

Comparison of Postmortem and Antemortem Radiographs, A Leading Clue for Speedy Identification of Human Remains

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Abstract

One of the most remarkable features of the human body is its individuality of appearance. "Each man's shell is his own personal sign, clearly setting him apart from any other human beings in the present or the past". The criminal acts of unlawful people can cause a disastrous end to the life of an individual. Soft tissue degeneration in human remains leads to loss of evidences. Forensic Science has proved to be of immense help in the identification of such cases with the available human remains such as skull and teeth due to their resistance to environmental insults. The most important application of forensic odontology includes identification of human remains through dental records and assisting at the scene of crime. The author reports a case of a victim of murder who was identified by comparing the postmortem data with the antemortem dental records sent by his dentist. Proper preservation and analysis of dental records can thus make it a legally acceptable document and assist legal authorities in the identification of victims and suspects.

Key words: Dental Records; Human Identification; Human Remains.

Introduction

The broadening frontiers of dentistry have taken the dentist as an expert witness in legal room proceedings and in the field of forensic sciences[1]. Personal identification form an integral part of forensic sciences, especially when they are dealing with crimes or mutilated bodies that have undergone damage beyond recognition[2]. It is most often accomplished by the comparison of postmortem radiographs of the teeth of the decedent with the antemortem radiographs obtained from the dentist of the suspected victim [3]. Dental tissue may resist extreme conditions of degradation, such as exposure to high temperatures, humidity and excessive pressure. The high mineral content of dental tissues, especially enamel, is responsible for their hardness and resistance, making the dental examination a key

component for identification of human remains[4]. Dental evidence emerges as one of the reliable identification modalities because of its unique treatment procedures such as restorations, and dentures which can provide significant information in identification of the deceased. A methodical and systematic examination of each tooth and the surrounding anatomical structures also play an important role in those individuals with minimal treatment procedures[5].

Case report

We reported a case of a research student from Spain who went missing in June 2006 from Dakshina Kannada district of South Western India. He was camping in the Western Ghats to study the Indian environment and forestry. The embassy of Spain approached the legal enforcement authorities to carry out an investigation. With the photograph of the victim, the investigating team began interacting with the natives of the village. A breakthrough was reached when a village dweller identified the

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photograph and reluctantly confessed that he was providing the student with necessary supplies for the camp in the forest.

On further interrogation, the villager revealed that he had not seen the student since long and therefore, he decided to pay a visit to the camp site. At the camping site, he saw the student's body hanging from a tree. Fearing that he would be falsely implicated regarding the murder, he refrained from informing the police. After a few weeks, he noticed some of the student's belongings in his neighbor's house.

The police arrested the suspect who later confessed to have murdered the student at the camping site. The police recovered skeletal remains of the victim from the interior forest area.

1. Examination of the body at the crime scene

The investigating team found skeletal remains at the crime scene. The belongings of the student found in the tent were positively recognized by his supposed father. The skeletal remains were recovered and sent to the forensic medicine department for further examination.

2. Forensic examination

The skeletal remains received included a skull without mandible and 10 teeth, manubrium, ribs, 23 vertebrae with sacrum, both clavicles, scapulae, humerus, ulna, tibia with broken ends, hip bones,

left radius, left femur and a few carpal and metacarpal bones. The dry bones were free of soft tissues.

The forensic expert observed that the bones belong to a human male aged about 25 - 35 years determined by fusion of ossification centers in the long bones, symphyseal changes on the articular surface of the pubis and obliteration of the cranial sutures. The stature of the person was about 183cm to 188cm determined using the regression formula (Karl Pearson Formula) to the length of femur and humerus. The cause and time of death could not be ascertained as there were no ante-mortem injuries on the bones and there was also drying of the bones.

