Original Article

THE STATISTICAL ANALYSIS OF APPLICATION OF TEETH IN FORENSIC ODONTOLOGY CENTER, TEHRAN, IRAN, 1980-2000

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ABSTRACT

Objective: This retrospective study investigated cases in Tehran Forensic Odontology Center, which have been solved by using teeth as the main proof.

Methodology: Two hundred forty eight files in archives of Tehran forensic odonotology center during years 1980 to 2000 were reviewed and the data collected from each file.

Results: It shows that only 12 cases (4.8%) used the forensic odonotology for proof of identity and age or crime. Theses 12 cases include seven individual files and five group cases. In individual files, six cases were identified using dental charts, position or morphology of teeth. One case remained unsolved. In-group files, from total of 119 victims, only 26 cases was identified by using dental charts, position of teeth and presence of prosthesis.

Conclusions: Most of the cases in Tehran forensic odontology have been solved using either dental records or position of teeth.

KEY WORDS: Forensic odontology, Crime, Dental charts, Gustafson's technique.

INTRODUCTION

Forensic dentistry or forensic odontology involves dentists' participation in assisting legal and criminal issues. It refers to the proper handling, examination and evaluation of dental evidence, which will be then presented in the interest of justice.[1] The evidence that may be derived from teeth, is the age and identification of the person to whom the teeth belong. This is done using dental records or antemortem (prior to death) photographs.[2] Besides, a forensic odontology report sets out the findings of a comparison between antemortem and postmortem evidence and indicates the odontologist's opinion on the identification. This opinion needs to be defendable in a court of law.[2]

In forensic dentistry different methods and techniques are used to determine age, sex identification of victims or assailants. Sex determination can be done using a major protein, which has been found in the human enamel called AMEL. Slight difference in size and pattern of the nucleotide sequence in AMEL has been seen in male and female.[3,4] A comprehensive dental record with number, position, morphology of teeth, a record of treatments which has been done on each tooth, all together have golden value in legal problems.[5] Teeth are highly resistant to destruction and decomposition, so dental identification can be made under extreme circumstances. Morphology of a buried tooth remains the same even after months, but amalgam fillings become soft and liquid.[6] A burnt tooth shrinks and its root curves. Severe burn makes crown to get powder. Different degree of temperature produces

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different changes to the tooth. At 150 degree centigrade it starts cracking and at 800 degree dentin is carbonized and becomes blue in color. If a burnt tooth is not recognizable by appearance, microscopic examination needs to be done.[7] In age determination since the human body has different number of teeth in different period of life, therefore it helps to determine the age almost easily.[8] If a single tooth is available (without body), Gustafson's method is used to determine age.[9,10]

New techniques of body identification are based on DNA analysis. Polymerase chain reaction (PCR) which enable amplification of very tiny amount of DNA to concentration suitable for diagnostic analysis.[11,12] Another method for identification purpose used is mt.DNA. The victim's identification involves a comparison between DNA obtained from tooth fragment of victim and blood sample of biological relative's.[13,14] Bite marks also can be used in crime identification.[15,16] For this purpose the bite marks is fixed in 10% formalin then saliva swab, photography and impression of the bite mark have been obtained. Acetate tracing from models of suspect is generated

and comparisons between these two models have been done by considering the anatomic location, type of injury and shape of the bite marks. The analysis of the information will prove links to the suspect.

METHODOLOGY

In this retrospective cross sectional study, we reviewed 248-death certificate from July 1980 to July 2000 available in the archive of Tehran forensic odontology center. The number of files on which teeth has been used to determine the identity, age, gender or crime was only 12 files. These consist of seven individual cases and five group files. The data was extracted from the records and results summarized in the tables. Computer based analysis were used for processing the data.

RESULTS

The results of 248 files showed that only 12 cases (4.8%) in which the tooth information were used for identification. These files can be divided into seven individual cases and five group files. The analysis of seven individual file showed that dental information helped in

Table-I: The results of using teeth in 7 individual cases in Tehran forensic odontology center 1980-2000.

