

Role of a Prosthodontist in Forensic Dentistry- A Step towards Evolution

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ABSTRACT

In Forensic odontology, dentistry plays a significant role in the identification of victims in the process of law and order. Dental identification serves as a primary mean for the identification of victim when other means such as fingerprints fail. Role of a Prosthodontist in forensic dentistry comes into play in cases where the victim has lost natural dentition and has been wearing prosthesis. Thus forensic identification by using prosthodontic appliances such as labeling of dentures and other appliances is gaining popularity as it could provide important identification clues. This paper presents a review of available literature emphasizing the fact that how a prosthodontist can play a vital role in identification of a deceased individual.

Keywords: Dental, Forensic odontology, Prosthetic appliances

INTRODUCTION

Forensic odontology mainly deals with dental evidence. Through this specialty of forensic odontology, dentists' knowledge has been utilised in the process of law and order. Identification of victims depends significantly on the quality of dental records [1]. In cases where methods for identifications such as visual recognition and fingerprint analysis seems to be ineffective like in advanced stage of decomposition or burnt cases, forensic dentistry comes into play, as the teeth are the most resistant structures of the human body and are frequently found to be well preserved after death, even when caused by fire or water [2,3]. Forensic identification by using prosthodontic appliances such as by denture marking, bar coding is gaining greater significance by providing vital clues for patient identification [4].

So, the main role of prosthodontists in forensic odontology are first and foremost to have a sound knowledge of dental materials, find ways to engrave records into prostheses, to study the pattern of rugae, impression making of bite marks and lip print recording and identification.

Denture marking [4]: The various methods of marking the denture are:

1. Surface Marking
2. Id Band
3. Engraved Fixed and Removable Restorations
4. Lenticular System
5. Rfid Tags
6. Bar Coding
7. Electronic Microchips
8. Chieloscopy
9. Palatal Rugoscopy
10. Bite Marks Analysis
11. Laser Micro-Etching
12. Identification of Dental Implants
13. Sex Determination by using Pulpal Tissue
14. Abuse

1. Surface Marking:

Person's name or other details are first labelled with the help of a laser printer. The palatal surface of the denture is then cut to 1mm depression and the label is placed on the designated depression. This depression is covered with an auto polymerizing acrylic resin which is then trimmed and finished [5,6].

2. ID Band-

Dentures can be engraved by using stainless steel. The most commonly used are titanium foil and HO matrix band which usually contains an identifiable coding system of patient details [7].

3. Engraved Fixed and Removable Restorations:

In case of fixed restoration as well as cast partial denture framework, the identification details of the patient can be incorporated which will help even in more extreme situations, such as fires and traffic accidents [8,9].

4. Lenticular System:

The lenticular lens technology is used to produce images with an illusion of depth, morph or the ability to change or move as the image is viewed from different angles. Information once written cannot be altered. In this technology each and every image is first sliced into strips and then interlaced with one or more of the other images [10].

5. RFID Tags:

It is a radiofrequency identification tag. It permits rapid and reliable identification of size 8.5 X 2.2 mm. So, large amount of patient details can be stored into the denture [11].

6. Bar Coding:

Bar coding process of denture is similar to bar coding of other goods in the market. Barcode systems which are resistant to high temperature are incorporated. One of the advantages of this system is that it can store large amounts of data. But the scanning of barcodes may be difficult due to the opacity of the acrylic resin,. For this reason the use of clear acrylic resin is recommended [12,13].

7. Electronic Micro Chips:

Here patient details were first etched onto a chip (5x5x0.6 mm) which is then bonded with acrylic resin. The specialized equipments

are used to transfer the patient details into the computer. The major disadvantage is that only the manufacturer can describe it [14].

8. Chieloscopy:

Lip prints are the characteristic pattern made by the depressions and elevations of the external surface of the lips. In, 1932 a French Criminologist, Edmond Locard first utilized lip prints in the identification of victim [15,16].

