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Forensic Dentistry

IMPORTANCE OF DENTAL RECORDS AND PANORAMIC RADIOGRAPH IN HUMAN IDENTIFICATION: A CASE REPORT.

Importância dos registros odontológicos e de radiografia panorâmica na identificação humana: um relato de caso.

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ABSTRACT

Forensic dentistry is important in human identification because it analyses individual characteristics present in the teeth of each individual based on comparison. The aim of this work is to highlight the importance of the correct documentation made by the dentist and to present a case solution using panoramic x-ray. To carry out the report, dental charts and panoramic radiography were used for comparison with dental examination of a female body remains. The wrong notation of charts, made by the dentist, almost leaded to an exclusion identification. Due to panoramic x-ray made nine years before the death, a positive identification could be made. That fact emphasized the importance of attention when charts are being filled out.

KEYWORDS

Forensic dentistry; Forensic anthropology; Dental records, Panoramic radiography.

INTRODUCTION

The primary utility of forensic odontology is the identification of human remains based upon the individualistic characteristics present in the teeth of different individuals[1]. In cases of body carbonization, decomposition, blast injuries mainly in mass disasters situations[2], where fingerprints, face recognition and even DNA are difficult or impossible, dental records comparison is one of the most efficient and cost effective scientific methods available[3].

Dental findings like implants, crows, endodontic treatments, dental fillings, and characteristics like dental pathology, restorations, dental anomalies can be used

to compare *antemortem* (AM) and *postmortem* (PM) data collected using dental charts, radiographies, photographs, casts, and impressions[4, 5]. Therefore, it is necessary that the dental surgeon has prepared and stored the dental records properly[6].

The International Organization for Forensic Odonto-Stomatology (IOFOS) defines quality assurance concerning of forensic odontology report in identification cases. The forensic odontology report is a legal document and must fulfil requirements as such: a) general requirements; or b) national requirements to comply with national laws. The report should be systematic and always end in a conclusion and it should be written in understandable terms to the lay person[7].

Hence, the aim of this case report is to show a dental identification report and emphasize the importance of correct notation and documentation made by the dentist that is decisive in identification cases.

CASE REPORT

In 2012, a body was found, partially buried, female, with head trauma and two shot guns wounds. The final stage of decomposition (skeletonisation) was verified mainly in face, skull, chest and upper limb (one of the upper limbs was missing); abdominal portion and lower limbs were partially skeletonised. In view of the impossibility of collecting digital impressions and direct recognition, the remains were submitted to forensic dental identification.

Postmortem radiograph (Figure 1) and dental arcs (Figure 2) have to be described very carefully. The World Dental Federation notation was used to describe the teeth (Table 1 and Table 2).

An overseas Police Bureau asked an investigation to Federal Police of Brazil and sent the dental records of a deceased. Dental arcs were cleaned and disarticulated (no enucleation technique was used because the body was skeletonized), and submitted to a panoramic dental X-ray (OPG) and photographs. The OPG postmortem were performed previously the knowledge of existence of the antemortem radiography and outside the Legal Medicine service.

Figure 1- Panoramic x-ray incidence obtained from the upper and lower dental arches of the deceased (*postmortem*).

UPPER DENTAL ARCH EXAMINATION

Figure 2- Maxilla and mandibular occlusal view.

Table 1 – Upper dental arch comparisons between the dental particularities evidenced in the ante-mortem (AM) records and in the post-mortem (PM) records (charts). Descriptions according Interpol dental codes[8] (Interpol, Lyon, France).

