

ODONTOLOGY: A FORENSIC OUTLOOK

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Abstract:

Forensic odontology is an innovative branch in dentistry. Forensic is derived from the Latin word 'forum' which means 'court of law'. It plays a key role in establishing person's identity. The dental anatomy is so unique, so it requires a good knowledge about the dental science. It is a weapon against the increasing crime rates. This article is a review about the lethal role of forensic odontology in medico-legal cases and different techniques that are used.

Key words: *odontology, denture marking, forensic dentistry.*

Introduction:

Harvey defined forensic dentistry as the branch of forensic medicine which in the interest of justice, deals with the proper handling and examination of dental evidence with the proper evaluation & presentation of dental findings. The forensic dentist plays a crucial role in the identification of deceased individuals. The ability to recognize, preserve, organize & document such information is the heart of forensic dentistry. Dental structures are the hardest tissues of human body and will survive longer than any other body tissues.

The materials used in restoration of the teeth are extremely resistant to destructive agents. Hence in deceased individual's identity can be retrieved based on the assessment of prosthodontic appliances. Identification of persons will be difficult in situations like natural calamities, road traffic accidents, mass disaster, or in act of terrorism. So in such situation we can make use of DNA comparison, visual identification, dental records and finger prints.

Requirements for ideal markings:

- The strength of the prosthesis must not be compromised.
- It must be easy and cheap or inexpensive to apply.
- The identification system must be efficient.
- The marking must be visible and durable.
- The identification should withstand fire and humidity
- The identification mark should be aesthetically acceptable.
- The identification should remain inert

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Classification for different types of denture labeling systems:

Dental identification plays a key role in disaster situations, and in particular, the mass casualties. The denture marking plays an important role in Forensic dentistry

There are two types of denture marking available: the surface marking method and the inclusion method.

Surface Method

This is easy to apply and relatively inexpensive and simple, but they wear off very easily. Scribing or writing on tissue surface of denture or embossing details in the master cast so as to replicate in denture. The main disadvantages are food accumulation and can cause infection. Surface method can be done with embossing, engraving or scribing

- **Writing:** It involves slight disking of the posterior flange of the denture (non-tissue-bearing side), marking the patient's name and service number on the roughened surface. Stevenson (1987) suggests that rubbing an ink pen over the grooves which are created will make it more evident.

Heath et al suggested a method in which the roughened surface of finished denture can temporarily marked with a fiber pen and then it can be protected with a sealant (figure 1).

- **Scribing and Engraving:** This system involves marking the letters in the models so that denture carries the identification marks upon fabrication (figure 2)

It can be done with a round bur on fitting surface of the denture result in a counter sink letter.

- **Embossing:**-it is scratching model before processing, it can be used in removable partial denture, an embossing tape can attach to wax



Figure 1: Finished denture temporarily marked with a fiber pen and then it can be protected with a sealant



Figure 2: Surface inscribed on mold



Figure 3: Surface method on denture

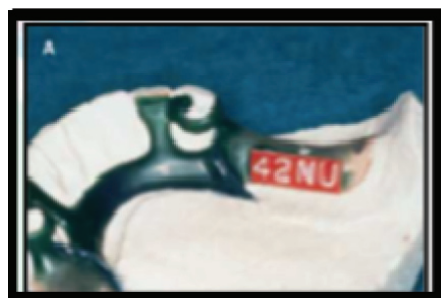


Figure 4: An embossing tape is attached to the wax pattern



Figure 5: Final casting is done



Figure 6: Finished denture with embossing tape

pattern (figure 4) and final casting is done (figure 5), so the plate will be visible through the acrylic. (figure 6).

Inclusion method:-

The marks should be enclosed in the denture. This should not affect the retention of the denture. The preferred area is the palate and posterior region of the lingual flange. So this will not be visible while patient wear that. As this is embedded within denture they are protected in case of fire.

Methods of intrusion

• **ID bands**

Dentures may be marked with stainless steel band. The most commonly used materials are HO matrix band and titanium foil which containing an identifiable coding system. This material is fire resistant.

• **Lead paper label and radiograph**

Lead foil found in intra oral x-ray can be used to

type the patient details with ribbon type writer. It can be incorporated during time of fabrication of denture or after processing of denture by cutting a depression then by covering it with light cure acrylic resin of same color (figure 7).

