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Research Paper

Dental Prosthesis As Your Identity:a Review

Medical Science

KEYWORDS : Denture Identification, Surface methods, Inclusion Methods, Palatal, rugae pattern

Dr. Bharath Prabhu

Dr.Satendra Singh

Dr. Nikesh P N

ABSTRACT

Establishing a person identity can be a very difficult process specially in case of fire and terrorist attack, major explosion, when the body can't be identified. Victim can be identified easier when some sort of marking data in the mouth can be read more directly. Labeling dentures, marking on crown and bridge and cast partial denture framework is widely described in literature. Here in this article different methods of labeling fixed and removable prosthesis including palatal rugae pattern are described.

Summary

After mass disaster and terrorist attack deceased body can be identified by dental prosthesis. Different methods of identification for removable and fixed prosthesis including palatal rugae pattern is described in this article

INTRODUCTION

Dentistry has much to offer law enforcement in the detection and solution of crime or in clinical proceedings. Prosthodontics as a speciality can play a important role in the identification of an individual. Dental prosthesis can be an important tool in identifying people who have lost their memory, states of unconsciousness, or in identifying the bodies of those who have died in accidents, disasters and natural calamity[1].

According to American board of forensic odontology guidelines, most dental identifications are based on restorations, caries, missing teeth and / or prosthetic devices.[1] After major disaster such as earthquakes, fires or floods, accurate and early identification of the dead and injured becomes of utmost importance. At times the only identifiable remains are a victims partial or complete denture.[2]

When a victim has no teeth information for use in personal identification based methods available in forensic odontlogy is much more limited than in the case of dentate victims. For edentulous victims, some identification methods are available such as comparing the anatomy of paranasal sinuses and comparing bony patterns seen on radiographs furthermore, the victims' denture themselves, which are usually found inside their mouth or within their homes, can provide us more personal information with regard to denture making, denture materials and their unique shapes for use as autemortem data or postmortem evidence[3].

The standard requirements for denture prosthesis markers are that they should be biologically inert, inexpensive, easy and quick to apply, possible to retrieve after an accident, acid resistant and survive elevated temperatures. The marking must also be esthetically acceptable, visible (readable) and durable without jeopardizing the strength of the prosthesis. In addition, the marking should be permanent and resistant to everyday cleansing and disinfecting agents. The recommended areas for marking therefore should be in the palatal or lingual regions of the prosthesis.[4]

Positive Identification through labeled dental prosthesis plays a key role in forensics. This article reviews various methods involved in labeling of partial and complete dentures.

Removable partial denture marking technique

Hideo Matsumura et al[5] described a technique for incorporation of a cast embossed identification plate into a partial denture framework. In this technique a labeled marker is used to prepare an embossed plastic pattern, which in turn is used to insert a marked metal plate into a denture framework.

After fabrication of a wax pattern on the refractory cast type the identification letters on embossing tape with a manual label marker. Manually cut a piece of tape 15 mm long and 5 mm wide for plastic framework pattern.(fig1)

Fig:1

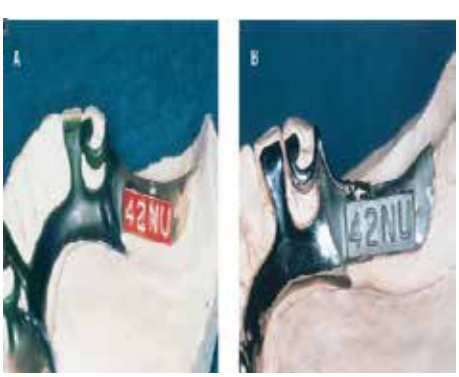

Fig: 2

Fig1Manual label marker used to prepare

Volume : 4 | Issue : 1 | January 2015 • ISSN No 2277 - 8179

Plastic pattern.

