

# Role of dental implants in forensic identification

Dental implant is a component that is placed within the jaw bones to aid support for the dental prosthesis by means of osseointegration. Recently dental implants are more often used in dental identification especially for cases where dentition is entirely constructed from implants. Dental implants are broadly classified based on their properties, implant design and attachment mechanisms. Modern dental implants fuses with bone through the biological process called osseointegration. Some of the materials like titanium and ceramic help in bone integration rather causing foreign body reaction. Recent advances like implant recognition software, radiographic recognition of dental implants and assessment of batch numbers help the forensic odontologist in identifying the victims by comparing with the antemortem records of the affected victims.

## Radiographic recognition of dental implants as an aid to identifying the deceased

**John W. Berketa, Robert S. Hirsch, Denice Higgins, Helen James**

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Forensic identification of the deceased involves various methods among which radiographic recognition of dental implants is one of the method used in identifying the individual. Dental identification involves the process of correlating the post-mortem details to the antemortem records of the given name. Various methods are available for identifying the dental implants in deceased such as intraoral radiographs, 3-D imaging, CT, panoramic image. Since intraoral radiography is already used commonly by odontologist in analyzing post-mortem records, it would be the method of choice for forensic identification.

In this article the author conducted a study to determine whether dental implants can be recognised radiographically and differentiated by company type, which would be useful for identifying the deceased and also if Implant

Recognition Software (IRS) improved the accuracy of recognition. Radiographic images were obtained from forensic odontologist both nationally and internationally and were digitalized. These images were assessed by the examiners. Both inter examiner differences and intra examiner difference were assessed and the examiners were asked to examine the images utilising the IRS and the entire process been repeated after a week in a random order. The author has discussed the intra examiner error was a significant factor as there was a significant difference between one examiner to the other, which would suggest that the examiners baseline knowledge about implants affects the study.

The author also adds on the disadvantages by this method such as poor angulation, lack of clarity and poor definition of images. The author also emphasize that there is only a marginal difference in IRS compared to radiographic method and IRS to be updated with more number of radiographic images. He further concludes that the introduction of new improved system to IRS system and the expansion of the available information lead to increased recognition rate.

## Survival of batch numbers within dental implants following incineration as an aid to identification

**J. Berketa, H. James, V. Marino**

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The purpose of this study is to identify the survival batch numbers which is inserted in the dental implant following incineration as an aid to identification. Instead of batch number the implants were to place an individual serial number, which helps to establish for the identification of the victims. The batch number of the pre and post incineration implants can be compared.

In this study, the author conducted a laser etching batch numbers within the chamber of their implants. In the case of incineration of victims, it is important to ascertain the implant batch numbers within the implant chambers survive the incineration process sufficiently that numbers can be identified. Implant batch numbers were imaged using a WILD Heerbrugg microscope attached with digital camera. The batch number is clearly visible within implant before firing. Following firing the number is still visible where there is an oxidation layer the survival of the

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identifying batch number will depend on the depth of the etched number and the thickness of the oxidation layer.

Although implants has high physical properties and will resist thermal insult, the lack of uniqueness of mass produced objects limits the use of implants in identification. Companies could be convinced to insert serial numbers on each implant could help establish a new approach to identify deceased persons.

## Identification of dental implants through the use of implant recognition software (IRS)

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*Int Dent J 2006;56:203-8*

Identification of victims by dental implants is the emerging field in forensics. Implant software recognises implants according to the specifications provided that makes the procedure efficient when it is used along with the radiographic techniques. Various identifying modalities have been followed by the odontologist for implant recognition. IRS adds to the general dental practitioners in identifying the unidentified implants.

