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Importance of Palatal Rugae, Denture Labelling, Dental Implants and Lip Prints in Forensic Odontology

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Abstract

Identification is crucial in ensuring justice within medicolegal investigations. In the realm of law enforcement, forensic odontology plays an essential role in victim identification. In complex cases where other investigative methods fail, dental identification becomes a primary resource. When a victim's natural teeth have been replaced with prosthetics, the prosthodontist's role in forensic odontology is particularly important. Investigations can be conducted by examining the labels on dentures and other dental appliances. Consequently, this field is gaining increasing recognition today. This paper provides an overview of the available literature that illustrates how prosthodontists can significantly aid in the identification of unidentified bodies.

Keywords: Dental implant, denture marking, forensic odontology, lip print

Introduction

Keiser-Nielson in 1970 defined Forensic odontology or forensic dentistry as "that branch of forensic medicine which in the interest of justice deals with the proper handling and examination of dental evidence and with the proper evaluation and presentation of the dental findings."[1] The field of forensic science is defined as those areas of work that can be applied in a judicial setting and accepted by the court and the general scientific committee to reveal truth from untruth.[2] Forensic odontology plays a very important role in bite mark analysis, human identifications and mal practices.

Human identity is the mainstay of civilization, and the identification of unknown individuals always has been of paramount importance to the society. Not only is it important to identify the deceased to ensure appropriate obsequies, but also there are issues such as criminal investigations, insurance settlements, and military proceedings that can be resolved only with a positive identification.

The primary benefit of dental evidence lies in its preservation post-mortem, similar to other hard tissues. Teeth are the most resilient components of the body, capable of withstanding temperatures up to 1600°C without significant alteration to their

microstructure[3].They can remain nearly intact long after other soft and skeletal tissues have been compromised by decay or incineration.

Responsibilities of forensic odontologist include[4]:

- Identification of human remains
- Age estimation
- Identification following mass fatalities
- Assessing bite mark injuries
- Assessment abuse cases (child, spousal, elder)
- Civil cases involving malpractice

Disaster victim identification process

This process comprises four primary steps: body tagging and bagging, fingerprinting, forensic pathology, and forensic dentistry. The forensic dentistry team was split into two sections: dental examination and dental radiology. A prosthodontist can significantly contribute to the forensic dentistry team.[5]

Palatal rugae in identification

Authors have detailed the application of palatal rugae patterns displayed on dental casts for comparison with discovered remains. This technique has led to successful positive identifications.[6]The configuration of these rugae is deemed distinctive to each individual and serves as a dependable method in postmortem investigations. The anatomical location of the rugae within the mouth, encircled by the cheeks, lips, tongue, buccal fat pads, teeth, and bone, ensures they are well-protected from injury and extreme temperatures. Consequently, they can be reliably utilized as a reference point during forensic identification.[7] Palatal rugae have been likened to fingerprints and are unique to each person.[8] This can be particularly significant in edentulous cases and in specific situations where fingerprints cannot be obtained, such as in the case of charred remains or bodies that have experienced extensive decomposition. By analyzing the rugae pattern, an expert may ascertain the identity of the individual who possesses the upper denture.[9]

Denture Labeling

Regulatory authorities have advised that all prosthetic devices should be labeled with an identification system[10], and various methods have been outlined for the identification of dentures.[11,12,13,14,15,16,17,18,19,20,21,22]

Engraving Methods

The engraving system entails marking the models during the fabrication process, ensuring that the denture retains the marked information. This technique is simple and facilitates incorporation of a stable and fireproof label in the denture base material.

Scribbing method

The scribbing method entails marking the denture post-fabrication. One approach involves inscribing one's name on the base of the denture using a waterproof marker or a graphite pencil after abrading the denture surface. Another method consists of printing personal identification labels directly onto the surface of the dentures without the need to remove the denture base resin

Inclusion method

The inclusion method entails the positioning of metallic or non-metallic labels or microchips, on which the names and service numbers are inscribed onto the denture.

