

# Forensic odontology: A prosthodontic view

Sulekha Gosavi,  
Siddharth Gosavi  
*Department of Prosthodontics,  
Krishna School of Dental  
Sciences, Malakapur, Karad,  
Maharashtra, India*

**Address for correspondence:**  
*Dr. Siddharth Gosavi,  
Department of Prosthodontics,  
Krishna School of Dental  
Sciences Malakapur, Karad,  
Maharashtra, India.  
E-mail: siddhu\_gosavi@  
rediffmail.com*

## Abstract

The most common role of the forensic dentist is the identification of deceased individuals. Dental identifications have always played a key role in natural and manmade disaster situations, and in particular, the mass casualties normally associated with aviation disasters. Because of the lack of a comprehensive fingerprint database, dental identification continues to be crucial in the world. An all-acrylic resin appliance such as a full denture or an all-acrylic partial denture (or orthodontic appliance), prior to delivery, could be inscribed with the patient's full name on a substrate (paper, metal) and sealed inconspicuously into the surface of a denture by various processes. It has been noted by several authors that in many cases of air disaster where the limbs are completely burnt off, some denture materials survive, especially the posterior part of acrylic dentures and metal-based dentures. Thus, marked dental prostheses (full and partial dentures, mouthguards and removal orthodontic appliances) would lead to rapid identification in the event of accidents and disaster.

**Key words:** Denture labeling, denture marking, denture naming, engraving, forensic dentistry, denture identification, postmortem dental profile, denture in investigation, forensic odontology, denture in disaster

## Introduction


The science of forensic dentistry is basically confined to the cranio-facial structures. The teeth and their dental restorations, dental prostheses, the pattern of bony trabeculae, configuration of the air sinuses, and the overall oro-facial morphology present a vast number of variations of possibilities and information. The ability to recognize, gather, preserve, organize, document, and present such information is the heart of forensic dentistry.

Harvey defined forensic dentistry as that branch of forensic medicine which in the interest of justice deal with the proper handling and examination of dental evidence with the proper evaluation and presentation of dental findings.<sup>[1,2]</sup>

The forensic dentist plays an important role in the identification of deceased individuals. Dental identification is done in two main steps. First, the most commonly performed examination is a comparative identification between the remains of a decedent and a person represented by antemortem (before death) to establish a high degree of certainty. The body or circumstantial evidences generally provide information that helps to identify the dead person. Second, in those cases where antemortem records are not available, and no clues to the possible identity exist, the forensic dentist provides a postmortem (after death) dental profile which suggests characteristics of the individual that helps to narrow the search for the antemortem materials.<sup>[3]</sup>

Identification of deceased individual helps in various ways as follows:

1. Criminal – Typically, an investigation of a criminal death cannot begin until the victim has been positively identified.
2. Marriage – Individuals from many religious backgrounds cannot remarry unless their partners are confirmed deceased.
3. Monetary – The payment of pensions, life assurance, and other benefits relies upon positive confirmation of death.

Access this article online	
<b>Website:</b> www.jfds.org	<b>Quick Response Code</b> 
<b>DOI:</b> 10.4103/0975-1475.99162	

4. Burial – Many religions require that a positive identification be made prior to burial in geographic sites.
5. Social – It is the duty of society to preserve human rights and dignity beyond life begins with the basic premise of an identity.
6. Closure – The identification of individuals missing for prolonged periods can bring sorrowful relief to family members.

Dental identification has always played a key role in natural and manmade disaster situations, and in particular, the mass casualties normally associated with aviation disasters. Due to the lack of a comprehensive fingerprint database, dental identification is growing as an essential part of forensic investigation.<sup>[4-11]</sup>

It is something of a paradox that teeth can be destroyed relatively rapidly *in vivo* and yet is almost indestructible postmortem. Teeth on exposure to postmortem influences will survive longer than other body tissues. Similarly, the materials used to restore damaged teeth are extremely resistant to physical, chemical, and biological destruction.