• **Bar coding**

A machine readable code of series of bars and spaces printed in defined ratios. It can be placed inside acrylic resin while processing can be also used along with crowns (figure 8). It is technique sensitive .it will get damaged above a temperature of 200-300°c.

• **T Bar**

It was introduced by Ryan (1993). A T shape clear PMMA resin bar and identification printed label is made on the flat section of bar. This is attached to the T bar by bonding agent and curing it.

The thickness of block should be less as possible, so as to include it in to the groove that is created in the denture. The surface is polished for the clear display of T bar.



Figure 7: Lead foil is incorporated to the denture during fabrication.



Figure 8: Bar code is incorporated to the denture during fabrication

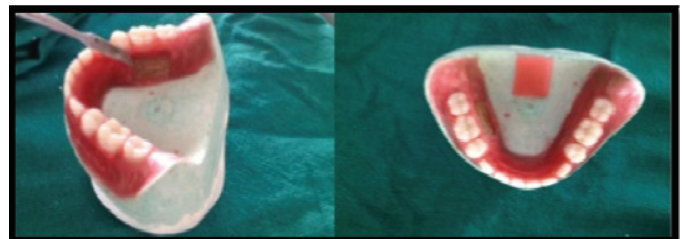


Figure 9: Depression cut on lingual surface

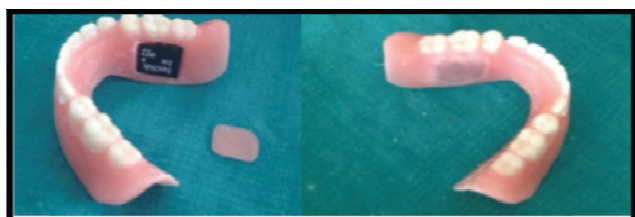


Figure 10: Micro SD card inserted

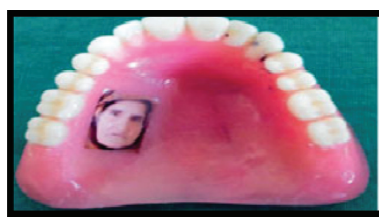


Figure 11: Photograph is incorporated during fabrication of denture



Figure 12: Different type of rugae patterns.

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• Computer printed denture micro labeling system

It was introduced by Berry et al 1995. A label containing patient details was computer generated and placed in slot in denture followed by saturated clear resin polymer to seal it and curing is done. (figure 9 and 10)

• Radiofrequency identification tags

This system consists of a data carrier, tag and electronic handheld reader. This reader energizes the transponder by means of an electromagnetic field emitted by reader antenna. It then receives signals from transponder and it is then converted to a readable data.

-It is stable at high as well as low temperature (i.e. subzero to burning at 1500°C for 1 hr). Disadvantages are high cost, not available in most of the dental set up.

• Photograph

This technique is used in country where literacy rate is low. Photograph can be embedded in clear acrylic denture base (figure 11). Disadvantage is that it will not resist heat beyond 300°C.

• Laser etching

Copper vapor laser that can etch a patient identification on to the metal surface of partial denture. This method needs specialized equipment it is very expensive and required experienced technician.

• Lenticular system.

This was introduced by Colvenkar in 2010. In this technique a lenticular lens is used to produce image with an illusion of ability to change or move as it is viewed from different angles. The images are printed on a black synthetic paper and it is laminated on a lens. Disadvantages –information can never be changed, it cannot withstand heat

or fire.

OTHER METHODS

• Palatine rugae pattern

Palatal rugae is known as the anatomical wrinkles or fold called as plica palatine (figure 12). Rugae pattern are unique. It can be studied by palatoscopy methods which include intra oral examination, study of model, rugoscopy. Its anatomical position in mouth will protect them from high temperature and trauma. Rugae inside mouth is surrounded by tongue, buccal pad of fat, cheek, lip, teeth and bone. Length of palate increase with age but remains in same position throughout life. It is formed in 12 -14 week of prenatal life and remain stable until degeneration of oral mucosa after death.

DENTAL IMPLANTS

In situation where the body of victim has been incinerated, there will be no scientific identifier because of loss of tooth, fingerprints, denaturing of DNA. The only available details will be characteristics of recovered implants. The property of an implant material such as high structural strength, high melting point will help them to withstand most of the unfavorable situations.