Fig 2 Piece of embossed plastic tape applied to wax pattern for partial denture framework, Cast framework of partial denture made from Ti-6Al-7Nb alloy. Embossed letters were reproduced clearly

After fabrication of a wax pattern on the refractory cast attached the trimmed tape to the appropriate position on the framework wax pattern. Invest and cast the wax pattern in the removable partial denture alloy of choice.(fig2) The resulting embossed lettering is identifiable through tissue colored acrylic denture base resin.

2)Fixed partial denture identification marking

M.R. Diwashkich et al[6] described a technique in which an electric engraver powered by an AC motor was the instrument used to mark the fixed partial denture or crown chairside before final communication. The engraver point is made of carbide steel and can easily be used to work crowns and Fpds, made of gold or base metal alloys(fig 4). Bar code is another method of marking crown and bridges for patients identification purpose. Bar code can be printed on the lingual or palatal surface of PFM or All ceramic crowns and decoded with the help of bar code reader equipment.(fig 3)

FIG:3

FIG:4

Fig3&4Bar code and engravement with carbide bur on crown

COMPLETE DENTURE MARKING METHODS

Various methods of denture marking have been reported in the literature. However, there are two main methods in marking dentures, namely the surface method and inclusion method.

SURFACE METHODS

Scribing or engraving method: In this method letters or numbers are engraved on the surface denture with the help of a small round dental bur. This technique is easy to operate and is economical but poses problems like food entrapment, bacterial infection and irritation.

Embossing method: In this technique name and other particulars of the patient used to scratched on the master cast. After processing it produces stamped or embossed letters on the impression surface of dentures. This technique is economical but has been associated with malignancy due to continous irritation of tissues.

Method of printing personal identification label directly on denture surface

Fumi Takahashi et al[7] described the method of printing personal identification label on the surfaces of dentures. Personal identification details were input into a computer using a image editing software programe, where by the letters were reversed. The reversed mark was printed on paper with a laser printer. Then, Methyl Methacrylate monomer was applied on the area of the denture where the mark would be located. The paper with the mark was pressed on the specimen plate before MMA monomer evaporated. The mark was thereby printed on the denture. MMA monomer act as a organic solvent which dissolve the binder resin present in the toner ink and color get printed on the surface of a denture.(fig 5)

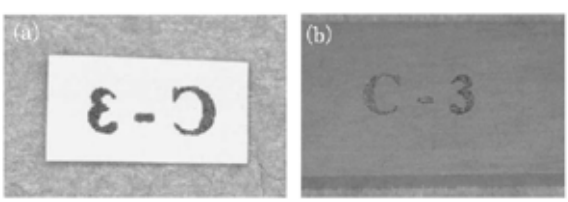

FIG:5

Inclusion method

Metal plate/tape id

Michael G. Reeson et al[8] described a method of denture identification by inclusion of a stainless steel tape on which patients name and identification was engraved with use of small rosehead bur.After trial closure for denture during flasking reopen the flask and insert a piece of metal tape the same size as the name plate but double the thickness of the plate to create space for clear heat cure acrylic over the name plate. After placing the metal plate; cover it with packing plastic and then close the flask. In the maxillary denture posterio-laterally region and lingual flange in the mandibular denture.Reopen the flask, remove the packing plastic and double thick metal tape. Insert the name plate and sprinkle some clear acrylic, polymerise the denture according to the manufacturer's instructions, deflask trim and polish the denture to complete the procedure.(fig 6& 7)

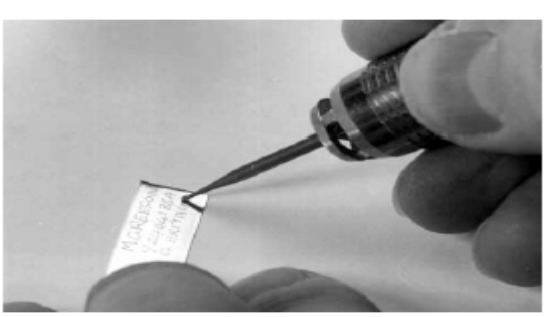

FIG:6

Fig6.Patient name and identification information on stainless steel tape.

Fig7.completed nameplate placed posteriolaterally in maxillary denture.