More often, denture (full or partial) may be found within or close to the scene where the body is found. They can be useful aids in identification. The chances of identification of an edentulous person wearing dentures are less difficult in comparison to those of a dentate person. Hence, the labeled or marked dentures are most useful.<sup>[12-14]</sup>

## History

Identification by teeth is not new. At the time of Nero in 66 AD, Nero's mother, Agrippina, had her soldiers kill Lollia Paulina, with instructions to bring back her head as proof that she was dead. Agrippina, unable to positively identify the head, examined the front teeth and on finding the discolored front tooth confirmed the identity of the victim. During the US Revolutionary War, Paul Revere (1775), a young dentist, identified war casualties by their bridgework. Dental identification is possible under extreme circumstances, also since teeth are extremely resistant to destruction and decomposition. It was used in various instances on Adolf Hitler and Eva Braun at the end of World War II, in the New York City World Trade Center bombing, in the Waco Branch Davidian siege, and innumerable airplane crashes and natural disasters.

Dr. George Parkman, a professor in Harvard University, was killed by Dr. JW Webster in November 1849. The body was partially burned and dismembered. A charred fragment of a tooth fused to gold was found in the furnace of the house. The trial relied strongly on Dr. NC Keep who had made a removal partial denture for Dr. Parkman. The hanging of

Dr. Webster in 1850 ended the first major trial based largely on dental evidence.

In April 1968, a badly mutilated body on the railway line at Mt. Kuringai near Sydney was positively identified as a patient of Parramatta Mental Hospital who had been missing for several weeks. The identification was made possible by an upper acrylic denture bearing a name inscribed on it.

It is the intent of this publication to offer dentists some tips about denture labeling in connection with a forensic investigation. The information provided here is for reference use only and does not constitute the rendering of legal, financial, or other professional advice or recommendation by the American Dental Association.<sup>[13-19]</sup>

## Denture Labeling in Forensic Investigations

The denture marking is important for the following reasons:-

- a. It serves to identify an unknown denture wearer in cases involving amnesia or senility, loss of memory, psychiatric cases, homicide, suicide, victims of fire, explosion, floods, earthquake, plane crash, or war.
- b. In cases of lost and found, the denture can be returned to the owner.
- c. A rapid and accurate method other than finger printing is essential for identification of the individuals.
- d. In the laboratory, the dental technicians will find it easy to identify a denture, especially at the deflasking stage, if it is marked/labeled.
- e. To ensure the correct denture delivery to the respective patient.

The denture labeling should consist of name alone or along with other details like social security number, driver's license number, city code. Generally, a combination of name and identifying number used inside a denture provides great help and prevents misidentification or delay in identification.

An all-acrylic resin appliance such as a full denture or an all-acrylic partial denture (or orthodontic appliance) could be marked with the patient's full name on a substrate (paper, metal) and sealed inconspicuously into the surface of a denture through various processes prior to delivery. Marking only initials of the denture wearer into the appliance might delay or lead to misidentification if there are many other fatalities, partial incineration, and fragmentation or commingling of remains.

Cobalt–chromium appliances, unlike acrylic, resist melting even in some cases of incinerated remains. However, it is not possible for dentists to mark cobalt–chromium appliances chairside due to the hardness of the metal.<sup>[15,17,20]</sup>

## Marking Methods

The various methods of marking denture are given below:

- Engraving: This system involves marking the models so that denture carries the identification marks upon fabrication. However, this may lead to soft tissue irritation due to "high spots." Subsequent grinding may lead to elimination of the marks.
- Scribing: This method involves marking of the denture after it has been fabricated either with a bur, stone, diamond, knife, or any other sharp instrument.
- 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, and painting a coat of nail polish over the area.<sup>[17,21,22]</sup>
- Inclusion: This involves replacement of part of the denture material (pink acrylic) with a second material (clear acrylic) and a medium (metallic, non-metallic labels or microchips) upon which is inscribed the name and service number. The inscribed material becomes part of the denture.<sup>[16,23,24]</sup>

## Medium Used

The following media may be used as denture markers:

- Paper, onion skin, nylon, linen, or fibered glasses are suggested.<sup>[25,26]</sup> The identification marks can be written on any of these media either in pencil or pen or typewritten.
- Metal inserts from materials such as stainless steel orthodontic band, matrix band material, shim steel material, or aluminum can be used. It is recommended that an inclusion denture marker, preferably metallic, should be used in order to withstand the most common postmortem assaults.<sup>[27]</sup>
- Modified acrylic denture base material which contains barium sulfate and increases the radiopacity of the material can be used. Radiopaque materials such as Stellan and Chex gauze which contain barium sulfate can be used.<sup>[28]</sup>

