Braz J Oral Sci.
January/March 2009 - Volume 8, Number 1

Original Article

# Evaluation of identification cases involving forensic dentistry in the city of Pelotas, RS, Brazil, 2004-2006

Fernanda Nedel[1], Ana Paula Nedel[2], Ricardo Henrique Alves da Silva[3], Rafael Guerra Lund[4]

[1]Undergraduate student, Dental School, Universidade Federal de Pelotas (UFPel), Pelotas (RS), Brazil
[2]DDS, MSc, Postgraduate student in Social Politics, Universidade Católica de Pelotas (UCPEL), Pelotas (RS), Brazil
[3]DDS, MSc, PhD, Professor, Department of Pediatric Clinic, Community and Preventive Dentistry, Dental School of Ribeirão Preto, Universidade de São Paulo (USP), Ribeirão Preto (SP), Brazil
[4]DDS, MSc, PhD, Assistant professor, Department of Biochemistry, Institute of Chemistry and Geosciences, UFPel, Pelotas (RS), Brazil

## Abstract

**Aim:** This study investigated the use of dental arch examination as a forensic technique for body identification at the Institute of Forensic Medicine (IML, acronym in Portuguese) of Pelotas (RS), a city located in the South of Brazil. **Methods:** The data collected for the study referred to the period between 2004 and 2006, when a forensic dentist was part of the IML staff. The *post-mortem* records with regard to the entry of unidentified bodies that had undergone dental identification by the forensic dentists were analyzed quantitatively. **Results:** Ten unidentified bodies entered the IML and all of them were submitted to dental arch examination for body identification. However, the conclusive identification was based on the analysis of DNA, because the victims' dental records were not accurate, complete and updated. Only five assessed bodies had been referred from Pelotas police station, two from Pedro Osório police station, one from Capão do Leão police station, one from Arroio Grande police station and one had no information about its origin. **Conclusions:** The current configuration of Pelotas IML staff does not include a forensic dentist, and the presence of this professional is needed, for the city is reference for referral of forensic cases from the surrounding region.

**Keywords:** forensic dentistry; human identification; tooth; forensic anthropology.

## Introduction

Forensic Dentistry is the specialty that investigates psychological, physical, chemical and biological phenomena that can reach human beings (alive, dead or body fragments), comprehending aspects of human identification; criminal, civil, labor and administrative forensic investigation; forensic tanatology; legal documents; forensic traumatology; image examinations (e.g.: X-ray, tomography); saliva analysis and other aspects involving a multidisciplinary approach[1].

Recent events have emphasized the important role that forensic dentistry plays in the identification of victims of air and industrial accidents, natural disasters and terrorist attacks[2,3]. Furthermore, forensics dentistry also uses its expertise to identify the relation between aggressor and victim in crimes involving rape, murder, body injury and child abuse in which damage has occurred by leaving remaining bite marks[2].

The identification of human remains is usually made by photographs, comparison of radiographic images, fingerprints and, more recently, DNA-based techniques. However, these

**Received for publication:** December 12, 2008
**Accepted:** March 25, 2009

**Correspondence to:**
Rafael Guerra Lund
Universidade Federal de Pelotas,
Faculdade de Odontologia
Rua Gonçalves Chaves, 457
CEP 96015-560 – Pelotas (RS), Brasil
E-mail: rafael.lund@gmail.com

methods of identification have some limitations and may become ineffective when the investigated bodies are decomposed, skeletonized, fragmented or mutilated, preventing its recognition in expert investigations[4-6]. Such cases are referred to forensic dentistry specialists. Dental identification is the most commonly used technique in these cases. The application of forensic dentistry techniques may be very useful in human identification, for the dental tissue may resist extreme conditions of degradation, such as exposure to high temperatures, humidity and excessive pressure. The high mineral content of dental tissues, especially enamel, is responsible for their hardness and resistance, making the dental examination a key component for identification of human bodies[5].

The dental characteristics were proved to be particularly important for the identification of carbonized victims in mass disasters, when visual recognition and identification by means of fingerprints and DNA analyses are not possible. The unique characteristics of a person's teeth can make a positive identification of human corpus[2]. Since restorations and dentures also have high durability, the combination of restored, non-restored, absent and temporary teeth can be exceptional as a fingerprint, and it is very unlikely for two dentitions to be completely equal[4,7].