RFID is a technique for identification that utilizes radio waves. It comprises a data carrier known as a tag and a reader equipped with an antenna. The reader retrieves the information stored in the tag. Initially, connect the tag to the computer for programming, and then integrate the programmed tag into the channel located on the external posterior buccal surface of the denture. Finally, apply clear acrylic resin over the tag to reshape the denture.

Identification of dental implants

Identification of victims by dental implants is the emerging field in forensics Berketa et al.[23] conducted a study to investigate the changes that occur to bone-supported dental implants following cremation when placed in the mandibles of sheep. A selection of dental implants was photographed and subjected to radiography. Subsequently, these implants were surgically inserted into sheep mandibles, and the entire heads of the sheep were cremated using a commercial cremator. After retrieval and reirradiation of the implants, an image subtraction evaluation of the radiographs was performed. The photography of the retrieved implants indicated that the batch number on the Straumann™ implant remained visible, which could significantly enhance the identification process of deceased individuals.

Michelinakis. G et al.[24] conducted a study using IRS software. The implant software identifies implants based on the provided specifications, enhancing the efficiency of the procedure when utilized alongside radiographic techniques. Various identification methods have been employed by odontologists for recognizing implants. The IRS contributes to the efforts of general dental practitioners in identifying previously unrecognized implants. This article aims to create a more straightforward software program that facilitates the identification of implants by gathering pertinent information, including images. The author has compiled comprehensive data regarding dental implant products through a World Wide Web search conducted over a period of ten months, encompassing all languages. A total of eighty-seven implant manufacturers were identified, resulting in 231 distinct implant designs categorized by implant body shape, abutment connection, and surface characteristics. The IRS principle involves collecting a positive dataset stored in a standalone database, with the potential implant system being identified through a series of questions. Additionally, it encompasses implant recognition by comparing the derived system with radiographic and clinical images. The contact details of the implant manufacturers, including e-mail addresses, web pages, and phone numbers, were compiled at the conclusion of the search. This software can be utilized for individual cases or in the aftermath of mass disasters for body identification, particularly when dental implants are present, by determining the implant system, site, length, and diameters. The author concludes that the task of identifying dental implants for clinicians and technicians would be made easier through the use of this IRS software.

Dental implants also serve the purpose of identifying human remains through radiographic recognition and geographic assessment. In cases where a human body is discovered without dental records, identification can be achieved using radiographic images of the dental implant. The radiographs of these implants assist in determining the manufacturers and the design of the implant. Digital radiography of the implants is conducted to ascertain the type of implant. Radiographs are instrumental for odontologists in identifying victims. Nuzzolese E[25] conducted a study is to identify unidentified victims who have dental implants by utilizing radiographic images. Forensic identification relies on comparing post-mortem dental records with antemortem records. In this research, Italian implant manufacturers were requested to provide specimen implants of various diameters. Digital radiographs were captured for all implants. The radiographs were taken with horizontal rotation and vertical inclination in relation to the radiographic beam and X-ray sensor. A total of fifteen images per implant were captured and analyzed to identify features that

would facilitate implant recognition. The radiographs were produced using a trophy x-ray appliance, and trophy radiovideography sensors were employed. During postmortem implant radiography, the positioning of the X-ray device and sensor must replicate the geometry of the implant design. Multiple X-ray images are taken during identification to ensure a clear geometrical image of the implant is obtained. The digital radiographic images assist forensic odontologists in identifying unknown victims who lack dental records.

Berketa J et al[26] determine the survival batch numbers that are embedded in dental implants after incineration, serving as a means of identification. Rather than using batch numbers, the implants were designed to incorporate individual serial numbers, which facilitate the identification of victims. The batch numbers of implants before and after incineration can be compared. In this research, the author implemented laser etching of batch numbers within the chambers of the implants. In instances of victim incineration, it is crucial to verify that the implant batch numbers within the implant chambers endure the incineration process to a degree that allows for identification. The implant batch numbers were captured using a WILD Heerbrugg microscope connected to a digital camera. The batch number is distinctly visible on the implant prior to incineration. After incineration, the number remains discernible where an oxidation layer exists; the survival of the identifying batch number will be contingent upon the depth of the etched number and the thickness of the oxidation layer. Despite the high physical properties of implants that enable them to withstand thermal damage, the lack of distinctiveness in mass-produced items restricts their utility in identification. If manufacturers could be persuaded to include serial numbers on each implant, it could pave the way for a novel method of identifying deceased individuals.

