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Case Report

Dental Human Identification using Radiographic Records of Oral Implant Placement – a Case Report

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Abstract

Dental identification of charred bodies consists of a complex procedure, making necessary the investigation of especially unique dental identifiers. In parallel, Implantology has become more accessible worldwide. Consequently, clinical and radiographic records of implant procedures proportionately, are being increasingly available for legal purposes. Based on that, the present study aims to report a case of identification of a charred body through radiograph record of implant placement. In 2013, an unknown adult male became charred after a traffic accident. His body was referred for identification at the medico-legal institute. Concomitantly, relatives of the potential victims were asked to provide any medical record. Based on that, the Ante-Mortem (AM) data consisted of a clinical file; three periapical radiographs; six bitewing radiographs; and one panoramic radiograph dated from 2012; while the Post-Mortem (PM) data consisted of cadaveric radiographs; photographs and two dental implants retrieved from the charred body. Positive identification was achieved founded on the compatibility between the AM and PM morphology of the dental implants; the radiographic endodontic arrangement of the maxillary right third molar; and the thickness of the alveolar bone in the posterior region of the maxilla. In this context, clinicians must be aware of properly recording and storing steps of daily performances in Implantology in order to aid the justice; while forensic dentists must be aware of the best alternatives to overcome the limitations of identifying charred bodies.

Keywords: Implant; Radiograph; Morphology; Human identification; Forensic Odontology

Introduction

The dental human identification is an essential procedure in the routine of medico-legal investigations. This procedure is often performed through the comparison between the available Ante-Mortem (AM) dental data of the missing person and the Post-Mortem (PM) data collected from oral autopsies [1]. The AM dental data usually consist of imaging records, dental casts, and clinical files; while the PM data comprehend a broad range of cadaveric records from intra- and extra oral cadaveric examinationination [2]. In special situations, dead bodies are found putrefied, mutilated, charred, and skeletonized hampering the forensic labor [3]. In this context, unique dental evidences, such as morphological traits and signs of treatment interventions, play a key role during the human identification process [1].

In the last decades, Implantology became an emerging branch of dentistry [4]. Consequently, the demand for computerized imaging examinations prior to implant planning potentially increased [5], making of Implantology a valuable source of AM data. In parallel, the adequate registration and storage of clinical procedures represent an essential step in order to aid the justice in face of legal requests for circumstances [6].

The present study aims to support the medical literature on the interface between Implantology and Forensic Odontology highlighting the value of radiographic evidences for dental human identifications.

Case Report

In 2013, an unknown adult male was victim of fatal traffic accident. His body was found charred and referred to the local medico-legal institute for the investigation on the cause of death and dental identification. The cause of death was determined as "multiple trauma and carbonization".

Broken and charred maxilla and mandible were used during the dental autopsy. Most of the teeth presented fractured crowns due to high temperature. However, a partially charred maxillary right third molar (#18) was found unerupted and impacted (Figure 1). Additionally, two single dental implants with metal-ceramic prosthetic crowns were collected from the body (Figure 2). Both implants; the tooth (#18); and the fragments of maxilla and mandible

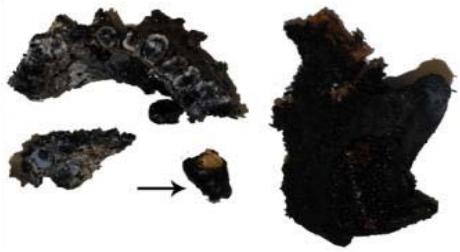

Figure 1: Post-mortem photograph of the maxillary right third molar (arrow) and the fragments of maxilla and mandible.

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Figure 2: Post-mortem photograph of the dental implants collected from the body.

were referred for post-mortem radiographic examination (Figures 3-6).

In parallel, police investigations on lists of missing persons pointed out a potential identity. Relatives of the potential victim were asked to provide any medical record to support a possible comparative dental identification. Consequently, a clinical file; three periapical radiographs; six bitewing radiographs; and one panoramic radiograph dated from 2012 were obtained. Specifically, the panoramic radiograph revealed an unerupted impacted #18 transversally positioned; absence of the maxillary left third molar (#28) and mandibular left first molar (#36); two dental implants in the region of mandibular right second premolar (#45) and first molar (#46); endodontic treatment of the mandibular right second molar (#47); and an erupted mandibular right third molar (#48) positioned adjacent to the mandibular ramus (Figure 7).

The comparison between AM (2012) and PM (2013) data revealed several compatible evidences: When transversally positioned, the tooth #18 revealed the same radiographic endodontic morphology of the tooth #18 observed AM (Figure 8); both dental implants retrieved from the cadaver presented the same morphology and screw pattern compared to the implants detected AM in the mandible of the victim; and the periodontal examination of the maxillary alveolar bone were also compatible AM and PM. Additionally, no discrepancies were found comparing the AM and PM radiographic data. Based on these outcomes, a positive dental identification was achieved.

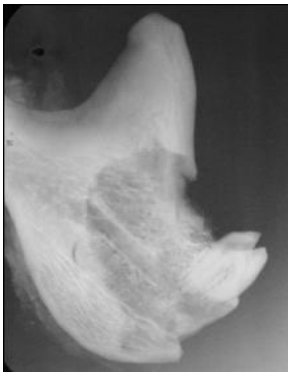

Figure 3: Post-mortem radiograph of the fragment of the right mandibular ramus.