The importance and acting fields of the forensic dentist at Institutes of Forensic Medicine (IML, acronym in Portuguese), outside them and in congener institutions, range from working as an expert or technical assistant (in cases of civil, criminal and labor area) to being the head of an administrative headquarter. Furthermore, the different methods of human identification used in forensic dentistry (dental arch exams, palatal rugae and DNA extraction of the dental pulp) must be exclusiveness of the forensic dentist because this professional is the only one who has the proper skills to intervene in the cadaver's encephalic biotype. Therefore, deep forensic knowledge from the dentist is required to work in this field because it implies several attributions and liabilities, such as being legally nominated to undertake several kinds of expertise in the civil, criminal and labor areas and acting in the administrative council[8,9].

This study investigated the use of dental arch examination as a forensic technique for body identification in the IML of Pelotas (RS), a city located in the South of Brazil.

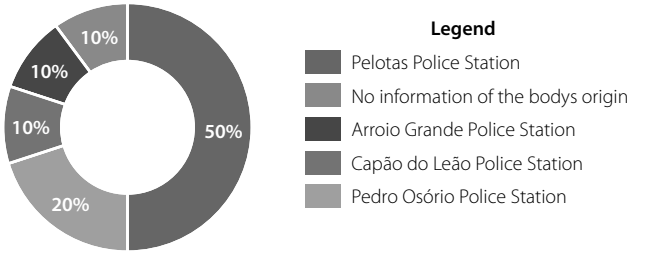


**Figure 1.** Cases that used dental identification referred from the police stations of surrounding cities.

## Material and methods

The research protocol was reviewed and approved by the Research Ethics Committee of the Universidade Federal de Pelotas, Brazil. The data collected for the study referred to the period between 2004 and 2006, when a forensic dentist was incorporated in the staff of the IML of Pelotas (RS), Brazil. The *post-mortem* records referring to the entry of unidentified bodies that had undergone dental identification by the forensic dentist were analyzed quantitatively. The records comprised a complete tooth diagram (odontogram), detailed description of the upper and lower dental arches and information about age, skin color and gender.

## Results

Data analysis revealed that, between 2004 and 2006, ten unidentified bodies entered the IML and were subjected to dental arch examination for body identification. From these, only five had been referred to the IML from Pelotas police station, two from Pedro Osório police station, one from Capão do Leão police station, one from Arroio Grande police station and one case had no information about the body's origin (**Figure 1**).

Several methods of corpse identification are used in the expertise routine at Pelotas' IML. Firstly and immediately, the clothes are carefully examined, photographed, described in the necropsy report and stored. Within the clothes, it is possible to find, for example, an identity card, a driver's license and personal objects in the pockets. These things give information about the possible places that the corpse had been to or where it had passed by, the social status of the victim, etc. All these data are extremely valuable to reach initial conclusions about corpse identification. After the necropsy, the Human Identification Department searches for fingerprints in order to compare them to those registered in their files and identify the corpse by the datiloscopic method. This is when the forensic dentist may help in the identification of the corpse. The forensic dentist has to fill in a form with the corpse data, such as skin color, age, odontogram and the description of the upper and lower dental arches.

## Discussion

Modern society was characterized by the high concentration of people in urban areas and consequent agglomerations in buildings, schools and restaurants, increasing the possibility of mass accidents, as seen in the attacks to the World Trade Center occurred on September 11, 2001[5,10].

Forensic dentistry has been requested in these scenarios, helping in the identification of bodies in major accidents. Teeth have been widely used as source of information for human identification, especially when soft tissues cannot provide reliable information[5]. However, according to the Brazilian law 5081/66, dentists acting in the field

of forensic dentistry have access to neck and head region and are not limited to the dentition. By means of an anthropometric study of elements of the skull and teeth, the forensic dentist can estimate height, sex, racial group (extremely questionable because of miscegenation) and age[11-13].

