J Indian Prosthodont Soc (July-Sept 2012) 12(3):131–136
DOI 10.1007/s13191-012-0125-x

REVIEW ARTICLE

"Denture Marking" as an Aid to Forensic Identification

Jayashree Mohan · C. Dhinesh Kumar · Paul Simon

Received: 11 October 2010 / Accepted: 17 May 2012 / Published online: 27 June 2012

Abstract "Identification through forensic science is an art of giving the corpse a name A real life detective work that would put even Sherlock Homes to shame." Forensic dentistry deals with proper handling and examination of dental evidence and proper evaluation and presentation of dental findings in interest of justice. Denture marking or labeling is not a new concept in either Prosthetic or Forensic dentistry and its routine practice has been urged by Forensic dentists internationally for many years. Denture marking is accepted as a means of identifying dentures and persons in geriatric institutions or post mortem during war, crimes, and civil unrest, natural and mass disasters. Prosthodontists are playing very important role in forensic dentistry as they are concerned with fabrication of various prostheses which can serve as an important tool for identification. Identification is essential requirement of any medico-legal investigation because a wrong identity may pose a problem in delivering justice. The main objective of this article is to discuss the various methods of denture marking and to emphasize the importance of denture marking for person identification in medico legal investigations.

Keywords Denture identifications · Denture labeling systems · Denture marking forensic dentistry

J. Mohan (✉) · C. D. Kumar · P. Simon
Department of Prosthodontics, Vinayaka Missions Sankarachariyar Dental College, Salem, Tamil Nadu, India
e-mail: mohanjay@rediffmail.com

C. D. Kumar
e-mail: cdhineshkumar_bds@yahoo.com

C. D. Kumar
27/18, Kambar Street, DLM Building, Marapalam, Erode 638001, India

Introduction

"Everyone has a right to recognition everywhere as a person"-Article 6 of United Nations Universal Declaration of Human Rights [1]. Identity of the dead is very essential in deaths associated with fire, aircraft accidents, explosions and other mass disasters such as recently struck killer harbor wave—"Tsunami". Some parameters like facial features, scars, tattoos, deformities, dental findings can assist in identity of a person [1]. Most dental identifications are based on restorations, caries, missing teeth, prosthetic devices such as partial and full removable prostheses which may be readily documented in the record. The dental profession has long acknowledged the importance of placing identification marks on dentures. Labelled dentures can be of greater interest in identification of individuals. Unlabelled dentures have been recovered from patients and then fitted to casts retained by the treating dentist or laboratory and this has been accepted method of identification [2].

This review describes the different methods of denture marking and the importance of denture marking in forensic investigatory purposes. The last recommendations issued by Sweden the National Board of Health and Welfare states that "the patient shall always be offered denture marking and be informed about the benefit there of Denture marking is not permitted if the patient refuses it" [3].

The American Dental Association have specified certain criteria for denture marking [3]

- The identification should be specific
- The technique should be simple
- The mark should be fire and solvent resistant
- The denture should not be weakened
- The mark should be cosmetically acceptable

Review of Literature

Benchmarks in Forensic Dentistry

Ancient Period

A. 2500 B.C.-Egypt

First dental evidence found in pyramid at Giza-a skull with gold wire holding molar together [3].

B. 45-70-Rome Nero

First evidence of dental findings used in Forensic manner.

Nero's Mistress (Sabina) had Nero kill his mother was identified by two Maxillary Canine teeth [3].

18th–19th Century

C. 1776. Boston.Joseph Warren

First mention of dental forensics in American history concerns the Paul Revere who identified the body of General Joseph Warren by a missing Maxillary Canine tooth which was replaced by a piece of Walrus Tusk as Pontic [3].

D. 1835. Hatfield House

Turner et al. reported that the Countess of Salisbury was burned to death and was identified by her gold denture [3].

E. 1850-Boston–Webster/Parkman Case

Incinerated bits of bone and a removable partial denture were found in a privacy behind the dissecting room. Dr. Keep testified these were parts of denture made for Dr. Parkman and thereby the dead body of Dr. Parkman was identified. This contributed a great deal of circumferential evidence and Dr. Keep was appointed as the first dean of Harvard Dental School [3].

20th Century

The American Academy of Forensic Sciences was established in 1969 [3].

G. 1972. Houston Mass Murders

Paul G. Stimson identified 27 boys in Houston mass murders using dental evidence which was marked as a great deal in Forensic identification [3].

H. 1976. Colorado-Big Thompson Canyon Flood

139 Bodies were recovered and identified and the missing persons were reduced to seven this was the first use of a computer as aid in dental identification of victims [3].

