



## Case Series

## Prosthodontic markers: Identification tools in forensic medicine

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## ABSTRACT

Forensic is any term related to court of jurisdiction. Forensic medicine relates the application of knowledge of principles with practitioners of medical and para medical sciences for the purpose of administration of law. It includes various disciplines such as forensic toxicology, forensic engineering, forensic anthropology and forensic odontology. Forensic dentistry includes various odontological parameters such as DNA fingerprinting, bite mark identification, rugoscopy and cheiloscopy but these markers are of little use in completely edentulous patients. Dental records of edentulous patients are often sparse due to frequent follow up of the patients and lack of record keeping by the dental practitioners. Therefore, the provision of some form of permanent denture labeling or marking can serve as a solution to these problems.

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## 1. Introduction

The average life span of the individuals has increased globally with an increase in the geriatric population with concomitant physical and neural disorders. A common presentation among these patients is the loss of dentition leading to poor general health due to reduced masticatory efficiency. A common mode of rehabilitation of these patients is conventional complete denture prostheses. At numerous instances, these patients are lost and get involved in some untoward incident. In such instances, the dental identification by means of these prostheses can play a vital role in eventual identification of an individual. Denture identification is also important for patients in geriatric institutions and hospitals.

Forensic odontology is the branch of dentistry which deals with handling, examination, evaluation and presentation of dental findings in the interest of justice.<sup>1</sup> It includes various odontological parameters such as DNA fingerprinting, bite mark identification, rugoscopy and cheiloscopy. It assists in identification of martyrs in war, identification of dead bodies in mass disasters and

disbursement of justice in court of law. Therefore, it is the moral, social and legal responsibility of any dentist to maintain antemortem records of their patients so as to serve as a valuable identification tool in times of a casualty or disaster.

In addition to these existing odontological parameters, the Prosthodontist can provide accurate and definitive identification markers by incorporating various identification aids in the prostheses delivered to the patient and maintaining the database for the same which can help in positive identification of the individuals by matching antemortem and postmortem data.

This case series highlights rehabilitation of completely edentulous patients with conventional complete denture prostheses incorporated with these identification devices which would serve as a valuable aid in ascertaining the identity of the individual.

In the first patient, a bar code was incorporated on the palatal surface of the maxillary denture and in the other case a micro SD card was incorporated in the mandibular denture as an identification device, which could help in personal identification in times of an untoward incident.

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## 2. Case Series

### 3. Case 1

A 69 years old male patient reported with a chief complaint of inability to chew food since last 08 months due to loss of teeth. History revealed that the teeth were extracted due to carious lesions and periodontal involvement. Medical history was nil contributory. And dental history didn't reveal any deleterious habits like tobacco chewing or alcohol consumption.

Extra oral clinical examination revealed a symmetrical face with square facial form and concave profile, well coordinated neuromuscular response and no abnormalities in the temporomandibular joint.

Intra-oral examination revealed completely edentulous maxillary and mandibular arches. Soft tissue examination including mucosa and tongue showed no obvious pathological feature. OPG of the patient revealed completely edentulous maxillary and mandibular arches with no retained root fragments or pathological lesion and normal position of the condyles in the glenoid fossae.

On corroborating the history, clinical examination and radiographic evaluation, diagnosis of Class I edentulous maxillary and mandibular residual ridges was arrived at. A treatment plan was formulated to rehabilitate the edentulous maxillary and mandibular arches with conventional complete denture prostheses using heat polymerized acrylic resin. The procedure was explained to the patient and informed consent was obtained.

#### 3.1. The treatment sequence comprised of the following steps.

Maxillary and mandibular primary impressions were made with high fusing impression compound, final impressions were made with zinc oxide eugenol impression paste, Orientation jaw relation recorded using spring bow and transferred on Hanau semi adjustable wide view articulator. Vertical and centric jaw relations were recorded and mandibular cast was articulated. Teeth arrangement was done and bilateral balanced occlusion was achieved. The patient's approval was obtained at the trying stage after achieving the desired level of phonetics and esthetics. The dentures were processed using heat polymerized acrylic resin utilizing a long polymerization cycle to reduce the amount of residual monomer content.

The prostheses were finished and checked for the function, comfort, speech and esthetics. After that, a bar code with specific patient identification number was generated and incorporated on palatal side in the cameo surface of maxillary denture by making a groove (Figures 1 and 2). Bar code was printed on a paper and laminated in order to prevent any damage from saliva and oral environment. Bar code was covered with a transparent sheet and secured within prosthesis using clear auto-polymerizing

acrylic resin. A software was designed which contained complete personal information of the patient including name, age, blood group, contact number, address of the patient along with next of kin's data Software worked on the basis of unique patient identification number. Upon scanning bar code with a barcode scanner or with bar code scanning software in mobile, it decodes the same patient identification number which was fed while generating the bar code and on account of which patients information is stored in the software (Figure 3). Patient identification number was typed in the software, which retrieved the patients information and data already stored.

Other advantage of this treatment modality is that the clinical, radiographic and photographic data of the patient can also be stored in the software.

### 4. Case 2

A 56 years old male patient reported with a chief complaint of inability to chew food since last 10 months due to loss of teeth. Medical history did not reveal any significant data. Extra oral clinical examination revealed symmetrical face, with tapering facial form and concave profile. Intra-oral examination revealed completely edentulous maxillary and mandibular residual ridge with no other contributory finding. Radiographic examination confirmed the same and based on these examinations, diagnosis of Class I edentulous maxillary and mandibular residual ridges was arrived at. Treatment plan was formulated to rehabilitate edentulous maxillary and mandibular arches with conventional complete denture prostheses using heat polymerized acrylic resin.