Postmortem Intra oral periapical radiographs (IOPA) and Ortho-pantamograph (OPG) of skull without mandible (Fig. 1, 2 & 3) revealed

1. Impacted (distoangular) maxillary right and left third molars.
2. Root canal treatment with respect to permanent maxillary right second molar
3. Caries/fracture with respect to permanent maxillary right first molar
4. Radiopacity with respect to permanent maxillary left first and second molar suggestive of restoration
5. Incomplete root apex formation with respect to 18 and 28

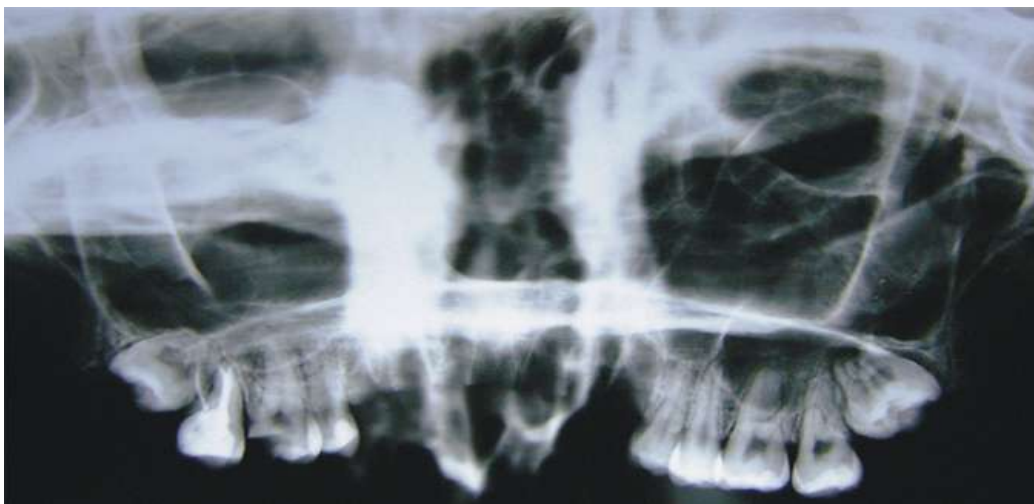


Fig. 1: Postmortem IOPA of left posterior maxilla.

Fig. 2: Postmortem IOPA of right posterior maxilla.



Fig. 3: Postmortem OPG.



The antemortem dental records (Fig. 4, 5 & 6) included

1. 8 IOPA
2. Dental treatment chart

Comparison of antemortem and postmortem dental records

On comparison, the morphology of the teeth, morphology of associated bony structures, position of individual teeth, relation of teeth with each other, pathology associated with the teeth, dental

restorations, developing 3rd molars and morphology of the root canals of root canal treated tooth matched with those in the post-mortem IOPAs thereby confirming the identity of the victim.

Other investigations which were done included:

1. Superimposition of the skull
2. Personal belongings such as ATM card, clothing and books (Identified by his father)
3. DNA testing which was done by extraction of DNA from the teeth.
4. Transitional vertebrae or sacralization of lumbar vertebrae which is a congenital abnormality on the sacral bone.

Fig. 4: Antemortem IOPA of right posterior maxilla.

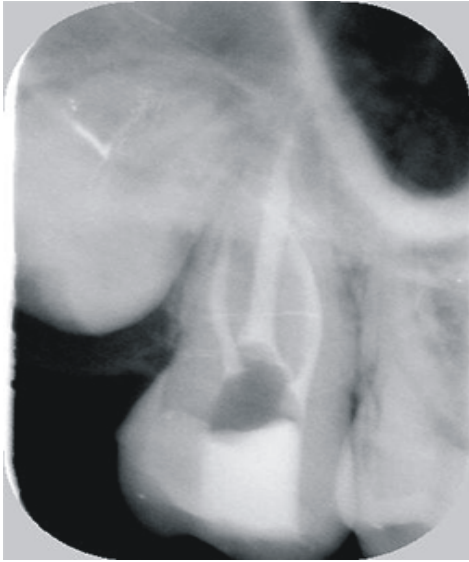
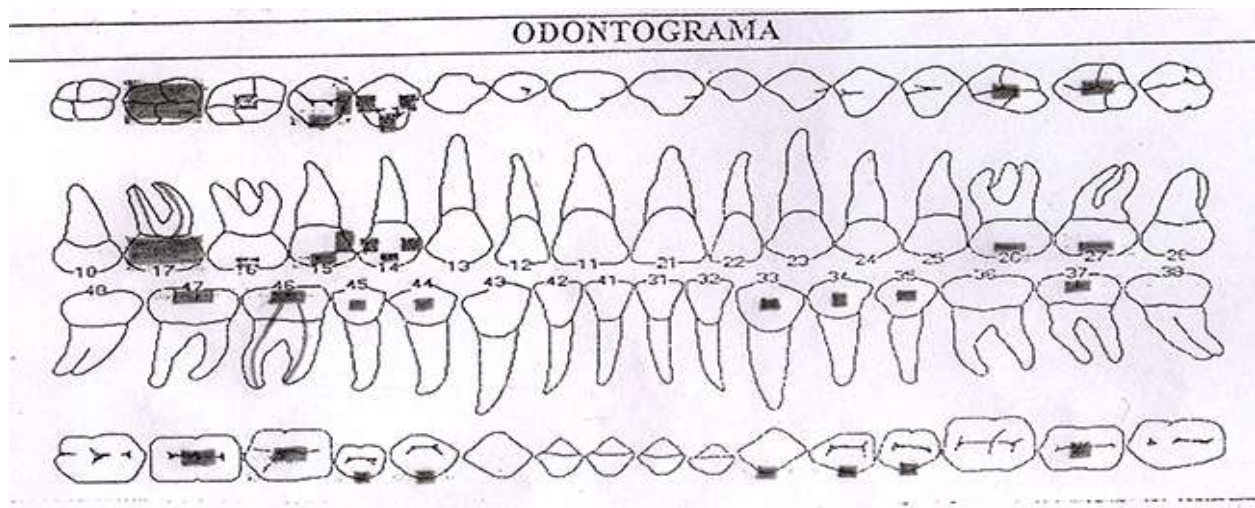