CHELIOSCOPY

It is the study of lip prints, i.e. The elevation and depression which form the characteristics features of lip. Edmond Locard (1932) is the first person who suggested use of lip prints in crime identification. *Figuralineariumrubrorum* is the new name suggested by Suzuki and Tsuchihashi for lip prints. Lip prints can be obtained by direct and indirect methods.

BITEMARK ANALYSIS

The dentition will be different for each person. The missing or prominent tooth in dental arch help easy identification of bite mark there by the culprit. The

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maxillary and mandibular teeth are found to be the main factor in causing bite mark. Each bite mark will differ according to the texture of skin. Most commonly found bite mark is contusion. Bite mark will reduce size within 10-20 min so the initial documentation should be done at initial stage by forensic dentist.

DNA

Deoxyribonucleic acid is an evident tool in identifying the culprit. DNA can be isolated from saliva, organic substance like tooth, body tissue, bone and blood.

CONCLUSION

A prosthodontist plays a vital role in forensic identification. In some circumstances visual identification, fingerprints and DNA identification are not possible so the dental identification will be successful because of its resistance nature to incineration, trauma, mutilation. This is done by comparing postmortem details with ante mortem details. So it is the duty of dental professional to keep dental notes, radiographs, study model, clinical photograph etc. which will aid in identification of a victim.

REFERENCE

- Mário marques fernandes, rachelribeiro limatinoco, luizrenatoparanhos, luizfrancesquini junior, eduardodarugejunior. Prosthodontists' perception of the forensic dentistry aspects of dental records. *Rgo - revista gaúcha de odontologia*. Porto alegre, v.61, n.3, p. 357-362, jul./set., 2013.
- Dr. Roohikapoor, dr. Ravpreetsingh, dr. Kavipalsingh, dr. Kamleshwarkaur "denture marking" a novel concept in human identification. *Iosr journal of dental and medical sciences (iosr-jdms)* e-issn: 2279-0853, p-issn: 2279-0861. volume 14, issue 3 ver. I (mar. 2015), pp 67-70.
- Drbaljindersingh, dmavroopbatth, drkaranprakashsingh and drharleenkaur. Palatal rugae a finger print of oral cavity. *Journal of dental science* 2015.
- Vagishkumar, shanbhag. Significance of dental records in personal identification in forensic sciences. *Journal of forensic science and medicine* | january 2016 | volume 2 | issue 1
- Sunil kumarmishra, harsh mahajan, rupalsakorikar, anoopjain. Role of prosthodontist in forensic odontology. A literature review. *Journal of forensic dental sciences / september-december 2014 / vol 6 / issue 3.*
- Pankajdatta, soniasood, poojarastogi, kalyanibhargava, deepakbhargava, mukeshyadav. DNA profiling in forensic dentistry. *J indian acad forensic med.* April-june 2012, vol. 34, no. 2.
- dhakshaini, ashishsatpathy. Contribution of a prosthodontist in the field of forensic odontology. *international journal of prosthodontics and restorative dentistry*, april-june 2014;4 (2);56-59.
- Ramasamy Chidambaram. Forensic odontology: a boon to community in medico-legal affairs. *jnmavol 54* i no. 1 i issue 2011 jan-mar 2016.
- sylvielouiseavon, dmd, msc. Forensic odontology: the roles and responsibilities of the dentist. *Journal of the canadian dental association*. July/august 2004, vol. 70, no. 7
- Joyce thomas, alexmathewmuruppel, dinesh n, sheebagladstone, noxygeorgemanjuran. Dentures in forensic identification- a review of methods & benefits. *J adv med dent scie* 2014;2(1):85-94.
- Sumalatha s., padmaja s., prafullathumati. Every contact leaves its trace"-insight into recent advances of forensic odontology". *Journal of cancer treatment and research*. Vol. 3, no. 1, 2015, pp. 1-7. Doi: 10.11648/j.jctr.20150301.11.
- Corina Laura Stefanescu, Marius Florentin Popa, Lavinia-Simona Candea, Ionut Parlica. Study on forensic dental identification methods by labeling prosthetic restorations. *J Leg Med* 37-42 [2015].
- sulekhagosavi, siddharthgosavi. Forensic odontology :a prosthetic view. *J forensic Dent Sci* 2012 jan -jun ;4(1):38-41
- paul G stimson. Forensic odontology. *j prost dent*. dec 1973, vol30, issue6, pages 922-925.