Lip prints

The arrangement of wrinkles on the lips possesses unique traits akin to fingerprints. The wrinkles and grooves found on the labial mucosa, known as sulci labiorum, create a distinctive pattern referred to as lip prints, and the examination of these patterns is termed Cheiloscopy[27] This can be described as a technique for identifying an individual based on the specific configurations of lines present on the red portion of the lips, or as a discipline that focuses on the lines that appear on this area. [28] Lip prints remain consistent throughout an individual's life and can be utilized to confirm an individual's presence or absence at a crime scene, especially if there has been interaction with beverages, drinks, or the use of cloths, tissues, or napkins, among other items, at the location of the crime.[29] Nevertheless, a thorough investigation and the establishment of additional facts regarding lip prints will undoubtedly serve as valuable evidence in the field of forensic dentistry.

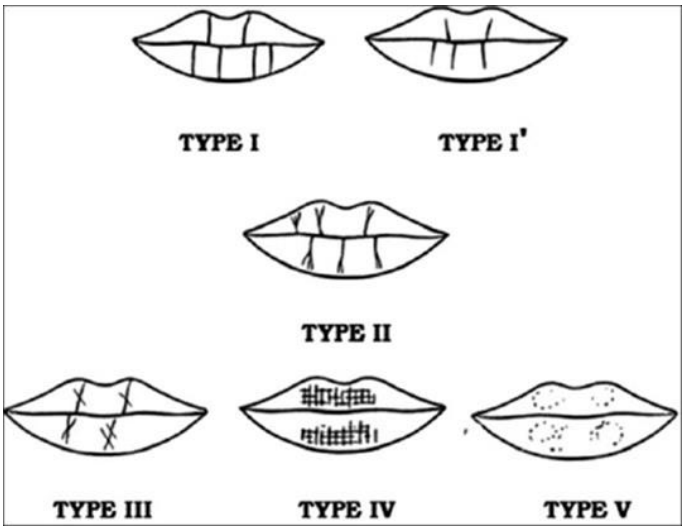
Recording lip prints

Lip prints can be recorded in a number of ways.

- Photographing the suspect′s lips.[30]
- On a non-porous flat surface such as a mirror they can be photographed, enlarged and overlay tracings made of the grooves.[31]
- Applying lipstick, lip rouge, or other suitable transfer mediums to the lips and then having the individual press his or her lips to a piece of paper or cellophane tape or similar surface.[30]
- Using a finger printer, preferably a roller finger printer.[32]
- By having the subject impress his or her lips (without lipstick or other recording medium) against a suitable surface and then processing these prints with either

conventional finger print developing powder or with a magna brush and magnetic powder.[30]

Suzuki and Tsuchihashi, in 1970,[33] devised a classification



Type I: A clear-cut groove running vertically across the lip.

Type I′: Partial-length groove of Type I.

Type II: A Branched groove.

Type III: An intersected groove.

Type IV: A Reticular pattern

Type V: Other patterns.

Similar to fingerprints and dental impressions, lip prints can serve as a means of identification. Lip prints are distinctive and remain unchanged throughout an individual's life.[34] Evidence of lip prints should be sought on utensils and dishware, on glass surfaces such as windows or doors, and on photographs or letters. Additionally, lip prints may be found alongside bite marks on food items. In practical applications, lip prints have been observed on windows, paintings, doors, plastic bags, and cigarette butts.[35] They are most commonly encountered in cases of homicide, sexual assault, and theft. Traces that exhibit clear lines and unique features allow for the individual identification of persons. In this regard, lip prints hold comparable significance to fingerprint evidence. When traces take the form of impressions, the identification process concludes with group identification; their characteristics are akin to other chemical and biological traces.[36]

Conclusion

Forensic dentistry is crucial in identifying individuals who cannot be recognized visually or through alternative methods. The practice of marking or labeling dentures is not a novel idea in the fields of prosthetic or forensic dentistry, and forensic dentists worldwide have advocated for its routine implementation for many years. The governing body in the health sector should mandate denture marking, and as prosthodontists, we urge our colleagues, other dental specialists, and general dental practitioners to recognize that it is our professional and ethical responsibility to adopt this practice.