TOOTH	AM	PM	OUTCOME
18	Missing tooth (mis)	Missing tooth (mis)	SI
17	Abutment tooth (abu) – Tooth coloured crown (tcc)	Abutment tooth (abu) – Tooth coloured crown (tcc)	SI
16	Pontic (mcp) – Tooth coloured crown (tcc)	Pontic (pon) – Tooth coloured crown (tcc)	SI
15	Pontic (pon) – Tooth coloured crown (tcc)	Pontic (pon) – Tooth coloured crown (tcc)	SI
14	Implant (ipx) – Abutment tooth (abu) – Tooth coloured crown (tcc)	Implant (ipx) – Abutment tooth (abu) – Tooth coloured crown (tcc)	SI
13	Abutment tooth (abu) – Tooth coloured crown (tcc) – Root filling (rfx)	Abutment tooth (abu) – Tooth coloured crown (tcc) – Root filling (rfx)	SI
12	Tooth coloured filling (tcf) MOD*	Tooth coloured filling (tcf) MOD*	SI
11	Tooth coloured crown (tcc) - Root filling (rfx) – Post (pox)	Tooth coloured crown (tcc) - Root filling (rfx) – Post (pox)	SI
21	Tooth coloured crown (tcc)	Tooth coloured crown (tcc)	SI
22	Cavity (cav) MIP – Tooth coloured filling (tcf) DP	Cavity (cav) MIP – Tooth coloured filling (tcf) DP	SI
23	Tooth coloured crown (tcc)	Tooth coloured filling (tcf) BMP	ED
24	Abutment tooth (abu) – Tooth coloured crown (tcc) - root filling (rfx) – post (pox)	Abutment tooth (abu) – Tooth coloured crown (tcc) - root filling (rfx) – post (pox)	SI
25	Pontic (pon) – Tooth coloured crown (tcc)	Pontic (pon) – Tooth coloured crown (tcc)	SI
26	Abutment tooth (abu) – Metal crown (tcc)	Abutment tooth (abu) – Metal crown (tcc)	SI
27	Missing tooth (mis)	Missing tooth (mis)	SI
28	Missing tooth (mis)	Missing tooth (mis)	SI

SI: Similarity; ED: Explainable Discrepancy.

*Capital letters M, O, D, V, B, L e I, refer respectively to the mesial, occlusal, distal, buccal, palatine, lingual and incisal faces of the dental elements. Interpol dental codes showed between parentheses.

LOWER DENTAL ARCH EXAMINATION

Table 2- Lower dental arch ccomparisons between the dental particularities evidenced in the ante-mortem (AM) records and in the post-mortem (PM) records (charts). Descriptions according Interpol dental codes.

TOOTH	AM	PM	OUTCOME
38	Missing tooth (mis)	Missing tooth (mis)	SI
37	Tooth coloured crown (tcc) -Root filling (rfx) – Post (pox)	Missing tooth (mis)	ED
36	Implant (ipx) – Abutment tooth (abu) – Tooth coloured crown (tcc)	Implant (ipx) – Abutment tooth (abu) – Tooth coloured crown (tcc)	SI
35	Pontic (pon) – Tooth coloured crown (tcc)	Pontic (pon) – Tooth coloured crown (tcc)	SI
34	Implant (ipx) – Abutment tooth (abu) – Tooth coloured crown (tcc)	Implant (ipx) – Abutment tooth (abu) – Tooth coloured crown (tcc)	SI
33	Tooth coloured crown (tcc)	Tooth coloured crown (tcc)	SI
32	No abnormality detected (nad)	No abnormality detected (nad)	SI
31	No abnormality detected (nad)	No abnormality detected (nad)	SI
41	No abnormality detected (nad)	No abnormality detected (nad)	SI
42	No abnormality detected (nad)	No abnormality detected (nad)	SI
43	No abnormality detected (nad)	No abnormality detected (nad)	SI
44	Tooth coloured filling (tcf) BOD	Tooth coloured filling (tcf) BOD	SI
45	Tooth coloured crown (tcc)	Tooth coloured crown (tcc)	SI
46	Metal crown (tcc) – root filling (rfx) – post (pox)	Metal crown (tcc) – root filling (rfx) – post (pox)	SI
47	Missing tooth (mis)	Missing tooth (mis)	SI
48	Missing tooth (mis)	Missing tooth (mis)	SI

SI: Similarity; ED: Explainable Discrepancy

Interpol dental codes showed between parentheses.

