The Value of Identification Marking on Dentures*

SUMMARY
Since there is a large variation in the oral status of populations all around the World, the need for removable dentures will continue for the next decades. Denture marking can play an important social and legal role. There are 2 methods for denture marking: the surface method and the inclusion method. The purpose of this article is to present some cases of denture marking with various techniques from both methods. Some of them are easy to make, having their advantages and disadvantages. Marking by the inclusion method is more persistent, but the research for new marking materials continues. There is an obvious need for an international consensus about denture marking for clinical and forensic purposes.

Keywords: Denture Marking, methods; Human Identification; Forensic Odontology

Introduction
In today’s complicated and fast paced life, it often becomes difficult to identify deceased individuals. People may die in accidental disasters in trains, airplanes or buses, or in natural disasters such as floods and earthquakes. When these disasters occur, the bodies are often found decomposed, fragmented or burned. Persons who die as a result of these causes are often found decomposed and/or skeletonized. With facial features and fingerprint pads often missing, the principal method of identification is through dental means.

Denture marking is a well-accepted mean of identifying both dentures and persons. It facilitates the identification of a patient in cases of unconsciousness, loss of memory and for forensic purposes (post-mortem identification) during war and civil unrest, crime cases, natural and mass disasters. It is also useful in geriatric institutions, hospitals and dental laboratories1,2. Since the oral status of population varies in different countries and the wearing of full dentures will continue for the next decades, the denture marking can play an important social and legal role3. The material from which a denture has been made, the type of the teeth and the standard of workmanship may help in identification4. Dentures are not always marked. In European legislation, denture marking exists only in Sweden and Iceland5,6.

There are 2 main methods in marking the dentures. In the surface marking method, the marks are located on 1 of the denture’s surface. In the inclusion method, the marks are enclosed in the denture. The mark should be placed in a part of the denture without affecting the resistance of the denture, it will not be visible when the patient wears them, and it will be relatively protected in case of a fire. Therefore, the posterior regions of the lingual flange and palate are recommended2.

The purpose of this article is to present some cases of denture marking, including marking by using metal materials. The dentures presented are 3 removable complete maxillary dentures, 1 removable partial maxillary denture and 2 removable partial mandibular dentures.

Case Reports of Different Marking Methods

Surface Method
Scribing or engraving the denture: This is the simplest way of marking dentures. In this technique 2 letters were engraved with a small round dental bur on the fitting surface of the maxillary complete denture, which resulted in countersunk letters (Fig. 1). The first letter is the initial letter of the name and the second letter is the initial letter of
the surname. In this case, the letters KX are present on the fitting surface of the maxillary complete denture. The denture of Fig. 1 belongs to a 70-year-old man.

Marking with embossed letters: In this technique, embossed letters are made by scratching or engraving on the model before processing (Fig. 2a). The maxillary complete denture of Fig. 2a belongs to a 65-year-old man. His initial letters were written on the buccal surface of the disto-buccal flange. This technique can be also used in partial dentures, as shown in figure 2b.

Writing on the denture surface: In this technique, the tissue-fitting surface of the finished denture is temporarily marked with a fibre-tip pen or a sharp graphite pencil and covered with a clear varnish, like Vocolpal Varnish (Voco Cuxhaven, Germany). The mark is better protected against abrasion by layers of varnish. The technique is as following: A small area of the surface of the denture is roughened, removing the polish with fine sandpaper. Then the patient’s full name or initials or a special number are written on the denture surface, covered by at least 2 thin coats of varnish. Varnish may be prepared by dissolving 5 g of acrylic resin polymer in 20 ml of chloroform. A clear solution, easy to apply, with long life is produced, that has excellent resistance to abrasion, cleaning and disinfecting agents, and does not affect the strength of the denture or induce surface crazing. The first coat should be dried, before applying the other coats. In our cases, in figure 3a, the identification mark, a special number 223, appears posterio-laterally on the fitting surface of the maxillary complete denture, which belongs to a 65-year-old man. In figure 3b, the patient’s initial letter of the name and the surname was written with a felt marker on the buccal surface of the disto-buccal flange of the removable partial maxillary denture, which belongs to a 70-year-old man.