Forensic techniques are used worldwide. It is important to have in mind that, in cases of major accidents, the traumatic forces of the accident are so intense that the fragmentation and conflagration permit only the preservation of the most resistant *post-mortem* tissues of the victims, which are those derived from the human dentition. In these cases, the teeth are the main source for identification of the corpses[14,15]. Forensic dentistry can be very helpful on the identification of victims of mass disasters and, sometimes, in the differentiation of human remains of people victimized by situations like natural catastrophes, such as the tsunamis occurred in 2004[16,17], bus accidents involving body carbonization[18,19], plane crashes[20-22], firings[23,24], train accidents[25], military accidents and wars[26].

In Brazil, there were two airplanes mass disasters in less than ten months with national flight companies. The first one happened on September 29th 2006, in Mato Grosso State, when a 737-800 *New Generation* Boeing struck against a N600L Legacy jet, resulting in 154 victims[27]. The second accident was on July 17th 2007, in Congonhas airport, São Paulo, when an *airbus 320* lost control while landing, resulting in 199 casualties[28].

In this context, the cooperation of Forensic Dentistry in the processes of *post-mortem* human identification has an irrefutable value, developing a fundamental status in the identification of bodies that cannot be identified by visual inspection or other traditional means[29-31]. Therefore, dentists must have better working conditions to provide a most specialized contribution in cases of mass accidents and other types of collective disasters in the future[15].

Furthermore, the identification of human remains depends on the availability of *antemortem* information collected from records and family members, and the existence of sufficient *post-mortem* material[3,19]. However, the process of dental identification is limited due to a number of reasons such as lack of standardization of dental documentation necessary for human identification, difficulty in gathering complete dental information for each individual, the incompleteness or inaccuracy of dental information, which compromises the quality of identification, and limitation of qualified personnel[32]. Other conditions such as nature of the accident, nationality and home country of the victims, previous dental treatment, and severity of dental injury can determine the success of identification[18]. In a recent study, the relevance of dental records in the 'tsunami mass disaster' in Thailand was evaluated. This study was interesting because the large number of tourists involved in that event, especially from Europe, allowed a comparison of dental records from different countries. Ninety percent of the victims from Europe, North America, Oceania and Africa were identified mainly by means of dental records, indicating not only the existence, but the quality of these records. In contrast, 90% of the dental records from Thailand were useless for identification of the victims[33].

According to the Brazilian Federal Council of Dentistry (CFO), dental record should contain the professional data (full name and the inscription number of the regional council) and the patient's identification data (full name, sex, date of birth, home address etc), anamnesis (main reason to seek dental service, medical history and dental history), clinical examination (extraoral and intraoral exams and the use of an odontogram before and after the dental treatment), treatment planning, development and intercurrence of the treatment, prescriptions, complementary tests[34].

Dental treatment records offer a valuable resource for establishing the identification of deceased people by means of dental comparison, as required for forensic purposes. The creation, maintenance, storage and custody of such records are legal and ethical duties of each dentist. They are also required by law to record and report evidence of child abuse observed in the course of treatment. Furthermore, when dental records are required for forensic purposes, certain procedures should be followed for their release and collection[35].

The data collected in the present survey showed that all bodies that entered the IML of the city of Pelotas between years 2004 and 2006, period in which the institute had a forensic dentist in its team, were subjected to dental examination for identification purposes. However, the conclusive identification was based on DNA analysis because the victims' dental records were not accurate, complete and updated. In contrast, dental identification has been used around the world with promising results. For example, in a bus accident that occurred in Spain, 28 passengers lost their lives and dental identification was established in 57% of the cases[18]. Also, in 1994, an M/S Estonia ferry sunk, 94 victims were recovered and 60% could be identified by comparing *antemortem* and *post-mortem* dental data[36]. The Lyon-Strasbourg airline disaster in 1992 had a positive dental identification in 52% of cases and a partial match was achieved in 14% of cases[25].

Currently, the IML of Pelotas does not have a forensic dentist and so the unidentified bodies have to be transferred to the IML of Porto Alegre (capital of Rio Grande do Sul State) or a forensic dentist has to be brought to Pelotas, which is a disturbing situation. In the present survey, 40% of the cases were from areas surrounding Pelotas, a reference for smaller cities. This situation illustrates that, in Brazil, the forensic dentist is not appreciated as an important member of the forensic staff and that relevant information for human identification is not obtained. On the other hand, there is a demand for this technique since the IML received ten cases in only two years, which aggravates the problem of the current absence of a hired forensic dentist for the city of Pelotas.

