

Case Report

Panoramic Radiograph as a Clue for Human Identification: A Forensic Case Report

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ABSTRACT

Forensic odontology works in the interface between dentistry and law. Human identification is an important procedure performed by Forensic Dentists. The present study reports a case of dental human identification of a highly decomposed human body identified through the comparison of antemortem (AM) and postmortem (PM) panoramic radiographs. The AM radiograph was performed for planning dental implants, while the PM radiograph reproduced the same AM technique to enable a reliable comparative procedure. Radiographic dental similarities observed AM and PM led to a positive human identification. The importance of forensic odontology for legal purposes is highlighted and illustrated in the current study.

KEY WORDS: *Antemortem, dental implant, forensic odontology, panoramic radiograph, postmortem*

INTRODUCTION

Technical knowledge is applied in forensic odontology to assist justice both in civil and criminal scenarios.^[1] Specifically in the past, dental human identification figured as a procedure which was requested commonly by the courts.^[2,3] This procedure often relies on the comparison between antemortem (AM) and postmortem (PM) data. The AM data consist mainly of dental records, such as radiographs and computed tomography scans.^[2] These records are retrieved mostly from dental clinics in which the victim underwent treatment. On the other hand, the PM data are obtained during the dental autopsy preferably reproducing the images obtained from AM data. AM and PM data are confronted in the search for convergence of distinctive dental traits. These distinctive traits are named identifiers, which may be related to dental treatment, morphology, and pathology.^[1]

In this context, oral implantology plays a key role in assisting justice in dental human identification cases. Pre- and post-operative image-guided examinations are necessary in this field, producing a significant amount of radiographic AM records.^[4] The most evident identifiers found within these radiographs are related to the presence of dental implants, such as their anatomic position, shape, size, and angulation in the dental arch. In addition, the identification of implant system and components may be performed by an experienced professional or by computer-aided software.^[5]

Despite the fact that dental implants are a source of distinctive AM data, human identifications found on AM/PM comparison of dental implant radiographs are unusual in the scientific literature. The present study aims to report a case of positive identification of a decomposed human body after matching AM and PM panoramic radiographs of the victim, highlighting the distinctive role of dental implants as identifiers. Moreover, the ethical and legal aspects of storing and providing dental records for legal purposes are discussed in the study.

CASE REPORT

In 2014, a decomposed human body was found in a forest region in Central Brazil. After crime scene investigation, the body was transported to the Regional Institute of Legal Medicine to investigate the cause of death and the identity of the victim.

The medical autopsy revealed decomposed soft tissue and no bone fracture or other injury associated with the cause of death. The anthropological analysis suggested cranial and pelvic female traits, age range from 40 to 50 years old, stature between 158 and 167 mm, and Negroid ancestry. The dental autopsy revealed esthetic and amalgam restorations, temporary

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restorations, artificial crowns, AM dental loss, endodontic treatment, and a dental implant [Figure 1].

Simultaneously, police investigations for missing persons pointed a 43-year-old woman missing for 1 month as the potential victim. The relatives of the missing woman were asked to provide any medical or dental record belonging to her. Four AM dental radiographs dating from 2013 were provided – two periapical and two panoramic [Figure 2]. All the radiographs were used for planning dental implants in the region of the left maxillary first premolar (#24). A PM panoramic radiograph of the victim was performed to enable AM/PM comparison [Figure 3]. The AM and PM radiographic dental evidences were confronted in the search for similarities (converging AM/PM evidences) or discrepancies (different AM/PM evidences). The last were categorized as explainable or unexplainable. The comparison resulted thirty similarities and two explainable discrepancies [Tables 1 and 2], allowing a positive identification.

DISCUSSION

The scientific literature reports identification cases of charred, mutilated, decomposed, and skeletonized bodies, illustrating the value of human teeth when fingerprints are not available.^[1,2] However, dental identifications are necessarily supported by AM dental records containing distinctive identifiers linking the unknown body with a missing person.^[1,2] In the present case, several distinctive identifiers were observed. Most of them were related to restorative treatments and rehabilitation

procedures, including the dental implant observed in PM radiographs compatible with the maxillary missing tooth (#24) observed in AM radiographs. More specifically, the present identification was found in approximately thirty similarities, having a higher convergence of evidences compared to other studies.^[2]

Oral implantology gained popularity in the recent years,^[6] consequently, more radiographs of dental implants became part of the AM forensic evidences. The advantages of dental implants in the forensic scenario include the resistance to high temperatures, the distinctive morphology, the possibility to identify the manufacturer (geographic information) and implant system, the possibility to retrieve information from batch numbers, and the possibility to apply digital analysis for the recognition of implant components.^[7-10] In the present case, the dental human identification was mainly focused

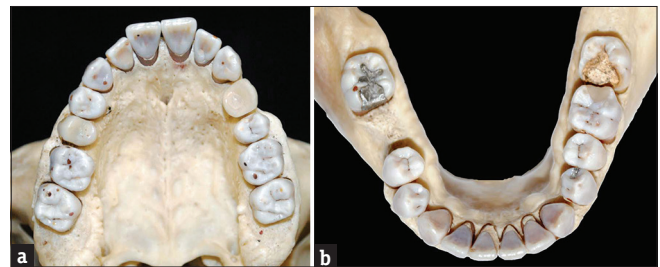


Figure 1: Occlusal view of the maxillary (a) and mandible (b) observed postmortem

Table 1: Comparison between antemortem and postmortem dental features and the respective outcomes for the maxillary dental arch

