

The utilization of small amounts of residual endodontic material for dental identification

John William Berketa¹,
Catherine Sims¹,
Rabiah Al Adawiyah Binti
Rahmat¹.

¹University of Adelaide

Corresponding author:
johnberketa@hotmail.com

The authors declare that they have
no conflict of interest.

KEYWORDS

*Forensic identification,
Edentulous,
Extruded endodontic
material*

J Forensic Odontostomatol
2019. May;(37): 1-63:65
ISSN :2219-6749

ABSTRACT

Dental information is one of the three scientific methods of identifying a deceased person. However, when an investigator is faced with dental ante-mortem information that indicates the deceased has had all his teeth extracted, it may be assumed that the dental information will not be useful, especially if no retained roots are visible in the post-mortem triage. The following case report highlights that careful examination including radiography, may reveal specific detailed information which was useful for identification to be established. Two small radiopaque objects were located in the apical area where the upper left canine root apex would have been. The radiopacities size, location, positioning to both each other and to the left maxillary sinus corresponded to ante-mortem radiographs. This case reveals an unusual use of extruded root canal material being of evidential value even though the tooth was extracted.

INTRODUCTION

Following the death of any person, identification is required for legal and ethical reasons.¹ For non-visual cases the three scientific methods of identification accepted by INTERPOL are fingerprinting, DNA and dental comparison.² DNA testing has proven to be very successful in matching biological material. However, DNA testing may be costly, delayed (depending upon the resources available for the local authorities) compromised by contamination and degraded by heat.³ In regards to fingerprinting, the deceased may also not be on the registry to provide a match. Dental identification based on comparative analysis of post-mortem dental information to ante-mortem information is recognized to be reliable and time efficient.^{4,5} Comparisons to anatomical landmarks and morphological structures such as sinus patterns, stylus abnormalities and medical prostheses, dependent upon ante-mortem information being available, may sometimes be utilised when the dental information is limited, either ante-mortem or post-mortem.⁴⁻⁸

Occasionally when the investigator receives dental ante-mortem information that indicates that the deceased is edentulous in maxillary and/or mandibular arches with or without full upper and/or lower dentures, too often it is assumed that the dental information has little or no forensic value for identification. Also there could be insufficient dental records, no ante-mortem radiographs available or the recovered

dentures are unlabelled. Previous literature has discussed the utilisation of root canal treatment comparison for identification where the roots are still present⁹⁻¹² but there is no literature available on the use of retained extruded material for identification purposes. The following case demonstrates that dental radiographic examination of edentulous areas could provide valuable forensic evidence for identification.

THE CASE

A deceased adult male in an advanced stage of decomposition was presented for odontological identification. Upon visual dental examination, it was noted that the maxillary arch was edentulous and the lower arch consisted of eight teeth with severe attrition, abrasion and erosion. There were only minor adhesive restorations present.

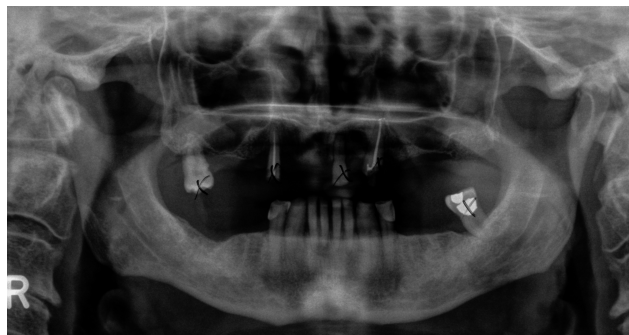
Upon detailed dental periapical radiography, two small radiopaque objects (one oblong in shape and the other more circular) were located in the apical area where the upper left canine root apex would have been (Fig. 1).

Fig. 1: Post-mortem radiographic image showing the two radiopaque root filling material objects positioned high and adjacent to the left maxillary sinus



The radiopacities size, location, positioning to each other and to the left maxillary sinus corresponded to the endodontic materials present on an ante-mortem orthopantomograph (OPG). The ante-mortem OPG was taken when the deceased still retained his upper left canine tooth with the overfilled root canal obturation at its apical area (Fig. 2).

Fig. 2: The ante-mortem orthopantomograph showing the pre-extraction positioning of the numbered 23 tooth together with the extruded root filling material compared with the maxillary sinus



Magnification of this OPG can be seen in Fig. 3. Further evidence was observed on a more recent ante-mortem OPG which was substandard in quality but contained sufficient detail to confirm that these radiopacities were still present post-extraction (Fig. 4). As the types of post-mortem and ante-mortem radiographs are of different styles and affected by technical issues such as dissimilar x-ray angulations and orientation of the patient's head, this situation does not allow accurate metric analysis, however comparative analysis is possible. This radiographic evidence, coupled with the information from the lower dentition, was sufficient to establish the identity of the deceased.