This article was aimed to develop a simpler software program to enable identification of implants by collecting relevant information including images. The author has collected all the information regarding dental implant products by World Wide Web search and in all languages over a 10 month period. Eighty seven implant manufactures were identified and 231 different implant designs were produced in relation to implant body shape, abutment connection and surface characteristics. The principle of IRS is of collecting positive dataset stored in a stand alone database and the possible implant system being detected by several questions. It also includes the implant recognition by comparing with the radiographic and clinical images of the derived system. The details of the implant manufacturers like (e-mail address, web page, and phone numbers) have been identified at the end of the search. This software can be used for single murders or after mass disasters for the identification of body. If it has a dental implant by identifying the implant system, site, length and its diameters. The author thus concludes that the clinicians and technicians job of identifying dental implant would be simplified by this IRS software.

## Radiographic dental implants recognition for geographic evaluation in human identification

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Dental implants are used to identify the human remains by radiographic recognition and geographic evaluation. If a human body is found and does not contain dental record it can be identified by the radiographic images of the dental implant. The radiographs of dental implants are used to

identify the manufactures and the implant design. Digital radiography of the implants was taken and it is used to identify the type of implant. Radiographs are useful for the odontologist to identify the victims.

The aim of this study is to identify the unidentified victims with dental implants by the radiographic images. Forensic identification is based on the comparison of post-mortem dental records with antemortem dental records. In this study, Italian implant manufactures were asked specimen implants of various diameters. The digital radiographs were taken of all implants. The radiographs are taken in horizontal rotation, vertical inclination relative to radiographic beam and X-ray sensor. Fifteen images per implant were taken and examined to identify the features that would aid in implant recognition. The radiographs were made with trophy x-ray appliance and trophy radiovideography sensors are used. During the postmortem implant radiography the position of the X-ray device and sensor should reproduce the geometry of the implant design. In the identification many different x-ray is taken so that a clear geometrical implant image is obtained. The digital radiographic images help forensic odontologist to identify the unknown victims with no dental records.

## Morphological analysis of dental implants-forensic significance

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*Rom J Leg Med 2010;18:207-12*

Dental implants have become a common procedure in the recent decade due to its minimal risk and decreasing cost. Dental evidence is widely used in forensic identification because of its low cost, availability of past dental records and its uniqueness to each individual. As most of the dentition is entirely constructed by implants in the recent years, dental implants are more often used as a tool in forensic identification.

In this article, the author has assessed the implants radiologically, morphologically as well as by its restorative material. The author has figured out few parameters for radiological assessment like position and shape, bone density and implant fixture. He further adds that one should take into consideration the technique used for radiograph to avoid distortion of image. Morphologically the article focuses on three main parts of implants for identification (apical, midbody, and coronal). Forensic identification by determining the restorative material radiodensity that is used for the implant restoration adds additional evidence in dental identification.

The author concludes that the medico legal usefulness of the dental implants is restricted or limited due to insufficient and biased geographic data available. A more keen focus on dental implant information including dental implant type

and its restorative information would be helpful for better odontological identification.

### **A pilot study in the recovery and recognition of non-osseointegrated dental implants following cremation**

**Berketa J, James H, Marino V**

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Dental implants are used as an essential aid in emerging field of forensic identification because of its ability to resist higher temperature even after incineration. Various studies have been done to evaluate the dimensional changes of the implants when it is incinerated at higher temperature (1125°C). Identification of dental implants after cremation would be possible due to the color and texture change on its surface. The outcome of this type of investigation also depends upon the material used for dental implants like pure titanium and titanium alloy.

This article focuses on the changes that occur in the implants placed within the sheep mandible as well as the visibility of the batch numbers present within an implant following

cremation. Three different system of implants (straumann, nobel biocare and, ankylos) were used in this study and were placed in two fresh adult sheep head which are then transported to the professional animal crematorium and incinerated for 2.5 h at a maximum temperature of 780° C. Radiographic images of the implants were taken before and after firing and were compared using adobe photoshop software. The result shows that there was a minimal image difference of all implants with identifiable threads and grooves. Even the batch numbers of the implants were also clearly visible on microscopic examination.

Survival of serial numbers thus imparts a milestone in odontologic perspective of identification of the dental implants after incineration. He further adds that the laser etching of these batch numbers is assumed to be useful for dental identification.

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