References

1. Verma AK, Kumar S, Rathore S, Pandey A. Role of dental expert in forensic odontology. Natl J Maxillofac Surg. 2014 Jan;5(1):2-5. PMID: 25298709; PMCID: PMC4178350
2. O'Shangnessy PE. Introduction to forensic science. Dent Clin North Am. 2001; 45:217–27. [PubMed] [Google Scholar].
3. Rothwell BR. Principles of dental identification. Dent Clin North Am. 2001;45:253–70. [PubMed] [Google Scholar].
4. Avon SL. Forensic odontology: the roles and responsibilities of the dentist. J Can Dent Assoc. 2004 Jul-Aug;70(7):453-8. [PubMed].
5. Rai B, Anand SC. Role of forensic odontology in Tsunami disasters. Internet J Forensic Sci. 2007;2:1–5. [Google Scholar]
6. Thomas CJ, van Wyk CW. The palatal rugae in identification. J Forensic Odontostomatol. 1988;6:21–7. [PubMed] [Google Scholar]

7. Caldasa IM, Magalhaesbcd T, Afonsoa A. Establishing identity using cheiloscopy and palatoscopy. Forensic Sci Int. 2007;165:1–9. doi: 10.1016/j.forsciint.2006.04.010. [DOI] [PubMed] [Google Scholar]
8. Lysell L. Plicae palatinae transversae and papilla incisiva in man: A morphologic and genetic study. Acta Odontol Scand. 1955;13(Suppl 18):5–137. [PubMed] [Google Scholar]
9. Goswami R, Garg R, Jolly R. Role of prosthodontics in forensic odontology. Int J Clin Dent Sci. 2011;2:85–9. [Google Scholar].
10. McGivney J. Marking of removable dentures. In: Averill DC, editor. Manual of Forensic Odontology. 2nd ed. USA: American Society of Forensic Science; 1991. pp. 62–6. [Google Scholar
11. Toolson LB, Taylor TD. Method for denture identification. J Prosthet Dent. 1989;61:114–5. doi: 10.1016/0022-3913(89)90117-0. [DOI] [PubMed] [Google Scholar]
12. Ling BC. A white character denture labeling technique. J Prosthet Dent. 199;;9:545. doi: 10.1016/0022-3913(93)90175-n. [DOI] [PubMed] [Google Scholar]
13. Coss P, Wolfaardt JF. Denture identification system. J Prosthet Dent. 1995;74:551–2. doi: 10.1016/s0022-3913(05)80362-2. [DOI] [PubMed] [Google Scholar]
14. Ibrahim WM. Denture microlabeling technique. J Prosthet Dent. 1996;76:104. doi: 10.1016/s0022-3913(96)90351-0. [DOI] [PubMed] [Google Scholar]
15. Ryan LD, Keller JB, Rogers DE, Schaeffer L. Clear acrylic resin T-bar used in denture identification. J Prosthet Dent. 1993;70:189–90. doi: 10.1016/0022-3913(93)90017-i. [DOI] [PubMed] [Google Scholar]
16. Berry FA, Logan GI, Plata R, Riegel R. A post fabrication technique fordentification of prosthetic devices. J Prosthet Dent. 1995;73:341–3. doi: 10.1016/s0022-3913(05)80328-2. [DOI] [PubMed] [Google Scholar]
17. Ling BC. Computer-printer denture microlabeling system. J Prosthet Dent. 1998;79:363–4. doi: 10.1016/s0022-3913(98)70256-2. [DOI] [PubMed] [Google Scholar]
18. Reeson MG. A simple and inexpensive inclusion technique for denture identification. J Prosthet Dent. 2001;86:441–2. doi: 10.1067/mpr.2001.118565. [DOI] [PubMed] [Google Scholar]
19. Rajan M, Julian R. A new method of marking dentures using microchips. J Forensic Odontostomatol. 2002;20:1–5. [PubMed] [Google Scholar]
20. Matsumura H, Shimoe S. Incorporation of a cast, embossed identification plate into a partial denture framework. J Prosthet Dent. 2002;88:215–7. doi: 10.1067/mpr.2002.127954. [DOI] [PubMed] [Google Scholar
21. Stevenson RB. Marking dentures for identification. J Prosthet Dent. 1987;58:255. doi: 10.1016/0022-3913(87)90188-0. [DOI] [PubMed] [Google Scholar]
22. Dimashkieh MR, Al-Shammery AR. Engraved fixed restorations to facilitate identification in forensic dentistry. J Prosthet Dent. 1993;69:533–5. doi: 10.1016/0022-3913(93)90166-l. [DOI] [PubMed] [Google Scholar]
23. Berketa J, James H, Marino V. A pilot study in the recovery and recognition of non- osseointegrated dental implants following cremation. J Forensic Odontostomatol. 2011;29:38–44. [PMC free article] [PubMed] [Google Scholar]
24. Michelinakis G, Sharrock A, Barclay CW. Identification of dental implants through the use of