According to Meléndez[37], the unsatisfactory presence of forensic dentist in forensic institutes and the negligence of general dentists with forensic matters can be justified by the few number of theoretical and practical hours in the discipline of forensic dentistry during graduation, the small number of forensic dentistry teachers with expertise in this field, lack of a PhD programs in the area. However, a promising future can be anticipated for forensic dentistry since most Latin American IMLs have already recognized the importance of having a forensic dentist in their staff.

It is extremely important that the IMLs have a forensic dentist in their team of specialists, for this professional can aggregate knowledge and contribute remarkably with cases in which the identification of human remains is difficult or in mass disasters. However, it is also of paramount importance that dentists keep complete, accurate and updated their patient's records for providing reliable information so it can be actually used by forensic dentists. In the IML of Pelotas, the presence of this professional is necessary because this city is the reference referral from smaller cities of the surrounding region.

## References


1. Brasil. Conselho Federal de Odontologia. Resolução CFO 22/2001. Baixa as normas sobre anúncio e exercício das especialidades odontológicas e sobre cursos de especialização, revogando as redações do capítulo VIII, título I; capítulos I, II e III, título III, das normas aprovadas pela resolução CFO-185/93, alterada pela resolução CFO-198/95. Conselho Federal de Odontologia: Brasília, DF; 2001.
2. Bushick RD. Forensic dentistry: an overview for the general dentist. Gen Dent. 2006;54(1):48-52.
3. Sakoda S, Zhu BL, Ishida K, Oritani S, Fujita MQ, Maeda H. Dental identification in routine forensic casework: clinical and postmortem investigations. Leg Méd. 2000;2(1):7-14.
4. Fereira JL, Fereira AE, Ortega AI. Methods for the analysis of hard dental tissues exposed to high temperatures. Forensic Sci Int. 2008;178(2-3):119-24.
5. Ramenzoni LL, Line SR. Automated biometrics-based personal identification of the Hunter-Schreger bands of dental enamel. Proc Biol Sci. 2006;273(1590):1155-8.
6. Silva RH, Sales-Peres A, Oliveira RN, Oliveira FT, Sales-Peres SH. Use of DNA technology in forensic dentistry. J Appl Oral Sci. 2007;15(3):156-61.
7. Bush MA, Miller RG, Prutsman-Pfeiffer J, Bush PJ. Identification through X-ray fluorescence analysis of dental restorative resin materials: a comprehensive study of noncremated, cremated, and processed-cremated individuals. J Forensic Sci. 2007;52(1):157-65.
8. Granjeiro JAM. Padronização de conduta na realização de perícias civis, criminais, trabalhistas e administrativas direcionados à odontologia legal. [Master's thesis]. Piracicaba: Faculdade de Odontologia da Unicamp; 2007.
9. Cintra JAA. A importância da odontologia legal no exame de corpo delito [Master's thesis]. Piracicaba: Faculdade de Odontologia da Unicamp; 2004.
10. Prieto JL, Tortosa C, Bedate A, Segura L, Abenza JM, Mariscal de Gante MC, et al. The 11 March 2004 Madrid terrorist attacks: the importance of the mortuary organisation for identification of victims. A critical review. Int J Legal Méd. 2007;121(6):517-22.
11. Brasil. Conselho Federal de Odontologia, Lei 5081/66, artigo 6º, item 1, RJ (1966 ago 24).
12. Keiser-Nielsen S, Strom F. The odontological identification of Eva Braun Hitler. Forensic Sci Int. 1983;21(1):59-64.
13. Miyajima F, Daruge E, Daruge-Júnior E. A importância da odontologia na identificação humana: relato de um caso pericial. Arq Odontol. 2001;37(2):133-42.
14. Gould GA. Forensic odontology: a global activity. J Calif Dent Assoc. 2004;32(5):410-5.
