FORENSIC ODONTOLOGY IDENTIFICATION USING SMILE PHOTOGRAPH ANALYSIS – CASE REPORTS

R.F. Silva*, S.D. Pereira, F.B. Prado, E. Daruge (Jnr.), E. Daruge

Department of Morphology and Forensic Odontology, Piracicaba Dental School - UNICAMP - SP - Brazil
*Forensic expert at the Technical and Scientific Police - Forensic Institute, Goiás State – Brazil

ABSTRACT

The identification of unknown human by smile photographs that show specific characteristics of each individual has found wide acceptance all over the world. Therefore this paper shows this situation reporting different cases which smile photograph analysis were crucial to determine the positive identification of unidentified human bodies. All the cases were subjected to personal identification by photographs of smile including one adult male found in an advanced stage of decomposition, one adult female disappeared during an ecotourism trip, and one carbonized body of a male individual found in a forest region. During the autopsy the photographs of the smile were used by comparison of the ante and postmortem images gave accurate and useful information not only about dental state but also the anatomical features surrounding the upper and lower anterior dental arches. This method is not time-consuming and also has the advantage of allowing extraoral dental examination. It is also recommended when there is a need to provide quantitative data for a forensic identification based on these structures. **(J Forensic Odontontostomatol 2008;27:1:12-17)**

Keywords: human identification, smile photograph, forensic odontology

INTRODUCTION

The identification of human bodies that are carbonized, mutilated or skeletonized or in the process of decomposition, through the analysis of dental characteristics is a common task for the medical legal department[1]. Thus, it is necessary that experts seek from family members any type of odontologic documentation that contains diverse identification characters of the individual to be identified.

Among the documents most frequently used to help forensic odontology task are the dental records, patient records,[2] cast models,[3] intraoral photographs,[4] periapical radiographs,[5, 6] interproximal and panoramic radiographs[7] and postero-anterior skull radiographs.[8]

However, in certain cases, the victim being analyzed may not have clinical records showing relevant odontologic characteristics. Therefore, experts in the practice of human identification currently search for information from alternative sources, such as facial photographs,[9] video recording[10] or smile photographs[11] that show specific characteristics of each individual.

Considering the importance of searching for new parameters of human identification using odontologic characteristics, the aim of the present work was to point out, by means of three criminal investigation cases, the importance of the forensic odontology analysis of smile photographs in human identification.

CASE 1

A male subject showing compatible age with the transition between adolescent and adult, was found in an advanced stage of decomposition. During forensic odontology examination, it was noted that the individual had practically healthy-appearing remaining dental elements, where only the upper left central incisor (21*, FDI notation) was absent, with characteristics compatible of former dental loss while still alive. In this region, the alveolar process appeared to have undergone remodeling and part of the mesio-distal space was found to be partially preserved (Figs.1A,1B). The police investigation found that a male with anthropologic characteristics matching those of the recovered body had disappeared in the same region for a few days. In attempts of finding the missing person, family members

had distributed around the area some posters with his photograph. This picture in the poster showed the missing person smiling, and a study of the anterior maxillary region, showed evidence that he was also missing a tooth in the region of 21* (Fig.1C). Based on this evidence and due to the fact that no type of odontologic records could be found, the photograph in the poster and the skull image of the corpse were compared by computerized superposition of the images, in addition to DNA analysis, confirming that the body was the person who had disappeared.

CASE 2

A Russian origin adult female disappeared during an ecotourism trip. Some posters containing information and photographs of the missing person had been distributed in the city where she was last seen, where two of these photographs showed the smile of the woman (Figs.2A,2B). However, the investigations only effectively developed almost one year after the disappearance date, when the suspect in the murder of the victim was arrested and indicated the location where the body's victim was hidden. Based on this information, the police involved in this case was able to find the skeletal remains. Forensic odontology investigation showed that the inter-arch relationship was an Angle Class II type, demonstrating significant horizontal cross bite, upper incisor overjet, and upper central inter-incisor diastema. Besides that it was noted a wearing on the incisal face of the upper right central incisor, as well the upper left central incisor and the upper left lateral incisor (11*, 21* and 22*), (Figs.3A,3B). With the skeleton was found a removable orthodontic retainer which fit the upper dental arch (Fig.3C). Combining the techniques anthropologic analysis (sex, age and stature determination), computerized superimposition of the skull images and photograph of face, analysis of information contained in odontologic clinical dental records and smile photograph, a positive identification was made of the skeleton examined as the missing person.

