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Review Article

Union of Forensic Odontology and Prosthodontics the Need of the Hour to Aid the Justice System and the Society

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Abstract

Forensic odontology deals with the proper handling, examination, and evaluation of dental evidences to aid the justice system and forensic investigation. The primary subject of analysis of this field of science is the teeth and human dentition. Various extrinsic and intrinsic factors together influence the development of teeth and dentition making it very unique and individualistic. Any loss of natural tooth or multiple teeth, require prosthodontics rehabilitation. Each dental prosthesis is made exclusively for its bearer and is unique. Thus dental prosthesis serves as a primary identifier in forensic investigations involving unidentified deceased bodies. This article aims to shine some light on the various techniques through which the dental prosthesis can be used in forensic examinations and the significance of the unification of Prosthodontics and Forensic Odontology for the ease forensic investigations.

Keywords: Denture, Denture marking, Primary identifier, Forensic odontology, Prosthodontics, Interdisciplinary approach.

Introduction

Forensic odontology is the branch of dentistry which deals with proper handling, examination, and evaluation of dental evidences in the interest of the justice system as defined by “Keiser-Nielson” [1]. A major function of this very specific field is the identification of unidentified bodies involved in any criminal case, natural disaster or any other catastrophic event [2]. Identification of fragmented, charred or decomposed bodies poses significant amount of difficulty in the investigative procedure. The major limitation in identifying these non-viewable types of human remain is the loss of finger print, facial features and in some cases absence or mutilation of body parts [3]. Teeth are considered as the strongest structure of the human body. Various intrinsic and extrinsic factors make the teeth and the human dentition unique and individualistic. All these factors combined makes human dentition an ideal source for post-mortem data especially for non-viewable human remain [4]. Identification process can be carried out comparing post-mortem (PM) and ante-mortem (AM) dental traits such as natural morphology, carious teeth, restorations on the teeth like fillings, mal-aligned teeth, missing teeth etc. Dental prosthesis also plays a crucial role in AM-PM

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reconciliation [5]. Dental prosthesis such as crowns, partial dentures, complete dentures, bridges, veneers and implants can be used for positive identification of an unidentified body. The methodology, through which a dental prosthesis is made, is highly individualistic and the prosthesis itself is unique only to the bearer [6]. This quality of the prosthetic appliances makes it invaluable in any forensic investigation and classifies it as a primary identifier.

Many instances in history has been recorded where a dental prosthesis has been used as positive identifier for an unidentified body. Few notable events include identification of US revolutionary war victims through their bridge work by Paul Revere. Identification of the charred body of “Countess of Salisbury” through her gold dentures. Identification of the cremated remains of Adolf Hitler and Ava Brown by their dentist Hugo Johannes Blaschke after they had committed suicide at the end of World War II [7]. Recent events include identification of the deceased victims of terrorist attack on the World Trade Center in America [8].

The most commonly prescribed dental appliance in the field of prosthetic dentistry is Removable partial dentures (R.P.D) and Complete dentures (C.D). Over the past decade many authors have identified techniques to record AM data into the denture itself for any future AM-PM reconciliation [9]. This makes comparative analysis of AM and PM records much easier. A denture without any data will have to be physically tried over the master cast retained by the attending dentist. This review article emphasizes the importance of collaborative efforts of forensic odontologist and prosthodontist for the identification of unidentified human remains.

Presently according to the literature, two major method of denture marking are suggested. They are called as 1) Surface marking methods & 2) Inclusion methods [10].

Surface Marking Methods

In this method a short data or a code number is written on the denture, this method does not physically tamper with the denture and maintains its structural integrity. A major limitation of this method is fading of the written data or code with time, as the prosthesis is used repeatedly and regularly. There are two major ways to perform surface marking on a denture they are – a) Scribing or Engraving and b) Embossing.

a) Scribing or Engraving – In these methods the short data or the code is engraved on the tissue fitting surface of maxillary dentures and on the lingual aspect of the tissue fitting surface of the mandibular dentures by a small round bur. The trough made by the bur should be as small as possible to preserve the structural integrity of the denture and also patient should be instructed about how to clean the dentures and maintain oral hygiene [11].

b) Embossing – In this a small bur is used to engrave a short code or data into the master cast. For maxilla the engraving is done on the palatal area and for the mandible the engraving is done on the lingual aspect of the alveolar ridge. After this, routine steps of denture fabrication are followed and the engraving is transferred onto the intaglio surface of the denture as an elevation. This method is highly discouraged as it causes constant irritation to the underlying tissues and causes formation of denture sores [11].