15. Li G. [The role dental profession can play in mass casualty and disaster events]. [Article in Chinese]. Hua Xi Kou Qiang Yi Xue Za Zhi. 2008;26(4):347-51.
16. Lau G, Tan WF, Tan PH. After the Indian Ocean tsunami: Singapore's contribution to the international disaster victim identification effort in Thailand. Ann Acad Med Singapore. 2005;34(5):341-51.
17. Morgan OW, Sribanditmongkol P, Perera C, Sulasmi Y, Van Alphen D, Sondorp E. Mass fatality management following the South Asian tsunami disaster: case studies in Thailand, Indonesia, and Sri Lanka. PLoS Med. 2006;3(6):e195.
18. Valenzuela A, Martin-de las Heras S, Marques T, Exposito N, Bohoyo JM. The application of dental methods of identification to human burn victims in a mass disaster. Int J Legal Med. 2000;113(4):236-9.
19. Valenzuela A, Marques T, Exposito N, Martãn-De Las Heras S, Garcãa G. Comparative study of efficiency of dental methods for identification of burn victims in two bus accidents in Spain. Am J Forensic Med Pathol. 2002;23(4):390-3.
20. Ludes B, Tracqui A, Pfitzinger H, Kintz P, Levy F, Disteldorf M, et al. Medico-legal investigations of the Airbus, A320 crash upon Mount Ste-Odile, France. J Forensic Sci. 1994;39(5):1147-52.
21. Ferreira RA. Reconhecendo pela boca. Rev Assoc Paul Cir Dent. 1996;50(6): 464-73.
22. Nambiar P, Jalil N, Singh B. The dental identification of victims of an aircraft accident in Malaysia. Int Dent J. 1997;47(1):9-15.
23. Campobasso CP, Falamingo R, Vinci F. Investigation of Italy's deadliest building collapse: forensic aspects of a mass disaster. J Forensic Sci. 2003;48(3):635-9.
24. Pretty, IA. Forensic dentistry: 1. Identification of human remains. Dent Update. 2007;34(10):621-2, 624-6, 629-30 passim.
25. Dumancić J, Kaić Z, Njemirovskij V, Brkić H, Zecević D. Dental identification after two mass disasters in Croatia. Croat Med J. 2001;42(6):657-62.
26. Brannon RB, Morlang WM. The USS Iowa disaster: success of the forensic dental team. J Forensic Sci. 2004;49(5):1067-8.
27. O Globo. Em menos de 10 meses os dois piores acidentes aéreos do país. São Paulo, 18 de jul. 2007. [Homepage on the internet]. [Cited may 25, 2009]. Available from: <http://oglobo.globo.com/sp/mat/2007/07/17/em_menos_de_10_meses_os_dois_piores_acidentes_aereos_do_pais-296831801.asp>. O Globo. São Paulo.
28. Folha On Line. Justiça suspende todos os indiciamentos do acidente da TAM. São Paulo, 24 nov. 2007. [Homepage on the internet]. [Cited may 25, 2009]. Available from: <http://www1.folha.uol.com.br/folha/cotidiano/ult95u471173.shtml>.
29. Calabrez MCT, Saldanha PH. A pesquisa de DNA em Odontologia Forense. In: Silva M. Compêndio de Odontologia Legal. São Paulo: Medsi; 1997. p. 167-221.
30. Sweet, D. Why a dentist for identification? Dent Clin North Am. 2001;45(2): 237-51.
31. Glass, RT. Forensic dentistry in a terrorist world. N Y State Dent J. 2005;71(3):21-5.
32. Chomdej T, Pankaow W, Choychumroon S. Intelligent dental identification system (IDIS) in forensic medicine. Forensic Sci Int. 2006;158(1):27-38.
33. Petju M, Suteerayongprasert A, Thongpud R, Hassiri K. Importance of dental records for victim identification following the Indian Ocean tsunami disaster in Thailand. Public Health. 2007;121(4):251-7.
34. Brasil. Conselho Federal de Odontologia. Prontuário odontológico: uma orientação para o cumprimento da exigência contida no inciso VIII do art. 5° do código de ética odontógica. Conselho Federal de Odontologia: Rio de Janeiro; 2004.
35. Brown KA. Procedures for the collection of dental records for person identification. J Forensic Odontostomatol. 2007;25(2):63-4.
36. Soomer H, Ranta H, Penttilä A. Identification of victims from the M/S Estonia. Int J Legal Med. 2001;114(4-5):259-62.
37. Meléndez BVDLC. O perfil do ensino da odontologia legal na América Latina [Master's thesis]. Piracicaba: Faculdade de Odontologia da Unicamp; 2003.