CASE 3

The carbonized body of a male individual was found in a forest region and sent for anthropologic and forensic odontology examination. The autopsy examination revealed skull bone fractures with exposure and loss of encephalic material, absence of the arms, presenting calcination zones in the osseous extremities and disarticulated lower limbs. Investigation with the presumed family located odontologic documentation (clinical records and periapical radiographs), two radiographs of the right upper arm and a smile photograph. This photograph showed the anterior upper teeth, indicating the absence of upper right and left first premolars (14* and 24*) and evidence of amalgam restoration on the mesial face of upper left second premolar (25*) (Fig.4A). All these indications had been confirmed during forensic odontology examination (Figs.4B,4C), which combined with the data present in the medical and odontological records, showed a positive correlation between the identity of the missing victim and body examined.

DISCUSSION

Human identification in which the body's soft tissues have been destroyed normally requires a multidisciplinary approach, where forensic odontology, forensic anthropology and molecular biology (DNA studies) are the most effective in establishing a positive correlation between a recovered body and the identity of a missing person.

In the presented cases, the three cited methods can make it possible to obtain a positive identification of the victim, with reliable results. However, each one of them possesses advantages and disadvantages when considering the type of techniques used, the time required and mainly the operating costs to obtain the results. DNA analyses, specifically, requires the expert to work with mathematical precision for establishing a genetic link or not between a questionable biological sample and the standard, or between biological samples of a disappeared individual (corpse) with samples from relatives.[12] However, the reliability of results is based on considerable operating costs (equipment, reagents and consumables) which are currently not yet included in the routine practice of the majority of official criminal investigation agencies.

In the analysis of corpses considered "unidentifiable", forensic odontology techniques stand out over other methods

because of the low operating costs, fast analysis and interpretation of the data, and high reliability of the results. Therefore, it is highly desirable that new forensic odontology parameters be developed to identify odontologic characteristics that are unique for each individual. Concerning that matter MacKenna (1986) in his Master thesis refers to William Ockham (1270-1349) that said "What can be done with fewer assumptions is done in vain with more"[11].

However, as with the many methods used in human identification, traditional forensic odontologic techniques can be at times unsuitable for various reasons. Among them there are situations such as: extensive destruction of the bucco-maxillofacial complex, lack of dental records and when information from available dental records is irrelevant to investigation. Exactly in the case of these last two possibilities, it could be interesting to examine photographs from family albums or of social events in which the missing person participated. The justification is based on the shape, dimensions and alignment of the teeth of an individual, which can comprise a specific and unique set.[11] Moreover, there has been a growing trend in the popular use of digital cameras, where the main focus is centered on the face of the individuals, more specifically on the smile.

The dental analysis of the smile constitutes a current concern of specialties that include aesthetic dentistry.[13] established the importance of diagrams of dental aesthetic reference (DDAR), where a smile can reveal dental relationships of symmetry, dental axes, gum contours, inter-dental contacts, incisal edges, teeth proportions and smile lines.

In this manner, orthodontics is one of the fields that deals with extensive clinical documentation of the dental elements that determine the smile of individuals, as it uses and needs complete odontologic documentation, including digital or analog photographs,[14] for the planning and execution of treatments.

The increased use of intraoral photographs for clinical purposes, along with the popularization of digital cameras, is providing more material with potential value for forensic odontology. Therefore, smile photographs constitute a reliable source of information with the potential to help solve certain cases of human identification.
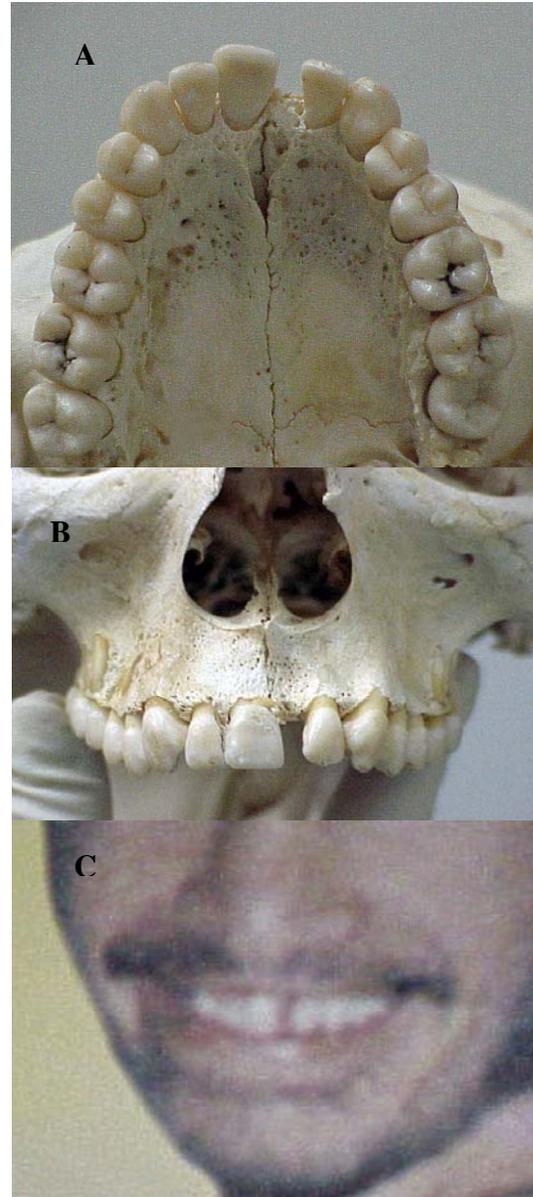