There are two types to obtain lip print:

- Direct method
- Indirect method

9. Palatal Rugoscopy:

Palatal Rugoscopy is the study of palatal rugae. Palatal rugae comprise of irregular and asymmetric ridges of the mucous membrane. The rugae pattern is found to be unique to an individual and therefore, can be used as reliable method in victim identification [17]. In addition rugae are usually protected from trauma due to their position in the head also insulated from heat by the tongue and buccal fat pads. It is specifically useful in edentulous cases and also in certain conditions where there other methods for identifications are less reliable as in burnt cases or where bodies have undergone severe decomposition. Rugae pattern may be also be unique to racial groups therefore facilitating population identification [18].

To study the rugae pattern, first the impression of maxillary arch needs to be taken which is the poured with dental stone. A prosthodontist by the identifying of the rugal pattern may help to find out upper denture wearer and some judgments are usually made by using ante-mortem impressions made for study models or prosthodontic consideration.

10. Bite Marks Analysis:

Bite marks are the marks left by the teeth of human or animal in the skin of a person. This bite mark identification can be used to link a suspect to a crime by identifying an individual. The most common type of bite marks are contusions [19].

Bite marks may be both two or three dimensional evidence. However, the interpretation of bite marks involves a three- dimensional reproduction. Prosthodontists who are usually well versed in the properties of different impression materials and hence can easily help in the construction of an accurate replica of the marks [20].

Bite marks should include [21]:

1. Distance from cuspid to cuspid.
2. Tooth alignment.
3. Teeth width, thickness and spacing.
4. Missing teeth.
5. Wear patterns.
6. Dental history including fillings, crowns, etc.,

11. Laser Micro-Etching:

Laser marking utilizes the use of lasers in a variety of methods like chemical alteration, charring, foaming, melting, and ablation to produce markings on an object for identification purposes. One such form is laser engraving which uses laser beams to engrave markings onto an object. Different varieties of Lasers have been used for engraving purposes such as the CO₂ lasers, fiber lasers, and diode lasers. Laser micro-etching is a very precise method which is not visible to naked eyes and required the help of a magnifying lens, loupes or microscope, thus providing good aesthetics. This technique is simple, cost effective and does not require much laboratory time [22].

12. Identification of Dental Implants:

The main scientific identifiers are DNA, fingerprint, and dental comparison. In cases where there is loss of fingerprint detail and denaturing of DNA due to incineration of the victim. With such extreme temperatures tooth loss will also occur with extreme

temperatures. Then the recovered dental implants, if any, may be the only evidence which will identify the victim [23].

Implants have high corrosion resistance, high structural strength, and high melting point which will help in the retention of intact implants following most physical assaults [24].

Berketa J et al., found that the batch number of implant was still intact even after the implant was subjected to intense heat exposure in a furnace. In the experiment, the batch number was laser etched within the chamber of their implant and was exposed to intense heat. The result was found to be an intact identifiable batch number on removal of the abutment [24].

13. Sex Determination by using Pulpal Tissue:

It is based on the presence or absence of X-chromosome [16].

15. Abuse:

A dentist should be well aware of child, elderly or spousal abuse when seen any unusual oral injuries, especially in cases of head or body injuries. Some of the common trauma due to abuse in the face and mouth are fractured teeth, laceration of the labial or lingual frenum, missing or displaced teeth, maxillary and mandibular fractures, and bruised or scarred lips. Elderly abuse is most commonly seen in both physical as well as psychological forms, especially those in old age home [25].

Prosthodontists can help to identify abused patients to a greater extent by carefully recording a detailed case history and understanding their psychology as they usually deal with elderly patients. To recognise such patient, Prosthodontist should look for bruised behind ear (battle's sign), traumatic alopecia (bald spots), any kind of skull injury, retinal haemorrhage, blackened eye, any fracture in the face, lacerations, fractured tooth, avulsed or discoloured teeth in absence of any reason [26].

CONCLUSION

Each practitioner has a responsibility to understand the forensic implications associated with the practice of his or her profession. A dentist's work in the forensic field should give the reason to maintain legible and legally acceptable records and also to assist legal authorities in the identification of victims and suspects.

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