Fig. 5: Antemortem bitewing radiograph of right posterior region.



Fig. 6: Dental treatment chart.



Discussion

Human identification, by comparing dental characteristics, is considered to be one of the most reliable, accurate and rapid methods when postmortem changes, traumatic tissue injury or lack of a fingerprint record invalidate the use of visual or fingerprint methods[6].

All the processes of human identification, from the analysis of fingerprints to dental identification or even DNA technology, are based on a comparative process; that is, to achieve a positive result, a composition of data previously obtained and related to the same material should exist to allow the comparison with the material available for

examination at the present moment [7]. Dental records are one of the materials that provide a higher number of information to execute the comparative process, offering the details and particularities that make a person unique[7]. The main characteristics used to compare dental records are the presence or absence of a specific tooth, the morphology and dental restorations of the teeth, pathologies and other anatomical features[8]. The main advantage of dental evidence is that like other hard tissues, it is often preserved after death. It may resist extreme conditions of degradation, such as exposure to high temperatures, humidity and excessive pressure as observed in the present case. The high mineral content of dental tissues, especially enamel, is responsible for their hardness and resistance, making

the dental examination a key component for identification of human bodies. The combination of decayed, missing and filled teeth is measurable and comparable at any fixed point of time [4,9].

An antemortem dental record contain written notes, charts, diagrams, dental and medical histories, radiographs, clinical photographs, study casts, results of specific tests, prescriptions, and referral letters and other information. Their accuracy and availability have a huge impact on the speed and efficacy of identification. The postmortem dental records include written notes, photographs, radiographs and charting down complete dental findings[10].

In the present case, antemortem radiographs and complete dental charts were available for comparison which helped in speedy identification of the victim. Individuals with numerous and complex restorations are often easier to identify than those with little or no restorative treatment[10].

In victims where there is complete decomposition, radiographs may be the only available biometric method. Dental records offer a valuable resource for establishing the identification of the deceased. The creation, maintenance, storage and custody of such records are thus the legal and ethical duties of each dentist[4].

Crime scene investigators often face lack of manpower, financial, and time constraints. Dental identifications are expeditious, accurate and cost effective [11]. In the present case, although DNA analysis was the confirmatory method, odontological and radiological examination helped in the initial speedy identification of the murdered victim by comparison of the antemortem and postmortem dental records. It is essential to emphasize the need for a standardized system of recording dental findings and to ensure that dental identification procedures will be used in all identification processes [12].

Conclusion

We conclude that odontological and radiographic procedure may be powerful, reliable, economic, rapid and accurate methods for identification of skeletonized, decomposed and burnt victims which invalidate visual identification. We also emphasize the value of a forensic dental examiner being present as part of the forensic team during the investigation to seek identification of human remains.

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