5)Computer – printer denture microlabelling system

Booi C Ling et al[9] describes a technique of denture identification in which personal information such as Name, Sex, National identification card number and country of origin was typed into a computer using a character of 8- point font size. After printing the information on a paper it was copied on a transparency film and reduced the size by 50%. Before incorporating the film into the denture it is incorporated with 100% cyanoacrylic acid esters adhesive solution to prevent any damage by monomer. Label can be incorporated into the denture during the packing stage using the wax spacer technique or after processing by making a depression of 1mm deep and wider than the size of the label. The label can then be coated with a thin layer of autopolymerised resin and polished.(fig 8&9)

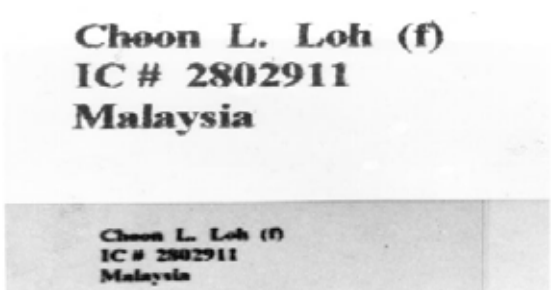

FIG:8

FIG:9

Fig :8Personel information of patient printed on white plane paper,at top;particulars photocopied on transparency film, with 50% reduction, at bottom.

Fig:9Finished maxillary denture with label incorporated.

6)Denture marker using Bar code

Aglouglu.S et al[10] described a technique of denture identification using machine readable code of a series of bars and spaces printed in defined ratios. Denture bar coding can be used with crown and bridge restorations.Bar code can contain information regarding patient name, age, sex, address etc. Denture bar coding is easy to perform and not very expensive, with the advent and generalization of smart phones there is no need for special equipments for reading the bar code.

FIG:10

FIG:11

Fig 10&11. Bar code placed in denture and bar code reader

7) Q-R code

Venkateshwaran Rajendran et al[11] described a technique in which they used a two dimensional bar code with details such as name, age, gender, address, phone no and social security number with a code generator.In this technique 10x10 mm QR code was printed and laminated to prevent the ink from scattering on contact with monomer during denture fabrication. Position the laminated label in a recess 1mm deep created on a palatal surface. Fill the recess with clear autopolymerised resin, finish and polish the denture(fig.12) For reading the QR - code hold a code decoder-enabled mobile camera against the label for the code to be deciphered(fig13)

FIG:12

Volume : 4 | Issue : 1 | January 2015 • ISSN No 2277 - 8179

FIG:13
2-D bar code incorporated into the denture and phone used to decode bar code

8)Paper strip method
Thomas CJ et al[12] described a method in which patient information was incorporated in a paper strip 10 x 5 mm in dimension generally name, age, sex, address etc. This paper strip was placed in the tissue surface of a denture after trial closure. In maxilla in between the ridge and the centre of palate and in mandible disto-lingual region of denture.The strip of typed paper is laid on this surface and the paper is moistened with the monomer. Clear resin is then placed over the paper before final closure of denture flask(fig 14&15)

FIG:14

FIG:15

9)Electronic microchips or memory cards
Richmond R et al[13] described a method in which patient information was downloaded into a chip or memory card. Slightly larger than the dimension of microchip or memory card recess was created on the distolingual region of mandible and posterior-lateral surface of the maxillary denture. These chips was laminated and placed in the recess and covered by self cure resin,denture was finished and polished(fig.16)

FIG:16

10)Radio frequency identification (RFID)
Carlos Madrid et al[14] In this study authors described a method of identification for dentures using radio frequency identification devices(RFID).The system consists of a data carrier, the tag or transponder and a reader. The tag consists of a microchip with a coiled antenna placed inside the dentures. The use of tags or transponders storing the patients data such as name and date of birth might solve a common problem in long term care facilities and hospitals, that is the difficulty in identifying the ownership of lost dentures were found.The tags used were small (2.12 x 8 mm) and placed at denture after fabrication and covered with self cure acrylic resin.The main disadvantages of this method of identification is highly expensive and not fire proof.(fig.17&18)

FIG:17

FIG:18

Tag placed in denture and tag reader

11) Photographs
Anehosur GV et al[15] described a technique in which patent photographs was embedded in the denture with the help of acrylic resin. The marker is particularly useful in the countries with low literacy rate where a photograph is the easiest method of identification. However thermal test revealed that the photographic marker were only resistant to around 200-300^{0}C.