I. 1979. Airline Crashes, Chicago and San Diego

191 Victims who died were identified by their dental records in American Airlines Flight crashes in 1979 [3].

Present

J. 1995. Borrman, Thomas emphasized that even though frequency of edentulousness decreased in recent years due to improvement in oral health, there is still increase in need to address the issue of denture marking for social and legal reasons [4].

K. 1998. Alexander et al. concluded from his research in South Australia that the dentures are not labelled regularly by the dental practitioner's and the reasons cited for that are cost, lack of awareness of standards and recommendations and a belief that the denture marking was of little importance [4].

K. 2007. Hideo Matsumura, Saji Shimoe describes a simple method for identifying the citizenship of the denture wearer by marking the telephone country code number inside the denture base so that this is simple way to identify the nationality of the denture wearer [5, 10].

L. 2007. Murray, Boyd concluded that the overwhelming opinion of Prosthodontic specialists within the UK promotes the use of denture marking as a routine procedure [6].

M. 2008. Stavrianou et al., Kafas P. Declared that the Swedish ID-Band has become the International standard and Federation Dentaire Internationale (FDI) accepted method of denture marking system [6, 14].

Methods of Denture Marking

Denture marking methods have been divided broadly into "surface marking" and "inclusion methods" [6–8].

Surface Marking Methods

ID marks are scratched, engraved or written on to the surface of the denture using a spirit based pen or pencil before covering them with a clear denture base polymer dissolved in chloroform.

Inclusion Techniques

Enclose the identifying marks within the denture base material, thereby rendering them relatively permanent. Various techniques have been tried out like typing the patient's name on a piece of "onion skin" paper, computer or laser printed label. This is placed in recess (4 mm width–1 mm depth) created in polished surface of denture.

Methods of Denture Marking in Complete Dentures

Radiographic Technique—Incorporation of Leadfoil "Invisible" Denture Identification—Michael Reason [9]

This method describes a radiographic technique where a lead foil marked with patient details is sandwiched between two layers of resin during processing of the denture. After processing the denture, radiograph can be taken to visualize the patient details marked in the lead foil incorporated inside the denture (Figs. 1, 2, 3).

Fig. 1 Lead foil marked with patient details—initials, outpatient number

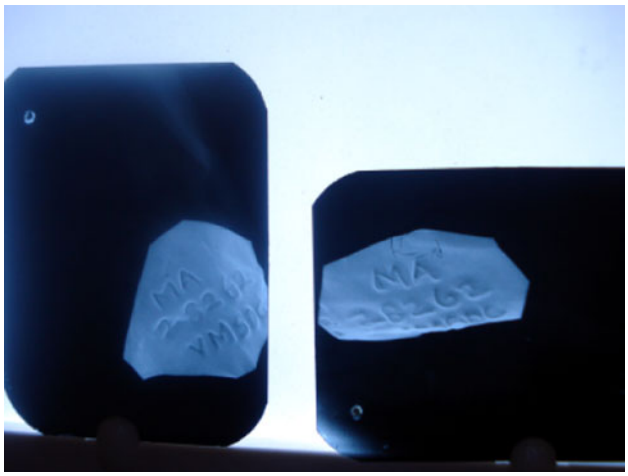

Fig. 3 Radiograph of the denture revealing the patient details marked in lead foil

The following method has proved to be simple, easy, quick, durable and cosmetically acceptable fulfilling all the requirements of ADA.

Automatic Identification of Dental Appliances—Milward Shepherd [7, 10].

This is a reliable, machine readable coding system for identification of dental appliances.

This method involves incorporation of printed thermal substrates and laser etched discs having two dimensional bar codes and matrix codes into a range of dental appliances. On scanning these bar codes or matrix codes the patient details are obtained.

Incorporation of Bar Codes in Denture Identification—Coss P. Wolfardt

This current technology involves the placement of bar codes inside the denture using both surface marking and inclusion methods [5].

In surface marking method the bar codes was directly stuck onto the denture surface then cyanoacrylate resin was painted to conceal the marking.

In the Inclusion method, the bar codes was stucked on to the clear acrylic plate and placed into recess created in the denture which was then finally covered with autopolymerising resin.

The bar codes placed into the denture by above methods are then scanned to obtain the patient details (Fig. 4).

Denture Marking with Inclusion Method Using Metallic Band-Based on Swedish Guidelines—Stavrianos

The Swedish ID-Band (SDI, AB, Sweden) has become the International Standard of denture marking method [14].

The metallic band is a stainless steel metal band with ten figure number having patient details. This ID-Band can withstand temperature up to 1,100 °C.

Stainless steel is of course a well established material for dental appliances and there is no documented case of it causing allergies (Fig. 5).