Inclusion Method

The removable partial mandibular denture seen in figure 4 belongs to 80-year-old man of Greek origin, living in Sweden. It was marked, according to the Swedish model of marking dentures, with a stainless steel metal band, the Swedish ID-Band. First, the denture was disinfected, cleaned and dried. Then a shallow recess for the metal band was prepared with a round bur on a hand piece in the denture base in the desired location, to a length 6 mm longer than the identification band. The preparation was 3 mm deeper than the thickness of the metal band. The metal band was placed in the lingual flange of the partial mandibular denture and contained a letter (S) and a 10-figure number. The letter S stands for Sweden. The first 6 digits are the patient’s date of birth, date month year with zero as a prefix to numbers smaller than 106.
The next 3 digits are the birth number and the last digit indicates the sex. It is even for females and odd for males. The personal identification number contained in the metallic band of the case shown in figure 4 is S-260614-6788 (S=Sweden, 26=year of birth, 06=month of birth, 14=day of birth, 678=birth number, 8=control digit) all of which were not less than 1.5 mm high. This personal identification number of the patient appears also in the identification card, the passport, the hospital card, the unemployment card, etc.

A small amount of clear acrylic resin (Hygienic Dental Mfg. Co, Akron, Ohio USA) was placed on the bottom of the prepared recess. Then the metal band was placed on the recess and examined for proper fit. The band was covered with clear acrylic resin, trimmed and finished in the usual manner. After polishing, it was checked if the personal identification number was clearly readable.

**Discussion**

In large scale disasters, associated with fire, the damage caused by heat could make medico-legal identification of human remains difficult. Therefore, the role of forensic odontology can be crucial. As teeth, restorations and dental prostheses are quite resistant to high temperatures, they could be used as aids in the identification process10. The absence of some or all of the teeth is a common situation in older age groups. In that case, the presence or absence of dentures could aid the identification. In some cases, it is essential to demonstrate that the denture had been worn by the victim and was not discarded at the scene by someone else4,11.

Denture marking or labelling is not a new concept in either prosthetic or forensic odontology, and forensic odontologists have proposed its routine international practice for many years. In 1835, the burnt body of the Countess of Salisbury was identified by her golden dentures and this was the first known case of identification by dentures9. In early 1920s, the idea of marking dentures was mentioned for the first time6. In 1972, at the Congress held in Mexico, the F.D.I. (Federation Dentaire International) proposed the marking of the dentures “recommending to all member associations to introduce denture marking in their respective countries”. In some countries the marking of dentures is regulated by legislation, but in other countries it is the dentist’s or the patient’s decision6. The results of a survey by Alexander et al12, aiming to determine the extent of the practice of denture marking in South Australia, indicated that no practitioner marked dentures routinely. The reasons for not marking dentures were cost, lack of awareness of standards and recommendations, and a belief that it was of little importance.

The standard requirements for denture markers as outlined by the British Council on Prosthetic Services and Dental laboratory Relations are the following6:
- The strength of the prosthesis must not be jeopardised;
- 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 aesthetically acceptable;
- The identification mark should be biologically inert (when incorporated into the denture).

In addition, the marking should be permanent and resistant to everyday cleansing, and withstand the cleansing and disinfecting agents2.

Over the years, 2 methods of denture marking have been proposed: the surface marking method and the inclusion method. The surface method is easy to apply and relatively inexpensive. Skilled personnel are not necessary, but they wear off very easily and should be reapplied. The inclusion method is permanent and provides a more predictable result, but it could weaken the structure and create porosity. It is more expensive and is usually made by trained personnel in dental laboratories, or it can be done in a dental office with relatively basic lab equipment2,7,8.

There is another surface marking technique in which the initials of the name and the surname of the patient are scratched with a sharp instrument (or with a dental bur) on the master cast. Mirror writing should be used. This technique produces embossed lettering on the fitting surface of the denture. This technique is not really recommended, since a carcinoma was reported close to a mark made in this way9.