12) Palatal Rugoscopy
After a disaster, natural calamity or terrorist attack, among the evidence taken from an edentulous victim, a palatal rugae pattern is one of the unique and relatively obtainable morphological features, and the pattern can be taken not only directly from the hard palate, but also from the mucosal surface of the dentures.[3]

Ines Morais Caldas et al[16] described the uniqueness and overall stability of palatal rugae and sugested their use for forensic identification. Palatal rugae are used in human identification not only due to their singularity and nature, but also due to other advantages, namely their low utilization cost.

Most commonly used classification is Carrea classification – palatal rugae divided into four different types or palatal rugae are classified only according to their form.

TYPE 1 Posterior- anterio directed rugae.
TYPE 2 Rugae perpendicular to the raphae
TYPE 3 Anterior-posterior directly rugae
TYPE 4 Rugae directed in several directions

Palatal rugae identification can be done by help of dental casts, old prosthetic devices (CD or RPD) and intra oral photographs (fig. 19&20)However due to its simplicity, price and reliability, the study of maxillary dental casts is the most used technique.

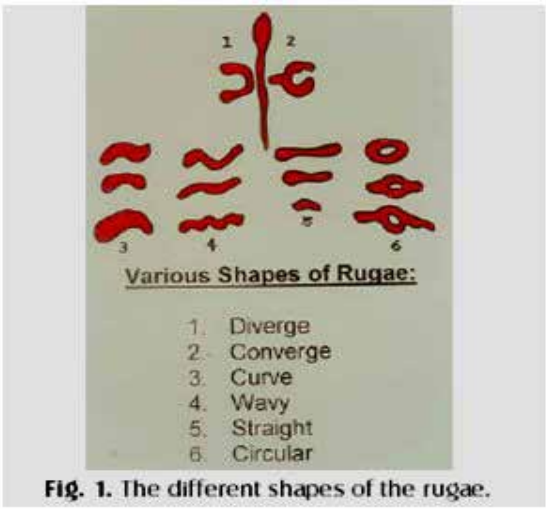

Fig. 1. The different shapes of the rugae.

FIG:19

FIG:20

Discussion

Two methods for dental prosthesis identification are generally used namely, surface method and inclusion methods. Surface methods seems easy to apply and relatively inexpensive, but they worn off very easily, get stained or shows color changes and need follow up.[1] Surface methods generally use engravement or embossed identification mark with the help of carbide bur or other equipments.

Inclusion methods, identification label or marking is placed during the fabrication of the prosthesis eg: embossed identification plate into a cast partial framework, stainless steel tape, paper strips, microchips etc.[5,8,12,13] Inclusion methods were definitely more permanent and provided a positive result, but it tended to weaken the denture structure and create porosity. It was also found to be more expensive and trained personnel in well equipped dental laboratories were needed.

Few studies using palatal rugae as a means of forensic identification are found in literature. However, the idea of rugae being unique to an individual is promising and deserve further investigation.[3,16]

Summary & Conclusion

The identification of the unknown deceased victim is a challenge and the forensic dentist is commonly required to assist in this process. Several situations demand that the individual to be identified. It is obvious that only marked prosthesis (CD, RPD and FPD) can reveal the positive identity of a person when all other methods fails to do so. The major reasons for not marking prosthesis are cost, lack of awareness, durability, biocompatibility, ease of marking. Dental prosthesis marking can be an important tool in forensic odontology. Hence an appropriate framework within dental educations is required to ensure so that both dentists and technician get exposed to denture marking methodologies.

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