Methods of Denture Marking in Removable Partial Dentures

Incorporation of a Cast Embossed Identification Plate into a Partial Denture Framework—Hideo Matsumura [10]

This is a simple technique in which embossed tape with patient details was placed into the major connector portion of the plastic pattern of cast partial denture framework and the casting completed. The patient details are visible in the metal framework of the cast partial denture.

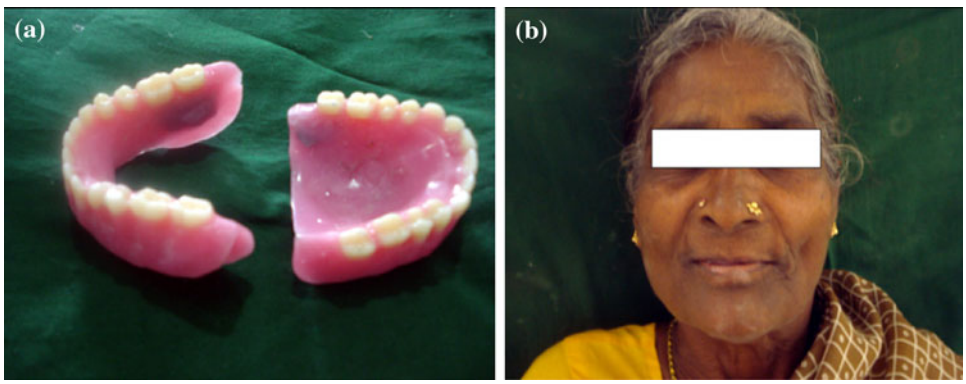

Fig. 2 **a** Maxillary and Mandibular complete dentures incorporated with lead foil having patient details. **b** Post operative view of the patient

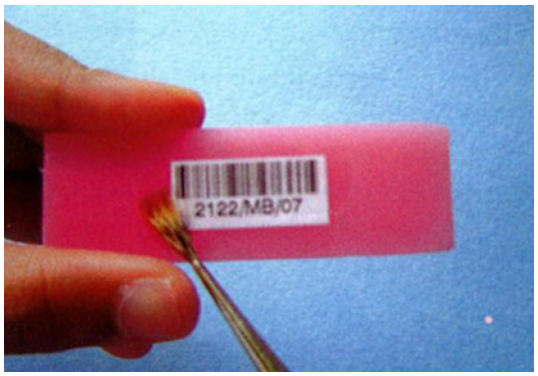

Fig. 4 *Bar codes* used for denture identification

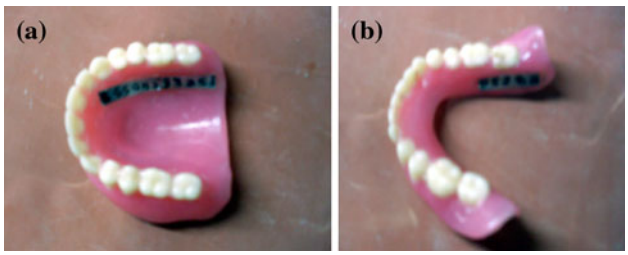

Fig. 5 (**a**, **b**) Maxillary and mandibular complete dentures marked with Swedish ID band

Fig. 6 Mandibular cast partial denture framework embossed with identification plate

Then after finishing teeth setting, acrylization was done. So the metal portion with embossed patient details was covered with acrylic resin and finally the cast partial denture was finished, polished and inserted into the patient mouth.

Incorporation of identification mark on a cast partial denture framework would ensure identification even in more extreme situations like fire and traffic accidents (Fig. 6).

Methods of Denture Marking in Fixed Partial Dentures

Procedure for Identifying Porcelain Fused *Fixed Partial Denture–P. G. Kamath* [11]

After baking the opaque layer of porcelain, dentin porcelain is applied and in this step, initials or letters can be carved with the brush.

Then stains can be applied for carved initials

After then enamel porcelain is applied and shaped with soft brush, Thus initials are maintained.

Only initials can be carved in crown and bridges due to lack of available space.

Lingual surfaces of anterior and posteriors are preferred for carving.

Discussion

Individuals having restorations and prostheses may be carrying their visiting cards in their oral cavity because each restoration is unique for an individual. The material used, the skill of the dentist, and changes seen after restoration offer a great help in identification [12].

To fabricate dentures with identification marking in their routine clinical practice the Prosthodontists should be aware of the details about the preferred site for placing denture marker and also the Medico legal significance of denture marking.

The most appropriate sites for the location of denture marker are [10–12]

Posterior buccal surface of maxillary denture.

Lingual flange of mandibular denture.

- Because this areas are accessible to reader
- There is often sufficient thickness of resin to incorporate without any technical difficulties
- Not affect the aesthetics of the denture.