Fig.1: *Absence of 21 in the superior dental arch (A and B) and in the smile photograph (C).*
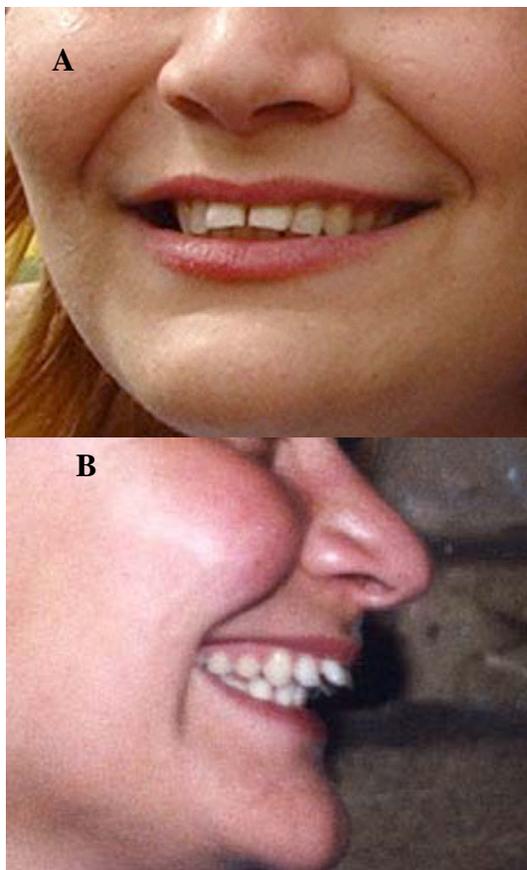
Fig.2: *Photographs of the victim in frontal view (A) and lateral right view (B).*
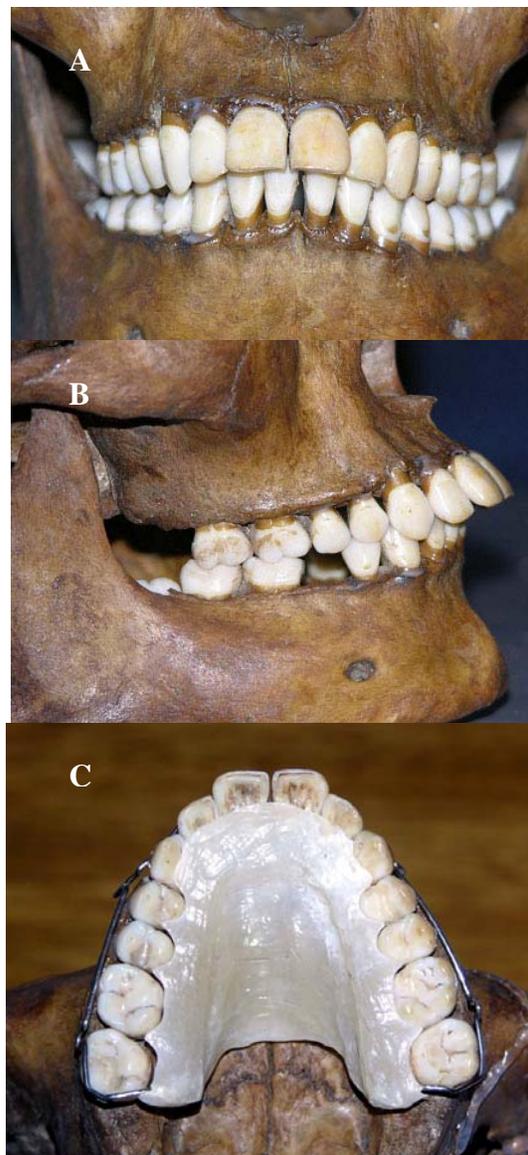