The Federal Police of the foreign country forwarded a reference material for identification process, the *antemortem* dental information contained in a .PDF file. The dental record (chart) of the patient, provided by the victim's dentist, there were descriptions of existing treatments in dental elements and a graphic chart of the teeth (odontogram). The document also makes reference to radiographic examination performed 9 years earlier (Figure 3), which as described in the history of this report, were requested for expert analysis. The AM panoramic x-ray was request in a posterior moment, since the dental chart had an inconsistency about the element 23 (upper left canine), described with a tooth coloured crown ("KV") on the chart.

DENTAL COMPARISON

Some of the coincidences between the *antemortem* data and the *postmortem* findings are evidenced in the comparison between the radiographs that follows in Figure 4.

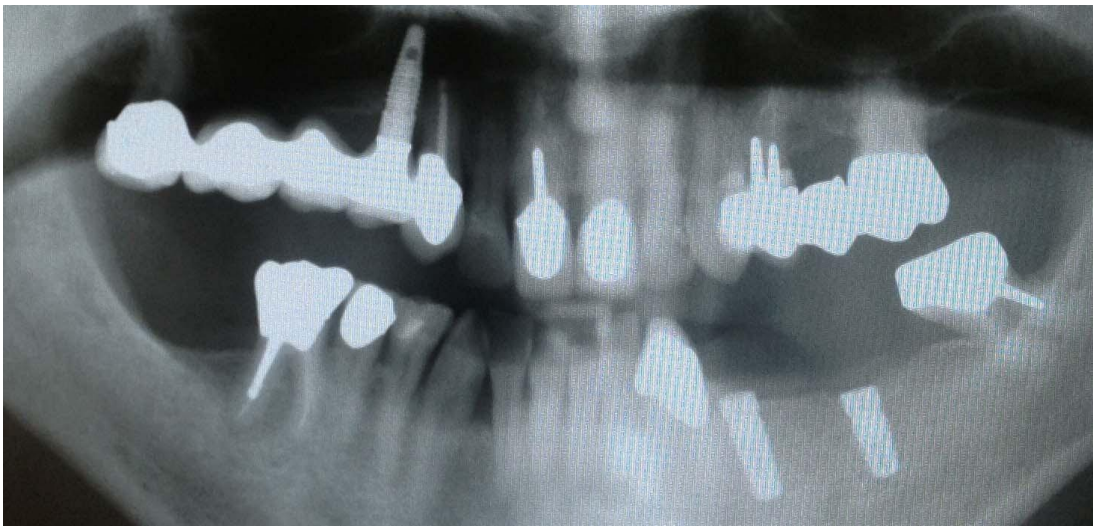

Figure 3- Panoramic x-ray incidence obtained from the upper and lower dental arches of the deceased (*antemortem*) made in 2003.