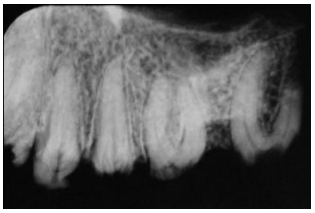

Figure 4: Post-mortem radiograph of the fragment of the posterior left maxilla.

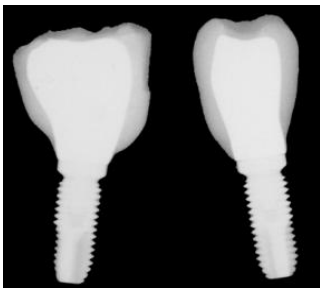

Figure 5: Post-mortem radiograph of the two single dental implants.

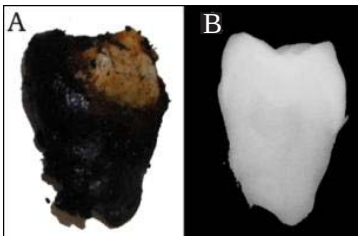

Figure 6: Comparison between post-mortem macroscopic (A) and radiographic (B) morphology of the tooth #18.

Figure 7: Ante-mortem panoramic radiograph of the potential victim.

Discussion

The identification of charred bodies consists of a challenging procedure in the forensic routine [3]. Specifically, hard and soft tissues may become fragmented and burnt hampering facial recognition, fingerprint analysis, and dental identification [7]. Metallic dental implants, however, play a valuable role as highly resistant PM evidence for comparative dental identifications.

Forensic surveys on cadaveric alterations from fire were designed to support dental identifications of charred bodies. Patidar et al [8], 2010, revealed that teeth and mandible bone become ashy and cracked when exposed to 1100° Celsius for 15 minutes. Yet metallic materials such as silver amalgam and titanium trend to resist up to 1100° Celsius[8] and 1668° Celsius [9], respectively. Ceramic crowns also revealed high resistance when exposed to 1100° Celsius for 15 minutes, presenting only morphological alterations [8]. However, these laboratory surveys simulated material alterations by fire under

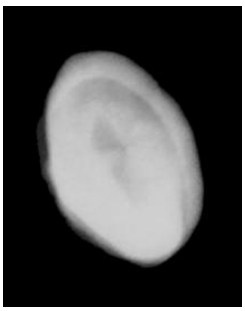

Figure 8: Radiograph of the maxillary right third molar transversally positioned.

the absence of orofacial muscles and adjacent bone, which may protect the teeth and restorative materials from the direct contact with fire. Specifically in the present case report, the AM radiographic data revealed that the dental implants and metal ceramic crowns were positioned in the posterior region of the mandible, consequently protected by adjacent soft and hard tissue.

Recently, innovations in Implantology led to laser labeling of batch number directly on dental implants, potentially enhancing human identifications [10]. Berketa et al [10], 2010, revealed that implants with abutments preserve the batch numbers intact even when exposed to 1125° Celsius. Unfortunately, implant batch numbers were not detected in the present case. In parallel, innovations in Forensic Odontology led to a trend on the investigation of geographic origin based on the implant pattern of different manufacturers [11]. However, major clinic and radiographic catalogues of dental implant patterns are necessary to represent effectiveness worldwide. Till now, no similar investigation was conducted within the Brazilian manufacturers, lacking application in the present case.

Additional advantages of using dental implants for human identifications comprehend the exclusion of potential victims in forehand. Specifically, PM data of victims with complete dentitions cannot be matched with AM data if victims with dental implants. This procedure is especially useful under mass disaster circumstances, in which several identifications are necessary in a restrict time interval.

Despite effective for forensic purposes, the radiographic images of dental implants were not addressed separate to the other parameters used for dental identification, but yet combined. Both the endodontic morphology of tooth #18 and the pattern of the maxillary alveolar bone revealed AM and PM compatibility. However, the PM imaging examination must properly reproduce the AM radiographic incidence in order to allow reliable comparative outcomes [12]. It is specifically observed when the tooth #18 was transversally positioned for the analysis of endodontic morphology. In the medical literature, charred bodies were identified using dental casts [13]; intraoral photographs [14]; clinical files [15]; and radiographs [16], but no study especially focused on the combination of dental implant, endodontic, and maxillofacial morphology.

Apart from the criminal panorama, clinical records of dental implant placement, and other dental interventions, are also the cornerstone of civil demands based on malpractice. Mainly, clinical files; radiographs; and computed tomography examinations; comprehend valuable tools to support legal expertises requested by the courts. Based on that, dentists should also maintain records of clinical treatments as evidence for defense under eventual legal conflicts [6].

Conclusion

In general, implants are unique dental identifiers with extreme importance as forensic evidences for human identification cases. Clinicians must be aware of properly recording and storing steps of daily performances in Implantology in order to aid the justice when requested by law; while forensic dentists must be aware of the alternatives for the use of dental implants, such as investigating morphology, batch numbers, and manufacture pattern, in the medico-legal routine.

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