## Position of the Medium

Several authors have observed that in many cases of air disaster where the limbs are completely burnt off, some denture materials, especially the posterior part of acrylic dentures and metal-based dentures, outlast because of the tongue.<sup>[29,30]</sup>

The most common possible area where the markers can be placed, as recommended by some authors, is along the posterior lingual flange, under the teeth for the mandibular dentures. It is found that generally if the marker is destroyed, then the denture is likely to be destroyed too.<sup>[31]</sup>

Some proposed requirements for marking dentures are:

- The strength of the prosthesis must not be jeopardized.
- It must be easy and inexpensive to apply.
- The identification system must be efficient.
- The marking must be visible and durable.
- The identification must withstand humidity and fire.
- The identification mark should be cosmetically acceptable.
- The identification mark should be biologically inert (when incorporated into the denture).
- It should be possible to retrieve after a mishap.

## Denture Marking Technique

Numerous authors have cited various methods for denture marking.<sup>[15,25,32]</sup> However, the inclusion method is the simplest and commonly used method for inserting the marked strip. The procedure is similar to the normal denture processing procedure till the point of final closure of the flask during the packing process.

The steps involved in the procedure are as follows:<sup>[33]</sup>

- Routine procedure of denture processing till denture packing is done.
- Then open the flask, place a strip of tin foil of about 5 cm by 2 cm onto the model (generally thickest and non-tissue-bearing area of the denture is used). Then make a trial pack as usual.
- Open the flask and remove the tin foil strip. The patient's particulars, typed on the medium to be used, are placed into the area left void when the tin foil is removed.
- Moisten the area with monomer and place clear acrylic resin over the strip of the medium to fill the void.
- Finally, close the flask and process as usual; then recover and finish the processed denture.
- Now, it is ready to be inserted in the patient.

Four organizations are dedicated to the field of forensic odontology. These organizations include: The Bureau of Legal Dentistry (BOLD), the American Board of Forensic Odontology (ABFO), American Society of Forensic Odontology (ASFO), and the International Organization for Forensic Odonto-Stomatology (IOFOS).<sup>[34,35]</sup>

## Conclusion

Forensic dentistry plays a major role in the identification of those individuals who cannot be identified visually or by other means. The task of determining the identity of the deceased persons has paramount importance. Most dental identifications are based on restorations, caries, missing teeth, and/or prosthetic devices, such as complete removable prostheses, which may be readily documented in the record.

Several authors have observed that in cases of air disaster, Tsunami, defense organizations, etc., where the extremities

are completely incinerated, some denture materials like posterior part of acrylic dentures and metal-based dentures survive.<sup>[36]</sup> Thus, marked dental prostheses (full and partial dentures, mouthguards, and removable orthodontic appliances) would lead to rapid identification in the event of accidents and disaster.

The results from a European survey show that denture marking is, to our knowledge, regulated by law only in Sweden and Iceland.<sup>[35]</sup> In the US, denture marking is so far mandatory in 21 states, while New York State requires dentures to be marked if the patient requests it and several other states impose the obligation to mark dentures on long-term care facilities. Since there is no international consensus regarding the issue of denture marking, it is important to address it.<sup>[37]</sup>

The supervising authority on the health sector should make it mandatory for all dentists to abide by the requirements. In addition to the above, the dentist should always inform clearly and motivate the patient about the benefits of the denture marking. The patient shall always be offered the opportunity to have his/her dentures marked with a personal number or any form of marking which is helpful in revealing the identity of the person during investigations.