The inclusion method can be divided in 2 categories: a) inclusion method using non-metal materials like finely woven nylon tape, onion skin paper, etc and b) inclusion method using metal materials-markers. These materials (non metal or metal) can be incorporated into the denture at the packing stage. During the final closure of the flask and the processing of the denture, there is a possibility of dislocation, wrinkling or tear, thus reducing their value as identification markers. The other variation is to incorporate the metal or non-metal marker after the finishing of the denture, making a small cavity2.

The Swedish ID-Band (SDI AB, Sweden) has become the international standard. It is a stainless steel metal band. Research has shown that ID-Band is not resistant to very high temperatures7,6. Olsson et al6 tested 3 different types of steel bands (Jasch, Remanit, ID-band) exposed to temperature levels of 1100°C, 1200°C and 1300°C. At 1100°C only the ID-band and the Jasch band were readable, but none of them at 1200°C and 1300°C. Thomas et al13 tested ID-Band, Ho-Band (stainless steel matrix) and Titanium foil at 700°C and 900°C. The performance of
ID-Band and Ho-Band was similar, meaning that Ho-Band could be used as a cheaper alternative.

Since there is no international consensus regarding the marking materials, the need for new more persistent materials is obvious. There are many proposals about the use of microchips for marking dentures. They have small size, they could include a lot of information (full name of the patient, sex, country of origin, ID number, etc). The data can be detected with the aid of a reading device. Their disadvantage is the high cost of manufacture and data incorporation. At the same time they arise a number of ethical dilemmas\textsuperscript{14,15}.

Legislation for denture marking exists only in Sweden and Iceland. In 1986, the recommendation issued by the National Board of Health and Welfare of Sweden stated that “the patients shall always be offered denture marking and be informed about the benefit. Denture marking is not permitted if the patient refuses it”\textsuperscript{16}. All dentures made in the Dental School of the University of Iceland are marked. However, Stenberg and Borrman\textsuperscript{16} showed in a study that only about 35% of the full dentures in Sweden were ID-marked. In the USA, denture marking is mandatory in 21 states, while in New York State denture marking is performed only after request of the patient. Several states impose the obligation to mark dentures on long-term care facilities and denture marking is compulsory for the Army\textsuperscript{6}. In the United Kingdom, denture marking is not compulsory. In Australia, the nursing homes require that the dentures of their residents should be “discretely labelled”\textsuperscript{12}. In Greece, there is no legislation for marking dentures. It’s the dentist’s decision to present the benefits of denture marking to the patients and ask for their consent. The dentures of the cases presented in this article were marked after the written consent of the patients\textsuperscript{17-20}.

Andersen et al\textsuperscript{21} have estimated that in Nordic countries, if denture marking was used generally, the contribution to the establishment of identity by forensic odontology in cases of fire would be increased by about 10%. Dentures can survive surprisingly well in fire provided they are not directly exposed to the flames\textsuperscript{4}. At the same time, carefully taken and well-protected dental records are essential. Since there is no international consensus, international collaboration is needed to solve the issue of denture marking for clinical and forensic purposes\textsuperscript{6}.

Conclusions

Denture marking is not a new concept. There are 2 methods, the surface method and the inclusion method. Each method can be applied using various techniques. Some of them are easy to apply, having their advantages and disadvantages. Marking by the inclusion method is more persistent, but the need for new marking materials exists. Microchips could be an alternative solution. Accurate dental records should be taken and kept carefully for a long time. The need of an international consensus about denture marking for clinical and forensic purposes is obvious.

The author’s suggestion is that dental associations of the Balkan countries and similar organisations should seriously consider bringing the issue to the attention of governments and populations, so that quality assurance programmes also involve the issue of denture marking for clinical and forensic purposes.

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References


Correspondence and request for offprints to:
Ch. Stavrianos
Aristotle University, Dental School
Department of Endodontology
Thessaloniki, Greece