

Forensic Dentistry – Identification from the Dentist's Point of View

**Dostálová T.^{1,2}, Eliášová H.³, Seydlová M.^{1,2}, Pilin A.⁴,
Hippmann R.^{1,2}, Šimková H.³, Daniš I.⁵, Zvárová J.^{1,6}, Nagy M.⁶**

¹Centre of Biomedical Informatics, Prague, Czech Republic

²Charles University in Prague, Second Faculty of Medicine, Department
of Paediatric Stomatology, Prague, Czech Republic

³Department of Biological Analysis, Institute of Criminalistics Prague,
Czech Republic

⁴Charles University in Prague, First Faculty of Medicine, Institute of Forensic
Medicine and Toxicology, Prague, Czech Republic

⁵Department of Chemical Analysis, Institute of Criminalistics Prague,
Czech Republic

⁶Department of Medical Informatics, Institute of Computer Science,
Academy of Sciences of the Czech Republic

Received February 6, 2008; Accepted May 26, 2008.

Key words: Dentistry – Forensic – Identification

*This project has been supported by the Ministry of Education, Youth and Sports
no. 1M06014.*

Mailing author: Professor Tatjana Dostálová, MD., DSc., MBA, Charles University
in Prague, Second Faculty of Medicine, Department of Paediatric Stomatology,
V Úvalu 84, 150 06 Prague 5, Czech Republic; Phone: +420 224 433 100;
Fax: +420 224 435 820; e-mail: tatjana.dostalova@fnmotol.cz

Abstract: The paper deals with an identification of missing persons based on a dental documentation. The procedure of the identification is presented in two case reports with a new possibility of electronic imaging called Dental Cross in comparison with classical dental documentation, which is officially used for identification of the missing persons by Interpol.

Introduction

The most common role of the forensic dentistry is the identification of deceased individuals. The dental identification of humans occurs for a number of different reasons, mainly in those cases when the body is fragmented or disfigured and visual recognition cannot be done. Dental identifications have always played a key role in natural and manmade disaster situations and particular in the mass casualties associated with aviation disasters. The identification is essential from both of the humanitarian and the religious points of view as well as for judicial reasons [1].

The dental examination is very accurate and also nowadays, in the time of a comprehensive fingerprint and DNA assessment, objectively supported. The identification, which is based on, the dental documentation leads up to 43–89 % of a successful process [1] and it is still a method of choice. The importance of teeth for identification consists in their highly mineralized composition, which makes them resistant to the influences of external environment. They are not changed by post-mortem decomposition and usually withstand to flames, alkali or even to weak acids [2, 3]. One's teeth are also an excellent resource of DNA [4]. Mostly the identification results from a medical treatment and its documentation. The regular dental examination of patients is generally carried out at least once to twice a year so their dental records represent important source of identification data. Registration of dental records is mandatory in several EU countries, health insurance companies require it and it is performed in dental private clinics as well.

The American Board of Forensic Odontology (ABFO) adopted Guidelines for the Bite Mark Analysis on February 21st, 1984. These recommendations were later provided as an obligatory legal norm. The American Board of Forensic Odontology [5] recommended that the results of the dental identification should be divided into four categories as follows:

1. *Positive identification*: the antemortem and postmortem data match in a sufficient detail, with no unexplainable discrepancies to establish that they are from the same individual.
2. *Possible identification*: the antemortem and postmortem data have consistent features, but because of the quality of either the postmortem remains or the antemortem evidence, it is not possible to establish the identity unambiguously.
3. *Insufficient evidence*: the available information is insufficient to form the basis for a conclusion.
4. *Exclusion*: the antemortem and postmortem data are clearly inconsistent.

The examination results are recorded into a special form called the INTERPOL Disaster Victim Identification (DVI) form (<http://www.interpol.int/Public/DisasterVictim/default.asp>). An electronic version of this form exists and is called DVI System International [6]. The program covers all parts of the paper based DVI forms. The user may select different languages for the user interface.

The new technique increased significantly data collection by implementation of interactive DentCross components is evaluated in two case reports. The electronic DentCross shows a virtual graphic combination of a dental examination and images including an X-ray and also photo documentation (i.e. root canal or implant picture) (Figures 1, 2) [7]. The end user can see all information in one screen. The main difference when compared with a written text in chart health documentation is more concentrated and more detailed information. There is a possibility of working with a treatment history of each tooth, which is in a special column when pressing the certain tooth. The user can appreciate the general assessment as well as the special periodontal examinations, which can be hidden or shown pressing a bottom in the lower part of the window. The typical example of the more structural record can be described in a filling. Whether the written file is used the filling is usually signed as a shortcut of one letter belonging to a certain tooth and the whole treatment is described in a free text. In the DentCross the filling is marked on the tooth in a certain size chosen from an offer of combinations and in a colour of used material. Secondary caries are marked with a red lining around the shape of filling. For any special notes free text can be supplemented in a right column when needed. The treatment history and the structurized and very detailed record are the main advantages from the electronical dental cross. The structure of the program can facilitate extracting the statistical data for various purposes inclusive finding a certain tooth treatment in the database, which can help in victim identification.

Our contribution demonstrates the practical ability of the DentCross component to deliver a real service to dental care and the ability to support identification of a person in forensic dentistry.

Case reports

The identification procedure is documented in two case reports described below.