Other sites are within the palate or buccal to tuberosity regions

- Usually Cameo or polished surface of denture is preferred but if esthetics is concerned, intaglio or impression surface is used.
- If the denture label is placed on intaglio surface, they become invisible when relining is done.
- In case of fixed prosthesis like crowns the initial or identification number was get engraved on usually lingual surface of anterior and posteriors. Occlusal surface of the posteriors are not preferred because of occlusal adjustments the opaque layer is removed in areas of carving.

The frequency of edentulousness has decreased in recent years due to improvement in oral health. However there is still a need to address the issue of denture marking for social and legal reasons because the oral status of populations varies in different countries and the wearing of

complete dentures will be a fact for foreseeable future [13]. In Sweden all the dental laboratories report that they mark all dentures processed by them. In 1982, ADA encouraged placing patient identification in all new removable prostheses constructed. The intent of this initiative includes forensic and humanitarian issues and remains valid and worth promoting by all dentists.

Some of the interesting medico legal importance of denture marking are; [9–11]

(1) Only one marked denture could lead to the identification of the dead or deceased when all other means have failed.
(2) Denture identification is important for forensic and social reasons in case patient need to be identified individually.
(3) Denture marking and denture records have played a vital role in victim identification in case of Mass disasters like Tsunami victims in Phuket, Thailand, terrorism, bombings, earthquakes, hurricanes, typhoons, air crashes and other transportation mishaps.
(4) In cases of mutilated bodies and decomposed bodies when all other parameters like scar, tattoos, and facial features get fails, denture identification by marking can solve the difficulty.
(5) Without valid entity to solve the ensuing problems of death certificate, disposal of diseased property, claiming of accrued money or insurance policies, claim for compensation (in case of traffic accidents) denture marking will definitely helps in positive identification of victims.

The forensic investigation was carried out and identification of the victims can be done by comparative identification and postmortem profiling of recovered dental evidences like missed teeth, restoration and dentures with identification marking.

The American Board of Forensic Dentistry has given four conclusions from dental evidence [14].

Positive identification—data available was accurate without discrepancies.

Possible identification—data was not confirmatory.

Insufficient evidence—insufficient data for conclusion.

Exclusion—data's are clearly inconsistent.

Summary

To summarize, the justification and advantages of denture marking in dentistry are [15]

- Patient identification
- Appliance identification
- Retrieval of dental records
- Diagnostic and decision support
- Education
- Recording and storage
- Quality assurance and quality control
- Complete and assurance documentation
- Improved accountability for purchasers/providers
- Improved inventory cost management
- Accurate billing
- Ability to trace suppliers, materials, equipments

Conclusion

From the overview it was clear that the denture appliances with identification marking can be taken as important evidence in forensic investigation and in various Medico legal issues. The need of an international consensus about denture marking for clinical and forensic purposes become obvious [14]. There should be a strong need to adopt international policy for denture marking and international collaboration should be encouraged with different opinions from the world wide community of Forensic Dentists discussed and with the aim of reaching some kind of consensus for the future [12–15].

References

1. Harvey W (1966) Identity by teeth and marking of dentures. Br Dent J 121:334–340
2. James A, Cottone DMD, Miles S, Standish DDS (eds) (1982) Outline of forensic dentistry. Year Book Medical Publishers, Chicago
3. Clark DH, Cainio P (eds) (1992) Practical forensic dentistry. Butterworth-Heinemann, Boston
4. Cunningham M (1993) Attitudes to identification of dentures: the patient's perspective. Quintessence Int 24:267–270
5. Wolfardt CP (1995) Denture identification systems. J Prosthet Dent 74:551–554
6. Stimson PG, Meltz CA (eds) (1997) Forensic dentistry. CRC Press, Boco Raton
7. Shepherd M (1997) Automatic identification of dental appliances. Br Dent J 182:171–174
8. Takahashi F, Koji T, Morita O (1998) Durable method of denture identification. J Prosthet Dent 3:28
9. Reeson M (2001) A simple inclusion technique for denture identification. J Prosthet Dent 86:441–442
10. Matsmura H, Shimoe S (2002) Incorporation of a cast, embossed identification plate into a partial denture framework. J Prosthet Dent 88:215–216
11. Kamath PG (2005) Engraved fixed restorations and denture micro-labeling to facilitate identification through forensic dentistry. J Indian Prosthodont Soc 5:79–81
12. Murray CA, Boyd PT (2007) A survey of denture identification in United Kingdom. Br Dent J 203(11):E24

13. Livini A, Shakartsi O (2008) Denture loss in geriatric institutions in Israel. Hebrew University, Jerusalem
14. Stavrianos C (2008) Denture identification based on Swedish guidelines: a forensic aspect. Int J Forensic Sci 3:1
15. Forensic odontology: past, present and future (2009) Dr. Aman Chowdry's, Consultant Stomatologists, New Delhi, India