Fig.3: *– Characteristics of the occlusion and the superior incisors in frontal view (A), lateral right view (B) and orthodontic appliance adapted in the superior dental arch (C).*
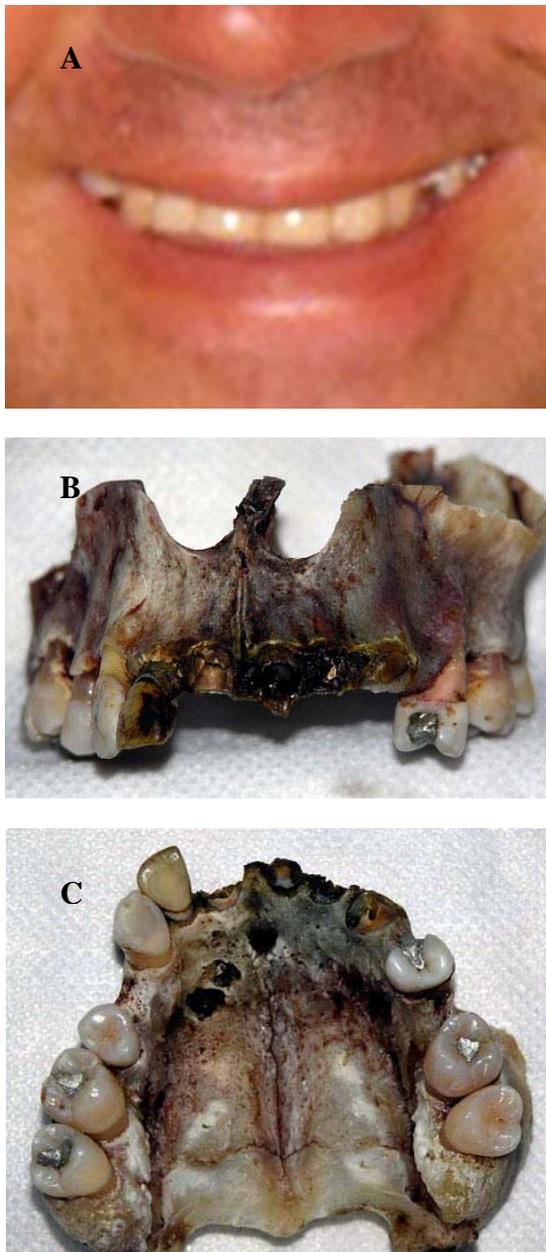
Fig.4: *Absence of upper left first pre-molar and presence of amalgam restoration in the mesial face of the element 25 in the smile photograph (A) and the upper dental arch in frontal view (B) and occlusal view (C).*

ACKNOWLEDGEMENT

REFERENCES

1. Oliveira RN, Daruge E, Galvão LCC, Tumang AJ. Collaboration of forensic odontology for identification post-mortem. Rev Bras Odontol 1998; 55(1): 117-22. Portuguese.

2. Silva RF *et al.* The importance of dental documentation in human identification: report of a case. Acta Odontol Venez 2005; 43(2): 67-74. Spanish.

3. Goodman NR, Himmelberger LK. Identifying skeletal remains found in a sewer. J Am Dent Assoc 2002; 133(11): 1508-13.

4. Miyajima F, Daruge E, Daruge Júnior E. The importance of dental science in human identification: a casework report. Arq Odontol 2001; 37(2): 33-42. Portuguese.

5. Silva RF *et al.* Confiability of forensic dental exam in human identification. ROBRAC 2004; 13(35): 46-50. Portuguese.

6. Silva RF *et al.* Dental radiographs: source of information for human identification. Odontologia Clín. Científ 2006; 5(3):239-42. Portuguese.

7. Nagai K, Sakoda S, Maeda H. Dental identification of decomposed victims in a case of multiple homicides by infection of succinylcholine. J Forensic Odontostomatol 1997; 15(2): 37-44.

8. Kirk NJ, Wood RE, Goldstein M. Skeletal identification using the frontal sinus region: a retrospective study of 39 cases. J Forensic Sci 2002; 47(2): 318-23.

9. Bilge Y *et al.* The identification of a dismembered human body: a multidisciplinary approach. Forensic Sci Int 2003; 137(2-3):141-46.

10. Marks MK, Bennett JL, Wilson OL. Digital video image capture in establishing positive identification. J Forensic Sci. 1997; 42(3): 492-95.

11. McKenna JJI. A qualitative and quantitative analysis of the anterior dentition visible in photographs and its application in forensic odontology. Hong Kong: University of Hong Kong, 1986: 131.

12. Silva RF *et al.* Genetics and molecular biology: a literature review of forensic dentistry applications. Braz J Oral Sci. 2007; 6(20): 1254-59.

13. Câmara CALP. Aesthetics in Orthodontics: Diagrams of Facial Aesthetic References (DFAR) and Diagrams of Dental Aesthetic References (DDAR). R Dental Press Ortodon Ortop Facial 2006;11(6): 130-56. Portuguese.

14. Machado AW, Oliveira DD, Leite EB, Lana AMQ. Film vs. digital photography: is the difference noticeable? R Dental Press Ortodon Ortop Facial 2005;10(4):115-23. Portuguese.

Address for Correspondence:
Rhonan Ferreira da Silva
Av. Arumã Qd 186 Lt 06 Parque Amazônia
Goiânia – GO. Brazil
CEP: 74835-320
Email: rhonanfs@terra.com.br