No.	Case description	Year of occurrence	Mode of use	Result
1.	Decomposed body of minister of petroleum in Iran-Iraq war	1980	Comparing dental records with teeth after death	Identity determination
2.	An unknown body found in a desert near Tehran	1999	Comparing dental records with teeth after death	Identity determination
3.	A female collage student was murdered in the forest in north of Iran	1995	Midline diastema and missing upper left 2	Identity determination
4.	Robbery in a house	1999	Comparing the bite mark on a piece of apply found on the scene, to the suspect's teeth	crime determination
5.	A young female was murdered in a desert near Tehran	1996	Tooth morphology help to identify animal's teeth which were given to forensic center by the murderer instead of human teeth	crime determination
6.	Persecuting a girl child	2000	Comparing bite mark in the child's body to the bite marks of the suspects obtained on tongue blade by articulating paper	crime determination
7.	Persecuting a woman	2000	Photography of the bite mark on the cheek	case remained inconclusive

Table-II: The result of using teeth in group files in Tehran fornsic Odontology Center, 1980-2000

Group file description	year	body condition	Victims No.	Mode of use	No. Of identified	Results
1. Firing case. 2 bodies, One young and one old determination	1998	burnt	2	Unerupted third molar. Sufficient width attached gingiva and less attrition in young	2	age
2. Military plane crash identity	1999	burnt	6	Comparing dental records to the teeth after death determination	6	
3. Explosion of a political identity party's office in Tehran determination	1981	burnt decomposed	72	Missing an upper central incisor	1	
4. Terror of Iranian diplomats identity and a Journalist in Afghanistan determination	1997	decomposed putrefied	9	Dental records compared after death. Bridge on the incisors and family approval	2	
5. A plane crash identity carrying the around the city of Sari minister of road and transportation determination	2000	burnt decomposed	15	Comparison of dental record and teeth after death		

identification of three decomposed bodies (two cases using dental charts and another one by tooth position). Confirmation of crime was made in another three files using study cast of suspects (2 cases) and tooth morphology (1 case). One file remained unsolved since the materials in the forensic odontology center was insufficient. (Tables-I & IV).

Analysis of five groups of files showed that the total number of victims in these files 119 in which only 26 cases was solved by forensic odontology. The number of cases in each file varied between 2-72 persons. Dental information was used to identify 24 victims (22 cases using dental charts and one case tooth position and another case presence of bridge), and age determination of two victims using teeth conditions (unrupted third molars and width of attached gingival) (Tables II & III).

In total, during two decades only in 33 cases, dental information was used for identification or determination of age or crime. No sex determination was seen in this study.

DISCUSSION

Since the teeth are one of the most resistant parts of the human body, therefore they can be used as evidence in justice. When the crime scene is arranged in a manner that may mislead police a rotated teeth or bite mark on either victim's or assailant's body helps the law to prevent the culprit to escape justice. According to the present study only 33 cases were identified within a period of 20 years using forensic dentistry which is a very low number. These cases were identified by using dental records, tooth position or presence of prosthesis which are old methods and of low accuracy compared to fast and new methods. Most of the cases in this study have been identified using

Table-III: Absolute abundance of using teeth for identity determined in Tehran forensic odontology 1980-2000

Mode of use	No of cases identified		Total No.
	Group files	Individual files	
Dental records	22	2	24
Tooth position	3	1	4
Comparing bite marks to the teeth	0	2	2
Morphology of teeth	0	1	1
Prosthesis	1	0	1
A Vague photography	0	1	1
Bite mark	26	7	33

Table-IV: Absolute of identity, sex, age and crime, which was determined by using teeth.

File type	Files No.	VictimsNo.	Identity	Age	Sex	Crime/certain	Crime/vague	Total
Group	5	119	24	2	0	0	0	26
Individual	7	7	3	0	0	3	1	7
Total No.	12	126	27	2	0	3	1	33

dental records. One of the problems which exists in these records is that; they are not yet standardized and differ among individual dentists or countries. The international search for identity based on these records could be extremely difficult;[17] therefore a standard and worldwide-accepted dental records are recommended.