Skeletal remains identification

Case report No. 1

Police in the forest near XY district found the dead body of an unknown man, in 1991. The corpse, in a considerably advanced step of rot, was brought to the Department of Forensic Medicine.

Decomposed changes of soft tissues indicated that the death occurred approximately a half-year ago. The detailed examination of the preserved soft tissues and bones revealed no marks that would prove crude violence or define

the cause of death. Relevant diseased changes of soft tissues could not be possibly evaluated because of considerable putrefactive changes of internal organs. The toxicological analysis of tissues excluded the cause of death by the drug poisoning. The forensic-anthropological expertises were done at the Institute of Criminalistics Prague. The only data, which could be evaluated from the skeleton, was the sex (according to skull and pelvis) and height (based on long bones). For these reasons, the leading method in identification was odontological examination that revealed mature incomplete tooth set. The age of the person – 50 ± 5 years was established based on examination of ground section of teeth (Figures 3, 4). The alveolar bone was markedly resorbed. The occlusal surfaces of teeth were worn. Signs of abrasions were observed on the necks of some teeth. Remnants of calculus were found on palatal parties of some teeth in the upper jaw.

Important individual indications were obtained by examining the state of the dentition. The visual classification of cranium affords an important identification sign – position of teeth and jaws matched expressive prognathia, which implicates big fleshy lips. The amalgam fillings were found on 13 teeth in total. The analysis of the fillings was implemented to know its composition and therefore the probable producer. The CamScan2 scanning electron microscope linked with a microanalyser of characteristic X-radiation – EDAX 9900 was used. The amalgam SAFARGAM (producer SAFINA Prague) was analyzed in an analogous way as the comparative material. Performed analyses confirmed that the filling material has an analogous composition like the SAFARGAM material, the Czech production. Nevertheless, because of homogeneity of material the proportion of single elements in the samples – silver, pewter, copper varied and precise quantitative could not be done. Even the composition of material is trade secret, the established absence of zinc in the analyzed amalgam lead to presumption that the amalgam is SAFARGAM being produced in SAFINA Prague since 1970.

All inductive offered strong support for identifying the personage. In the database of missing men was predicted B. S., born 1943, a handicapped pensioner after whom the nation – wide investigation was promulgated in the year 1991. The postmortem data agreed with found ante-mortem data.

Case report No. 2

The human remains embedded subterraneously were found during the garage demolishing. The body was dismembered for the purpose of covert disposal. The method included separation of body parts with an electric saw. After decapitation and separation of upper extremities and the trunk, the pelvis and parts of lower extremities were boiled vigorously for several hours. The process of sharp dissection of soft tissues from the skeleton succeeded. Both the cooked body parts and dismembered body parts, which did not demonstrate evidence of cooking, were subsequently buried and exposed to incidence of taphonomic factors in a soil

environment. The state of soft tissues answered to the time of death approximately a quarter of the year ago.

The examination of the tooth set contributed significantly to the determination of the time since death and to the identification. The teeth showed post-mortem red coloration (pink teeth). This red coloration may occur sometimes after death under conditions that promote putrefaction and the adipocere formation (Figure 5). The red coloration is due to hemolysis after exudation of hemoglobin derivatives through the dentine tubules.

Post-mortem radiographic studies of dentition were successful after searching antemortem dental X-rays. The features on the X-rays of the dead body answered to the findings on the X-rays of the first missing man (Figure 6). A presumed person, a man, aged 45, who disappeared from his family a quarter of a year before, was found by searching for missing persons. The post-mortem data (sex, age at death) carried out by the anthropology analysis was consistent with the missing person physical characteristics.

Conclusion

When compared the official type of collecting the data in the Interpol forms with the Dental Cross imaging we can show the more detailed type of information excluding the free text in many aspects, as e.g. treatment of the root is included in one picture. The Dental Cross could be an alternative source of information for searching the victims.

References

1. VALENZUELA A., MARQUES T., EXPOSITO N., MARTÍN-DE LAS HERAS S., GARCÍA G.: Comparative Study of Efficiency of Dental Methods for Identification of Burn Victims in Two Bus Accidents in Spain. *American Journal of Forensic Medicine & Pathology*. 23: 390–393, 2002.
2. GRIFFITHS C., HILTON J., LAIN R.: Aspects of forensic responses to the Bali bombings. *ADF Health*. 4: 50–55, 2003.
3. JONES D. G.: Odontology often is final piece to grim puzzle. *J. Calif. Dent. Assoc.* 26: 650–665, 1198.
4. SWEET D., DIZINNO J. A.: Personal identification through dental evidence-tooth fragments to DNA. *J. Calif. Dent. Assoc.* 24: 35–42, 1996.
5. American Board of Forensic Odontology. Body identification guidelines. *J. Am. Dent. Assoc.* 125 (X): 1244–1254, 1998.
6. PLASS DATA. DVI System International – Disaster Victim Identification. www.dvisystem.com, last accessed: 11. December, 2006
7. DOSTÁLOVÁ T., ZVÁROVÁ J., SEYDLOVÁ M., TEUBEROVÁ Z., PIEŠ M., HANZLÍČEK P.: Data structuring and modeling of Dental Documentation in a form of Interactive dental cross. *Journal of Health Technology and Application* 5: 288–291, 2007.