterior conditions by the palate in the superior aspect, mandibular teeth on the lateral aspect, floor of the mouth from the inferior aspect, lips in the anterior region and by the pharyngeal region in the posterior region.¹¹ It is interesting to know that each individual be it male or female, or identical or non-identical twins everybody has a unique tongue that matches with no other individuals. Our tongue can differ from one another in different aspect that includes its shape, color, texture, width, length. Due to this unique nature of the tongue, it can be used for various purposes that include biometric authentication, its use in forensic odontology for identification of individuals and suspects in criminal cases.

2. Contrasting Systems for the Classification of Tongue

Various classifications used to classify human tongue to record its uniqueness.

Table 1: Classification of tongue

Classification of tongue according to its shape (given by TCM) ¹²	Classification of tongue according to its color (given by TCM) ¹³	Classification of tongue according to its texture (given by Stefanescu et al) ¹¹
Rectangle	Pale	Physiological (normal) tongue
Acute Triangle	Light Red	Scrotal (fissured) tongue
Obtuse Triangle	Red	Geographic tongue
Square	Crimson	
Circle	Purplish	

3. Method of Recording Tongue Prints

3.1. Making positive replica of tongue using type II dental stone

In this method of recording the tongue prints we first ask the individual to rinse his mouth gently with water to remove all the food debris that was deposited on his tongue which is then followed by clinical examination and photography of his tongue (from frontal and side view). Now, to study the morphological features of the individuals tongue an alginate impression of the dorsal surface of the tongue is taken which is then poured using type II dental stone to generate a positive replica of the individuals tongue. This positive replica and the photograph is then used to determine the shape of the tongue using the three reference points (commissure of the lip and the tip of the tongue).¹⁴

3.2. Computerized tongue image analysis

In this method of analysis the color and texture of tongue is the most prevailing and this method also help in determining the shape and other geometrical features of the tongue which include the length, width, area of the tongue. The imaging device used in this technique is made up of 3 – chip CCD camera with 8 bit resolution and two D65 fluorescent tubes placed symmetrically around the camera in order to produce a uniform illumination. The image derived from this technique is properly aligned and has consistent feature which enhances the accuracy of the study.¹²

4. Role of Tongue Print in Forensics

Human tongue is incased within the oral cavity therefore it is very well protected and is difficult to be destroyed during any disaster ,in such cases it aids in identification of a person (living or dead) . Also, human tongue shows sexual dimorphism and even two identical twins do not have similar tongue which gives tongue genetic independence thus, human tongue serves as evidence in any legal cases.¹⁵

5. Conclusion

Human tongue idiosyncratic in terms of its shape, color, texture, length, width, area in each individual and hence can serve as inconvertible evidence in identification of an individual in any legal matter or during any disaster.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

- Shamim T. Forensic odontology. *J Coll Physicians Surg Pak*. 2020;20(1):1–2.
- Sarode GS, Sarode SC, Choudhary S, Patil S, Anand R, Vyas H, et al. Dental records of forensic odontological importance: Maintenance pattern among dental practitioners of Pune city. *J Forensic Dent Sci*. 2017;9(1):48. doi:10.4103/jfo.jfds_1_16.
- Chiam SL. A note on digital dental radiography in forensic odontology. *J Forensic Dent Sci*. 2014;6(3):197–201. doi:10.4103/0975-1475.137072.
- Rao DS, Ali IM, Annigeri RG. Bitemarks-A review. *J Dent Res Rev*. 2016;3(1):31–5. doi:10.4103/2348-2915.180115.
- Silva RH, Sales-Peres A, Oliveira RN, Oliveira FT. Sales-Peres SH. Use of DNA technology in forensic dentistry. *J Appl Oral Sci*. 2007;15:156–61.
- Prabhu RV, Dinkar AD, Prabhu VD, Rao PK. Cheiloscropy: revisited. *J Forensic Dent Sci*. 2012;4(1):47–52. doi:10.4103/0975-1475.99167.
- Mohammed RB, Patil RG, Pammi VR, Sandya MP, Kalyan SV, Rugoscropy AA, et al. Rugoscropy: Human identification by computer-assisted photographic superimposition technique. *J Forensic Dent Sci*. 2013;5(2):90–5. doi:10.4103/0975-1475.119771.
- Maheswari TU, Krishnan M. Forensic facial reconstruction. *Int J Forensic Odontol*. 2019;4(1):1. doi:10.4103/ijfo.ijfo_7_19.
- Jeddy N, Ravi S, Radhika T. Current trends in forensic odontology. *J Forensic Dent Sci*. 2017;9(3):115–9. doi:10.4103/jfo.jfds_85_16.
- Menon PA, Kumar NA. Recent advances in forensic odontology: An overview. *J Foren Sci Med*. 2021;7(3):105–8.
- Radhika T, Jeddy N, Nithya S. Tongue prints: A novel biometric and potential forensic tool. *J Forensic Dent Sci*. 2016;8(3):117–9. doi:10.4103/0975-1475.195119.
- Zhang B, Zhang H. Significant Geometry Features in Tongue Image Analysis. *Evid Based Complement Alternat Med*. 2015;p. 897580. doi:10.1155/2015/897580.
- Qi Z, Tu LP, Chen JB, Hu XJ, Xu JT, Zhang ZF, et al. The Classification of Tongue Colors with Standardized Acquisition and ICC Profile Correction in Traditional Chinese Medicine. *Biomed Res Int*. 2016;p. 3510807. doi:10.1155/2016/3510807.
- Jeddy N, Radhika T, Nithya S. Tongue prints in biometric authentication: A pilot study. *J Oral Maxillofac Pathol*. 2017;21(1):176–9. doi:10.4103/jomfp.JOMFP_185_15.
- Johnson A, Gandhi B, Joseph SE. A morphological study of tongue and its role in forensics odontology. *J Forensic Sci Criminal Inves*. 2018;7(5):1–5.

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Cite this article: Mudgal V, Bhateja S, Arora G. Tongue print and its role in forensic odontology- A review. *J Dent Panacea* 2022;4(3):122-124.