One individual case in the present study remained inconclusive, because of non-availability of advanced detection methods. In this case, the bite mark on the complainant's cheek was faded at the time of investigation; therefore justification was not possible. In an advanced technique developed by Australian Federal police ultra violet light uses to examine the bite marks. Since the damage to underlying tissue remains up to nine months, this method enable the examiner to see the bite marks to even after bruising has faded.[16] In France, using Gustafson's technique or determination of ABO antigen system of the dental pulp makes the identification easier than here.[10]

Other methods such as DNA analysis, PCR and different histochemical examinations are used in developed countries.[11-13] Unfortunately none of these advanced techniques are used in Iran and upgrading of technology in Tehran forensic department is highly recommended. Lack of funding, information and poor training of Iranian dentists in new methods of forensic odontology might be the reason for lack progress in this field.

In conclusion, most of the cases in Tehran forensic odontology have been solved using either dental records or position of teeth. Upgrading of the technology and equipments in this field is strongly recommended at par with other developing countries. Furthermore, training of dentists about the new techniques in forensic dentistry is necessary.

REFERENCES

1. Acharya AB. Teaching forensic odontology: An opinion on its content and format. Eur J Dent Educ 2006;10:137-41.
2. Higgins D, James H. Classifications used by Australian forensic odontologists in identification reports. J Forensic Odontostomatol 2006;24:32-5.
3. Karaman F. Use of diagonal teeth measurements in predicting gender in a Turkish population. J Forensic Sci 2006;51:630-5.
4. Inoue M, Hanaoka Y, Minaguchi K. Personal identification by DNA analysis of samples from dental prostheses made of acrylic resin. The Bulletin of Tokyo Dental College 2000;41:175-85.
5. Vermylen Y. Guidelines in forensic odontology: Legal aspects. Forensic Sci Int 2006;159 (Suppl 1):S6-8.
6. Bowers M, Bell G. Manual of Forensic Odontology 1995;3rd ed NY: ASFO.
7. Rossouw RJ, Grobler SR, Phillips VM, Van W Kotze TJ. The effects of extreme temperatures on composite, compomer and ionomer restorations. J Forensic Odontostomatol 1999;17:1-4.
8. Solheim T, Vonen A. Dental age estimation, quality assurance and age estimation of asylum seekers in Norway. Forensic Sci Int 2006;159 (Suppl 1):S56-60.
9. Muhlemann, HR, Steiner E, Brandestini M. Identification of mass disaster victims: the Swiss identification system. J Forensic Sci 1979;24:173-81.
10. Metzger Z, Buchner A, Gorsky M. Gustafson's method for age determination from teeth- a modification for the use of dentists in identification teams. J Forensic Sci 1980;25:742-9.
11. Anzai K E, Hirata MH, Hirata RD, Nunes FD, Melani RF, Oliveira RN. DNA extraction from human saliva deposited on skin and its use in forensic identification procedures. Braz Oral Res 2005;19:216-22.
12. Malaver PC, Yunis JJ. Different dental tissues as source of DNA for human identification in forensic cases. Croat Med J 2003;44:306-9.
13. Mornstad H, Pfeiffer H, Yoon C, Teivens A. Demonstration and semi-quantification of mtDNA from human dentine and its relation to age. Int J Legal Med 1999;112:98-100.
14. Moenssewns A, Starrs J, Henderson C, Inbau F. Scientific evidence in civil and criminal case. 1995;Westbury, NY: Foundation press.
15. Vale GL. Dentistry, bite marks and the investigation of crime. G Calif Dent Assoc 1996;24:29-34.
16. Freeman AJ, Senn DR, Arendt DM. Seven hundred seventy eight bite marks: analysis by anatomic location, victim and biter demographics, type of crime, and legal disposition. J Forensic Sci 2005;50:1436-43.
17. Ghazaei S. Forensic Medicine. 1990; 2nd Ed. Tehran, Iran.