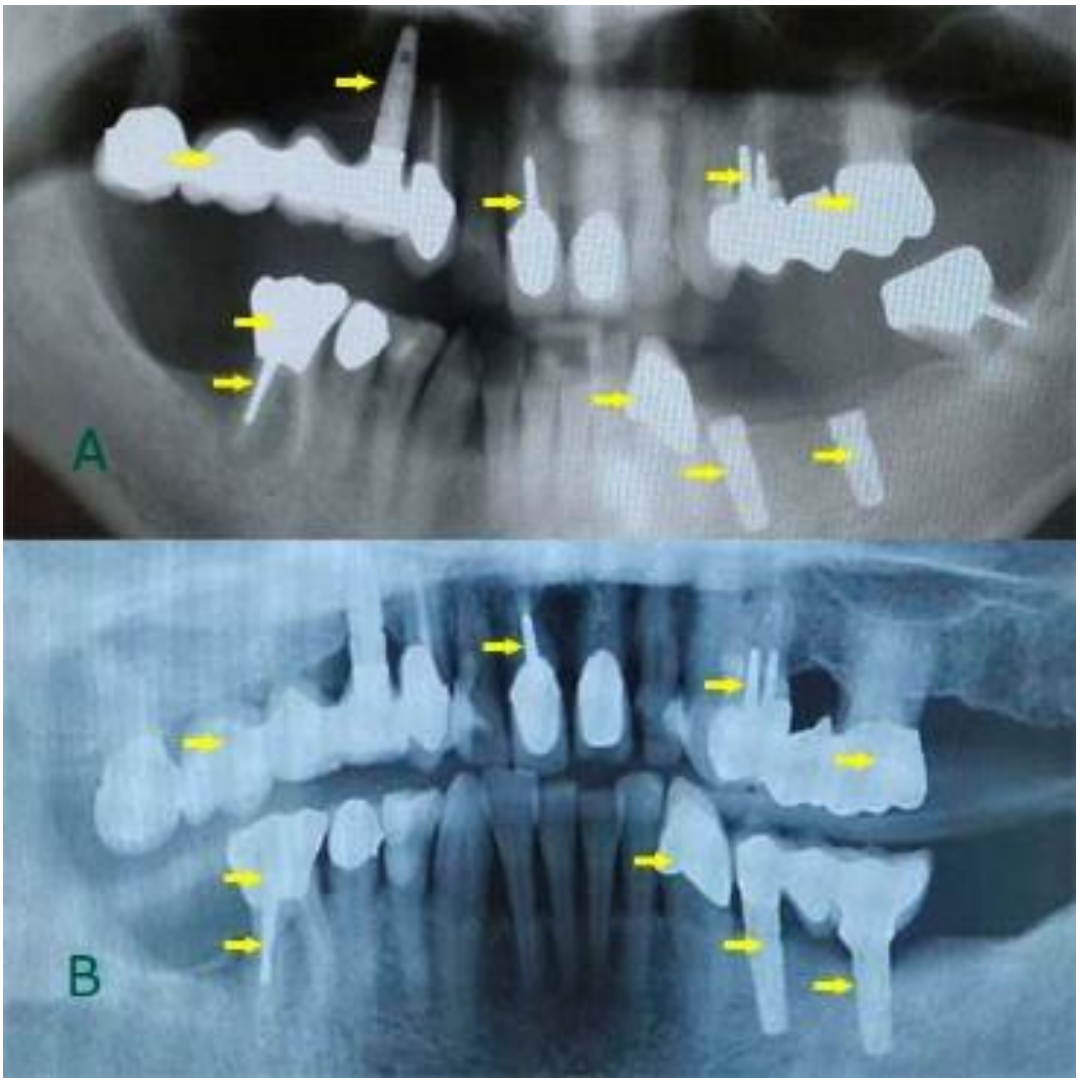

Figure 4: (A) *antemortem*; (B) *postmortem*. Yellow shafts show positive comparisons between panoramic x-rays.

The confrontation of the *postmortem* and *antemortem* charts found a large number of coincidences. It can be cited, for example, the quantity, type and location of the implants (14, 34 and 36), the existence of bridges (24, 25, 26 and 14, 15, 16, 17), the existence of crowns with intraradicular posts (11, 24 and 46), and dental materials used in various dental rehabilitation treatments (gold alloys for 26 and 46). Nevertheless, a discrepancy were detected on PM #23 (aesthetical material) and PM #37 (missing tooth), while AM chart were described as tooth coloured crown to #23 and #37 as tooth coloured crown, root filling and intraradicular post.

Due to the findings and after AM OPG examination, a positive identification was concluded.

DISCUSSION

A Forensic Dentistry aids in human identification based on the dental characteristics[9,10]. The forensic odontologist has extreme importance in the resolution of crimes and mass accidents, since the data obtained from the oral cavity could contribute to identify an individual and provide necessary information in a legal process. In addition, as information obtained from the oral cavity, they reduce the scope of the victim's search and play a key role in the process of human identification after catastrophes or mass catastrophes[11] and, in some cases, the probability value can be greater than DNA analyses[12].