Implant Recognition Software (IRS). Int Dent J. 2006 Aug;56(4):203-8.

25. Nuzzolese E, Lusito S, Solarino B, Di Vella G. Radiographic dental implants recognition for geographic evaluation in human identification. J Forensic Odontostomatol. 2008 Jun 1;26(1):8-11. PMID: 22689351.
26. Berketa J, James H, Marino V. Survival of batch numbers within dental implants following incineration as an aid to identification. J Forensic Odontostomatol. 2010 Dec 1;28(1):1-4. PMID: 21239857.
27. Randhawa K, Narang RS, Arora PC. Study of the effect of age changes on lip print pattern and its reliability in sex determination. J Forensic Odontostomatol. 2011;29:45–51. [PMC free article] [PubMed] [Google Scholar]
28. Prabhu RV, Dinkar AD, Prabhu VD, Rao PK. Cheiloscopy: Revisited. J Forensic Dent Sci. 2012;4:47–52. doi: 10.4103/0975-1475.99167. [DOI] [PMC free article] [PubMed] [Google Scholar]
29. Utsuno H, Kanoh T, Tadokoro O, Inoue K. Preliminary study of post mortem identification using lip prints. Forensic Sci Int. 2005;149:129–32. doi: 10.1016/j.forsciint.2004.05.013. [DOI] [PubMed] [Google Scholar
30. Williams TR. Lip prints: Another means of identification. J Forensic Indent. 1991;41:190–4. [Google Scholar]
31. Ball J. The current status of lip prints and their use for identification. J Forensic Odontostomatol. 2002;20:43–6. [PubMed] [Google Scholar]
32. Prabhu RV, Dinkar AD, Prabhu VD. Collection of lip prints as a forensic evidence at the crime scene: An insight. J Oral Health Res. 2010;1:129–35. [Google Scholar]
33. Suzuki K, Tsuchihashi Y. A new attempt of personal identification by means of lip print. Can Soc Forensic Sci. 1971;4:154–8. [PubMed] [Google Scholar.
34. Sivapathasundaram B, Prakesh PA, Siva Kumar G. Lip prints (Cheiloscopy) Indian Dent Res. 2001;12:234–7. [PubMed] [Google Scholar]
35. Prabhu RV, Dinkar AD, Prabhu VD, Rao PK. Cheiloscopy: Revisited. J Forensic Dent Sci. 2012;4:47–52. doi: 10.4103/0975-1475.99167. [DOI] [PMC free article] [PubMed] [Google Scholar]
36. Kasprzak J. Possibilities of cheiloscopy. Forensic Sci Int. 1990;46:145–51. [Google Scholar]
37. Millet C, Jeannin C. Incorporation of microchips to facilitate denture identification by radio frequency tagging. J Prosthet Dent. 2004;92:588–90. doi: 10.1016/j.prosdent.2004.07.025. [DOI] [PubMed] [Google Scholar]