Treatment sequence was similar to the previous case. Finished prostheses were delivered to the patient and recall was done after 24 hours. On the day of recall visit, incorporation of micro SD card in mandibular denture was planned. A trough equivalent to the size of micro SD card was prepared in the lingual flange of the mandibular denture (Figure 4). Fit of the micro SD card was checked and it was laminated with cellophane sheet, to achieve complete isolation. Before lamination Micro SD was digitally synchronized with particular information of the patient, including photographic record. Laminated card was placed in the prepared groove and covered with clear autopolymerizing acrylic resin. Finished denture was delivered to the patient.

## 5. Discussion

Forensic odontology has been the main stay for conflict victim identification. Forensic odontology using odontological landmarks plays an important role in identification of war casualties, mass disasters, conflict victim identification and disbursement of justice in court of law.<sup>2</sup> In every case there are different conditions and it is not always that the



Fig. 1: Bar Code



Fig. 2: Maxillary Prosthesis with incorporated Bar Code

	Patient ID	01dentcd	
	Patient Name	XYZ	
	Son's Name	ABC	
	A ddress	QWERTY	
	Phone NO.	8*****2	
	Blood Group	X+	

Fig. 3: Clinical, Radiographic and Photographic Data



Patient name : ABC  
 Age/Sex : --/M  
 Address : QWERTY  
 Mobile No : 9\*\*\*\*\*9  
 Blood Group : Y+  
 Son's Name : XYZ



Conventional Maxillary and Mandibular Complete Denture fabricated using high strength heat polymerised acrylic resin delivered on 31 Oct 2019

Fig. 4: Mandibular prosthesis with micro SD card and Personal details of patient

existing odontological parameters are available to solve the hurdles of that particular situation. So these identification devices or markers incorporated in the prostheses play a vital role in forensic identification of an individual.<sup>3</sup> There are numerous identification devices available which can be incorporated in the prostheses namely barcode, memory SD card, Lenticular card, RFID tags and unique identification numbers (Aadhar card Number) can be engraved within the prostheses.<sup>4,5</sup>

Bar code and micro SD card are relatively simpler, economic and most feasible amongst the various devices available to be incorporated as identification markers in complete and partial denture prostheses. They can be incorporated before or after polymerization without causing any damage to the prostheses.

Bar coding a prosthesis is an important marker for identification of the individual. Bar code is a 2D strip which can be generated online and printed on a paper. It can store large amount of information which can be revealed directly by scanning it with a bar code scanner or with mobile QR code scanner. It requires a software in which the information of the patient is stored and is synchronized with bar code through a unique identification digital number.

When a bar code is scanned with mobile QR code scanner, it generates a number and when this number is fed in the software, it will retrieve the complete information which has been stored in the software. This is an inexpensive method of marking or labeling a prosthesis with identification device, which helps in recognition of an individual in disastrous circumstances.

Bar code can be easily incorporated in the prosthesis and the antemortem data can be revealed by scanning it with a mobile with good quality camera.<sup>6</sup> Bar code printed on a paper should be laminated so as to protect it from salivary secretions and food in order to avoid the 2D pattern of the bar imprint on the paper.<sup>7</sup> It can be incorporated on the cameo surface of buccal flange or palatal aspect of the maxillary prosthesis. Bar code requires a specific dimension and good quality print to be read easily by the scanner. Barcodee should not be incorporated on the curved surface, otherwise it will not be detected by the scanner and will produce a false reading. Additional advantage of this modality is that it can also be used to identify the denture in laboratories with extra load so as to control cross infection.it is also of great use in large hospitals with geriatric population. Studies have revealed that photographic papers/ bar code markers are resistant to a temperature of 200-300°C. Richmond and Pretty have stated that markers which can be damaged with fire should be positioned palatally or lingually in the maxillary or mandibular molar region so that they can be protectd by the tongue.<sup>8</sup>

Micro SD card is an important marking device which can be incorporated in the lingual flange of mandibular

prosthesis or buccal flange of maxillary prosthesis.<sup>9</sup> These locations does not pose any esthetic problems and are well protected by buccal mucosa.<sup>10</sup> Micro SD card is easily available and the complete personal information of the individual ranging from name, age, sex, address, contact number, treatment delivered, blood group along with next of kins information can be stored in it. Moreover clinical, radiographic and photographic records of the patient can also be stored which can further aid in the accurate identification of the individuals. Information can be directly transferred from computer in to the card and can be retrieved when ever required. Small size of micro SD card provide ease of incorporation and placement in the prosthesis. It is not affected by variable oral conditions such as temperature and moisture as it is protected by a laminated sheet and also covered by a layer of clear autopolymerizing acrylic resin. Whenever required, the card can be retrieved from the prosthesis and information can be accessed by connecting it to a computer. The only disadvantage of this technique is that there are chances of damage to the memory card while retrieving it form the prosthesis and extra care is required at that time to avoid any damage.

A recent advancement in terms of incorporation devices is RFID tags which are radiofrequency identification tags in which information is to be fed with RFID writer and that can be read with the help of RFID reader.<sup>11</sup> The advantage of this modality is that they can be read from vicinity as they work on electromagnetic field.

## 6. Conclusion

There are various well known existing parameters in forensic odontology, which are working quite satisfactory in their efficiency to solve the hurdles in this field. Incorporation of these additional paramters by the prosthodontist along with the advancements the in the technology is an emerging aspect in the field of forensic odontology. Excellence can be gained in the same by collaboration of prosthodontist with various other specialists working in this field. Hence, it is also projected that a national data base portal is required to be established so that complete and comprehensive information of the patient including the treatment delivered can be stored. This data base can be accessed by the authorized dentists and government officials when any information is required in the interest of justice.

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## 8. Conflict of Interest

None.

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