Dental identification is based on confrontation between *antemortem* and *postmortem* characteristics[13,12], which are collected during dental examination. The first step in a dental identification is to collect all the dental evidence which is related with the unknown body: presence and/or absence of teeth, restorations, prosthesis (surfaces and materials), endodontic treatments and abnormalities[14]. *Antemortem* data were obtained from a dental record sent to serve as a paradigm for identification. By law, dental professionals are compelled to produce and maintain adequate patient records[15]. Therefore, the most common error among dentists is incorrect registration of restorations, indicating the importance of re-examining *postmortem* findings prior to comparison with *antemortem* data[16]. The fact of providing no descriptive details of the treatments made on dental records may lead to misleading identification human procedures and in allegations of clinical negligence or professional misconduct[17,18].

In this case, direct comparisons were made between *postmortem* and *antemortem* charts and panoramic radiograph. This procedure made it possible to verify the coincidence of clinical and radiographic PM dental data in relation to the AM records contained in the dental records and radiography performed 9 years earlier. The OPG may be of great value in the identification of human remains[19,20], though the comparison should be carried cautiously, if the *antemortem* radiographs were taken with a different technique. This because: (1) The film is so large that individual teeth and supporting structures are often overlapped and/or distorted, making comparison to other film types difficult and (2) the sheer logistics of positioning a decedent’s head, jaw or jaw

fragments, onto the machine may prevent the production of a quality image[21].

In the analysis of charts, only two significant discrepancies were detected. In the *postmortem*, 23 has tooth coloured restoration and absence of the 37, whereas in the *antemortem*, #23 has tooth coloured crown and #37 with tooth coloured crown with intraradicular post. The divergence as to the dental element #37 can be easily and logically explained by a simple extraction, which must have occurred after the annotation on the dental record signed by the dentist.

The discrepancy regarding dental element #23, after analysis of the AM panoramic x-ray, allowed the unequivocal confirmation that the mortal remains are from the questioned body. It can be said that it was a mistake in the registry made on the dental record, since the notation "KV" (crown - prosthesis) was used instead of "FK" (restoration). This fact highlight the importance of dental records for human identification that, even after years of dental treatment, contained relevant and specific information about the therapy performed in the person's oral cavity[22].

Despite these problems and challenges, teeth and dental treatments are recognized as one of the most valuable individualizing features on the human body. In addition to the enumerated and illustrated coincidences, the expert emphasizes that any unexplained discrepancies were found among the dental data contained in the dental records of the disappeared person, sent by the overseas Police Bureau, and the data obtained in the dental *postmortem* examination.

CONCLUSION

A positive identification based on 12 consistent features was achieved and there were no unexplainable discrepancies between *antemortem and postmortem* documents. In this case, besides the wrong notation made by the dentist and the importance to keep a quality dental records, this work evidences that panoramic x-rays are a valuable tools in dental identification and prosthetics and implants are great elements for a positive comparison, mainly when radiographs are available.

RESUMO

A odontologia forense é importante na identificação humana porque analisa características individuais presentes nos dentes de cada indivíduo com base na comparação. O objetivo deste trabalho é destacar a importância da documentação correta feita pelo dentista e apresentar uma solução de caso usando radiografia panorâmica. Para realizar o relatório, foram utilizados gráficos dentais e radiografia panorâmica para comparação com o exame dental nos restos de um corpo feminino. A notação errada do prontuário, feita pelo dentista, quase levou a uma identificação de exclusão. Devido à radiografia panorâmica feita nove anos antes da morte, uma identificação positiva pode ser feita. Esse fato enfatizou a importância da atenção quando o prontuário está sendo preenchido.

PALAVRAS-CHAVE

Odontologia Legal; Antropologia forense; Registros odontológicos, Radiografia panorâmica.

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