Tooth number*	AM (2013)	PM (2014)	Outcomes
18	Absent	Absent	SI
17	Present	Present	SI
16	Present	Present	SI
15	Artificial crown and endodontic filling	Artificial crown and endodontic filling	SI
14	Present	Present	SI
13	Present	Present	SI
12	NM (P)	NM (P)	SI
11	Present	Present	SI
21	Present	Present	SI
22	NM (P)	NM (P)	SI
23	Present	Present	SI
24	Absent	Dental implant and prosthetic crown	ED
25	Present	Present	SI
26	Present	Present	SI
27	Present	Present	SI
28	Absent	Absent	SI

*FDI dental notation. AM: Antemortem, PM: Postmortem, NM: Nonmetallic restoration, P: Palatal surface, SI: Similarities, ED: Explainable differences, FDI: Federation Dentaire Internationale

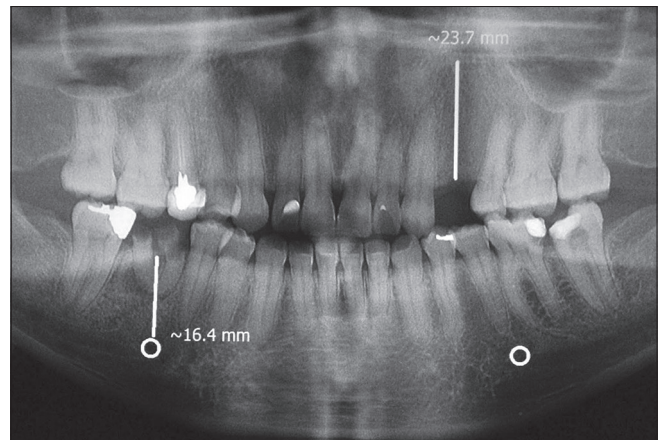


Figure 2: Antemortem panoramic radiograph of the victim dating from 2013

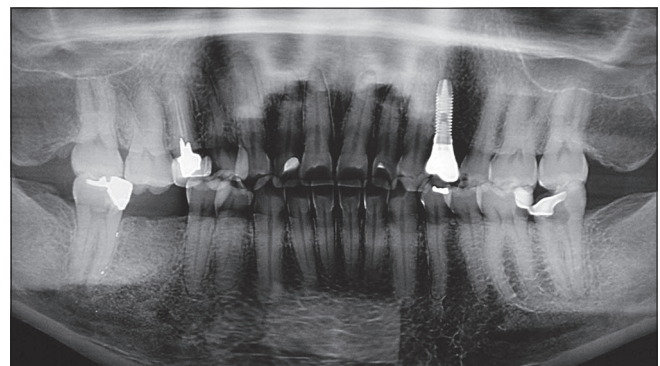


Figure 3: Postmortem panoramic radiograph of the victim dating from 2014

Table 2: Comparison between antemortem and postmortem dental features and the respective outcomes for mandibular dental arch

Tooth number*	AM (2013)	PM (2014)	Outcomes
38	Absent	Absent	SI
37	TR (MO)	TR (MO)	SI
36	NM (OD), not adapted	NM (OD), not adapted	SI
35	Present	Present	SI
34	MR (OD)	MR (OD)	SI
33	Present	Present	SI
32	Present	Present	SI
31	Present	Present	SI
41	Present	Present	SI
42	Present	Present	SI
43	Present	Present	SI
44	Present	Present	SI
45	Present	Present	SI
46	Residual roots	Absent	ED
47	MR (MO)	MR (MO)	SI
48	Absent	Absent	SI

*FDI's dental notation. AM: Antemortem, PM: Postmortem, TR: Temporary restoration, NM: Nonmetallic restoration, MR: Metallic restoration, DO: Distal-occlusal surfaces, MO: Mesial-occlusal surfaces, SI: Similarities, ED: Explainable differences, FDI: Federation Dentaire Internationale

on the analysis of dental implant location combined with all the other similarities found from AM and PM radiographs. Considering that dental identification is a primary method for identification, no other method was necessary to confirm the positive outcome.

In the present study, the AM/PM comparison of identifiers was supported by panoramic radiographs. Over other dental radiographs, panoramic radiographs have the advantage of registering several anatomic structures other than the human teeth, such as the nasal cavity, the maxillary sinuses, the mandibular canals, and the alveolar bones. Pathological conditions, such as periapical lesions, may be registered as well. Moreover, panoramic radiographs are commonly used in the daily routine of dentistry, especially for planning and follow-up surgical procedures (e.g., dental implants) and orthodontic treatment. However, it is also important to note that panoramic radiographs may lack information that could be detected photographically and vice versa. Other disadvantages of panoramic radiographs consist of the distortion inherent to the image acquisition process and the low quality for detailed registration of maxillofacial structures compared to high-tech imaging modalities, such as cone-beam computed

tomography (CBCT). In addition, these radiographs register the anatomic and pathological structures bidimensionally (2D), while in other dental data, such as CBCT and dental casts, these structures are registered 3D.

The combination of therapeutic (dental), morphological, and pathological identifiers enhances the comparative procedure, supporting the identification outcomes strongly. However, panoramic radiographs are only useful for forensic purposes if stored properly and provided when requested by law. Otherwise, low-quality forensic evidences will become part of the case and hamper identifications. More importantly, the acquisition and storage of dental records is assured ethically and legally to guarantee that these evidences will be available to support the potential needs of justice. Dentists must be aware of this information to contribute optimally to the important field of forensic odontology.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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