Fig. 3: Detail of Fig.2 showing the two radiopaque root filling material objects at the apex of the root

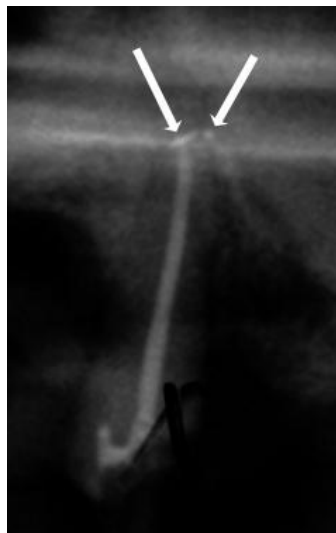
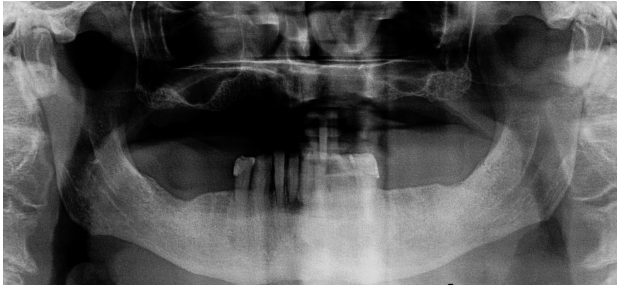


Fig. 4: A more recent (but blurred) ante-mortem orthopantomograph showing the upper loss of the numbered 23 tooth but the retention of the extruded root filling material



DISCUSSION

An initial triage assessment of a deceased person requiring non-visual identification with both or either full upper and lower dentures might suggest that dental examination would prove difficult¹³, suggesting other methods are required. In most cases this would be correct, however if other methods were not successful or in the case of a multiple victim disaster, a dental examination should be conducted as

REFERENCES

1. Cordner SM, Woodford N, Bassed R. Forensic aspects of the 2009 Victorian Bushfires Disaster. *Forensic Sci Int*. 2011;205(1-3):2-7.
2. DVI guide [Internet]. [Updated 2009; cited 2018 Dec 14]; Available from: <http://www.interpol.int/INTERPOL-expertise/Forensics/DVI-Pages/DVI-guide>.
3. Imaizumi K, Taniguchi K, Ogawa Y. DNA survival and physical and histological properties of heat-induced alterations in burnt bones. *Int J Legal Med*. 2014;128:439-46.
4. Marlin DC, Clark MAS. Identification of Human Remains by Comparison of Frontal Sinus Radiographs: A Series of Four Cases. *J Forensic Sci*. 1991;36(6):1765-72.
5. Monsour PA, Young WG. Variability of the styloid process and stylohyoid ligament in panoramic radiographs. *Oral Surg Oral Med Oral Pathol*. 1986;61(5):522-6.
6. Simpson EK, James RA, Eitzen DA, Byard RW. Role of orthopedic implants and bone morphology in the identification of human remains. *J Forensic Sci*. 2007;52(2):442-8.
7. Spyropoulos ND, Liakakoy P. The use of periapical x-rays in the identification of a corpse. *Hell Stomatol Chron*. 1990;34(2):151-6.
8. Pinchi, V, Zei G. Zei. Two positive identifications assessed with occasional dental findings on non-dental x-rays. *J Forensic Odontostomatol*. 2008;27(2):34-38.
9. Forrest AS, Wu HYH. Endodontic imaging as an aid to forensic personal identification. *Aust Endo J*. 2010;36(2):87-94.
10. Bonavilla JD, Bush MA, Bush PJ, Pantera EA. Identification of incinerated root canal filling materials after exposure to high heat incineration *J Forensic Sci*. 2008;53(2):412-8.
11. Silva RF, Franco A, Mendes SDSC, Picoli FF, Nunes GF, Carlos Estrela C. Identifying murder victims with endodontic radiographs. *J Forensic Dent Sci*. 2016;3:167.
12. Silva RF, Franco A, Picoli FF, Nunes FG, Estrela C. Dental identification through endodontic radiographic records: A case report. *Acta stomatologica Croatica*. 2014;48(2):147-150.
13. Borrman H, Grondahl, HG. Accuracy in establishing identity in edentulous individuals by means of intraoral radiographs. *J Forensic Odontostomatol*. 1992;10(1) : 1-6.
14. Tai CC, Blenkinsop BR, Wood RE. Dental radiographic identification utilising computerised digital slice interposition: a case report. *J Forensic Odontostomatol*. 1993;11(1):22-30.
15. Berketa JW. Maximizing postmortem oral-facial data to assist identification following severe incineration. *Forensic Sci Med Path*. 2014 Jun 1;10(2):208-16.
16. Slabbert, H., G. L. Ackermann, and M. Altini. "Amalgam tattoo as a means for person identification." *J Forensic Odontostomatol*. 9.1 (1991): 17-23.

there is a possibility that detailed information might be discovered. As well as root filling material a dental radiographic examination could highlight visible anatomical features including retained roots, maxillary sinuses and trabeculae patterns^{14,15}. Artefacts could also be highlighted, including amalgam tattoos which may not correspond to the exact position of an ante-mortem radiographic record due to movement if embedded within soft tissue only¹⁶, implants, medical stabilization devices (which consist of small plates and screws) and foreign bodies which can be compared with ante-mortem radiographs. Nonetheless, physiological or pathological changes affecting the dental structures should not be discounted when comparing the features between the post-mortem and ante-mortem radiographs.

Although this case is unusual, it provides evidence for the necessity of thorough dental radiographic examination of edentulous areas even though initial investigations might suggest that these areas are of little evidential value.

ACKNOWLEDGEMENTS

South Australian Coroner's Office