Inclusion method

In this method the short data or code is included into the denture and it becomes a structural part of the denture itself. If the inclusion is not done properly the structural integrity of the denture will be compromised and it will fail to provide its primary function which is prosthetic rehabilitation. Many inclusion methods have been suggested, the most prominent and scientific ones will be discussed in this review and they are as follows –

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a) ID-Band – This method is performed after completion of the curing cycle of the acrylic and before the steps for polishing and finishing. A bar code or short data is engraved on a titanium foil or a Ho Matrix Band. Next a shallow trough is made on the denture to accommodate the engraved metal band. The engraved band is well seated in the trough which is then filled with clear acrylic and cured. The conventional steps of finishing are then conducted to finish the denture for delivery [12].

b) Paper strips – In this method a piece of “Onion skin paper” is typed with the patient details and is placed on the denture fitting surface, in the palatal area between the ridge and center of the palate. Subsequently it is enclosed with clear or pink acrylic before final closure of the denture flask and cured, polished and finished following routine protocol [12].

c) T-bar – A “T” shaped clear acrylic polymethyl methacrylate resin bar is prepared containing the patient details or short code. A trough is prepared on the denture base corresponding to the shape of the T-bar. The T-bar is then placed in the trough and additional clear acrylic is used to fix the structure into the denture base [12].

d) Laser etching – This method is predominantly used for cast partial dentures where a copper vapor laser is used to etch the patient details on to the metal. The portion containing the short code or data can be overlaid with clear acrylic for better view of the laser etched area [12].

e) Electron microchips – In this method the patient’s details or a code is inscribed onto a chip by the respective manufacturer. This chip is then embedded in the acrylic resin. The radiopaque quality of the chip allows usage of tissue colored material over the chip. The chip can survive temperatures up to 600° C and has resistance to corrosive chemicals. Only drawback of this method is the high initial cost and the initial etching of details can only be

performed by the manufacture of the electron microchip [12].

f) Radio-frequency identification (RFID)-tags - The RFID system consist of a data carrier or a transponder and an electronic hand held reader that energizes the transponder by means of an electro-magnetic field. This hand held reader is used to both write and read data onto the tag. Major advantage of this technique is the large quantity of data which can be stored onto the transponder. The RFID tags are also small in size (8.5 mm × 2.2 mm) and can withstand temperatures upto 1500° C. The major limitation of this system is high cost and unavailability in most dental lab or dental operator [12].

g) Lenticular system – In this method an image of the patients face or any code is produced by a lenticular lens. The images are printed on the back side of the synthetic paper and laminated on the lens by the lenticular technology. Simple, cheap, quick and water resistance are the major advantages of this technology [12].

h) Denture bar coding - A bar code consists of a code expressed through a series of bars and spaces which are machine-readable and are printed in defined ratios. First a print of the code is made onto paper, next the code is photographed and a negative is produced. The negative is then moved onto a piece of silk. This is done by an industrial porcelain oven which is heated at 860° C for 30 minutes. This forces the code from the negative to transfer to the silk. Later this piece of silk can be incorporated in to denture and sealed with acrylic resin [12].

i) Photographs – This is a relatively new denture marking system where incorporation of the patient’s own photograph in clear acrylic denture base is suggested. This method is useful in the countries with low literacy rate where a photograph is the easiest method of identification [12].

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Identification through Dental Implants

Dental implants are titanium screws coated with hydroxyapatite crystals which are used as a fixed prosthesis replacing missing tooth [13]. The implants are embedded into the alveolar bone and are placed in such a manner that they are able withstand the masticatory forces exerted by the masticatory muscles. Titanium has high resistance to heat and corrosive chemicals, it can also withstand heavy physical trauma. In the year of 2010 *Berketa et al.* conducted a study to find out whether the batch number in each dental implant is still identifiable after introduction to high heat, corrosive chemicals and other traumatic events. He concluded that the batch number of the dental implant which is placed in the inner chamber of the implant is easily identifiable even after all the insult [14]. If a database is created by individual dental implant manufacturer which correlates the implant batch number along to the patient information to whom the implant was delivered to, then dental implant will also be considered as robust primary identifier.

Conclusion

The unique nature of our dental anatomy and the placement of custom restorations ensure accuracy when proper techniques are employed. Forensic dentistry plays a major role in identification of those deceased individuals who are not identifiable by visual or any other means. 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. After critical evaluation it can be stated that there are many methods available for denture marking but none of the methods perfectly fulfills all the requirements. Thus more emphasis should be placed on research and development in this very specific field and also the techniques of denture marking should be taught to the next generation of dentist as a part of the dental education programs for overall progression of both the subjects. This is only possible with a

healthy and scientific union of Forensic Odontology and Prosthodontics.

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