## References

- Keiser-Neilsen S. Forensic odontology. *Int Dent J* 1968;18:668-81.
- Harvey W. Dental identification and forensic odontology. London: Henry Kimpton publisher; 1976. p. 2.
- Jacob RF, Shalla CL. Postmortem identification of the edentulous deceased denture tissue surface anatomy. *J forensic Sci* 1987;32:698-702.
- Hauck MM, Siegel JA. Fundamentals of forensic science. 2<sup>nd</sup> ed, Burlington: Elsevier Academic Press, 2010. p. 471-3.
- Dolinik D, Matshes EW, Lew EO. Forensic pathology- Principles and practice. London: Elsevier academic press; 2005. p. 610-4.
- Roy A, Tumati S. Forensic gene banking; issues and prospects. *Indian J Forensic Med Toxicol* 2008;2:1-6.
- Gould GA. Forensic odontology: A global activity. *J Calif Dent Assoc* 2004;32:410-5.
- Preety A, Sweet D. A look at forensic dentistry part 1; The role of teeth in the determination of human identity. *Br Dent J* 2001;190:359-66.
- Brannon RB, Kessler HP. Problem in mass disaster dental identification: A retrospective review. *J Forensic Sci* 1994;44:123-7.
- Marella GL, Rossi P. An approach to identification by means of dental prostheses in a burnt corps. *J Forensic Odontostomatol* 1999;17:16-9.
- Andrews F. A look at forensic odontology. Enlighten Publisher; 2007. p. 1-25.
- Skinner M, Alempijevic D, Stanojevic A. In the absence of dental records, do we need forensic odontologists at mass grave sites? *Forensic Sci Int* 2010;201:22-6.
- Pretty IA. Forensic dentistry 1, Identification of human remains. *Dent update* 2007;34:621-2.
- Brannon RB, Kessler HP. Problems in mass disaster dental identification a retrospective review. *J Forensic Sci* 1999;44:123-7.
- Woodward JD. Denture marking for identification. *J Am Dent Assoc* 1979;99:59-60.
- Pyke TF. Personal identification from artificial dentures. *Aust Dent J* 1970;15:495-8.
- Haines DH. Identification in mass disasters from dental prosthesis. *Int J Forensic Dent* 1973;1:11-5.
- Luntz LL, Luntz D. A case in forensic odontology: A bite-mark in a multiple homicide. *Oral Surg Oral Med Oral Pathol* 1973;36:72-8.
- Shrof FA. Forensic odontology for the general practitioner. *Aust Dent J* 1973;18:298-303.
- Jerman AC. Denture identification. *J Am Dent Assoc* 1970;80:1358-9.
- Lose FM. Denture identification. *J Prosth Dent* 1958;8:940-1.
- Richmond R, Pretty IA. Contemporary methods of labeling dental prostheses – a review of the literature. *J Forensic Sci* 2006;51:1120-6.
- Nuzzolese E, Marcario V, Di Vella G. Incorporation of Radio frequency identification tag in dentures to facilitate recognition and forensic human identification. *Open Dent J* 2010;4:33-6.
- Meyer HJ, Chansue N, Monticelli F. Implantation of radiofrequency identification device (RFID) microchip in disaster victim identification (DVI) *Forensic Sci Int* 2006;157:168-71.
- Harvey W, Butler O, Furness J, Laird R. The bigger murder. Dental, medical, police and legal aspects of a case “in some ways unique, difficult and puzzling”. *J Forensic Sci Soc* 1966;8:157-219.
- Woodward JD. Denture marking for identification. *J Am Dent Assoc* 1979;99:59-60.
- Richmond R, Pretty IA. Contemporary methods of labeling dental prostheses—a review of the literature. *J Forensic Sci* 2006;51:1120-6.
- Seals RR Jr, Seals DJ. Hospital dentistry: The importance of denture identification. *Spec Care Dentist* 1985;5:164-8.
- Gustafson G. Forensic odontology. London: Staples Press; 1966. p. 29.
- Haines DH. Identification in mass disasters from dental prostheses. *Int J Forensic Dentist* 1973;1:11-5.
- Millet C, Jeanin C. Incorporation of microchips to facilitate denture identification by radio frequency tagging. *J Prosthet Dent* 2004;92:588-90.
- Dorion RB. Marking of dentures. *J Can Dent Assoc (Tor)* 1972;38:14.
- Patil MS, Patil SB, Acharya AB. Palatine rugae and their significance in clinical dentistry. *J Am Dent Assoc* 2008;139:1471-8.
- American Board of Forensic Odontology; available from: [Http://www.abfo.org](http://www.abfo.org). [Last cited on 2010 March 13].
- American Academy of Forensic Science. Available from: [Http://www.aafs.org](http://www.aafs.org). [Last cited on 2010 March 13].
- Friedman RB, Cornwell KA, Lorton L. Dental characteristics of a large military population useful for identification. *J Forensic Sci* 1989;6:1357-64.
- Borrmann HI, DiZinno JA, Wasén J, René N. Ondenture marking. *J Forensic Odontostomatol* 1999;17:20-6.

**How to cite this article:** Gosavi S, Gosavi S. Forensic odontology: A prosthodontic view. *J Forensic Dent Sci* 2012;4:38-41.

**Source of Support:** Nil, **Conflict of Interest:** None declared