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Case report

The role of forensic odontology in the identification of a mutilation victim: A case report

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ABSTRACT

Background: *Forensic odontology is an invaluable resource for human identification. An individual's bones and teeth may be the only remnants of their identity in certain situations where soft tissue has been lost, carbonized, or destroyed for any other reason. The body's hardest and best-protected structures are found in teeth, and these have individual characteristics and are resistant to factors such as temperature and chemistry. When antemortem dental records are not available for comparison, dental profiling is performed.* ***Purpose:*** *This case study highlights the importance of teeth in the identification process and their usefulness in estimating biological profile factors such as sex, age, and population affinity.* ***Case:*** *The case of an unidentified woman who was found in a house in a severely decomposed, skeletonized state is presented. The unidentified body was sent to the Forensic Medicine Installation of Bhayangkara Level I Hospital to determine the cause of death and for dental identification.* ***Case management:*** *The body was suspected to be a victim of mutilation. Shovel shapes observed on the lingual surface of the lateral upper incisor and tori palatini are the most outstanding diagnostic features in Mongoloid populations. The specific mesiodistal crown width and mandibular canine index revealed female traits. Using the Lamendin method, the age was estimated to be 52–58 years old.* ***Conclusion:*** *A forensic odontologist can identify individuals by comparing antemortem and postmortem dental data. They can also provide age estimation, sex, and population affinity determination by analyzing teeth.*

Keywords: *body remains; dental identification; forensic odontology; skeletonized*

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INTRODUCTION

Forensic odontology is the field of dentistry that deals with investigations in criminal and civil law cases. It is concerned with how dental evidence should be handled, examined, and evaluated, and how dental findings should be presented for equity.[1] Many cases that cannot be identified by fingerprints or visual identification can be identified using a forensic odontology method. The main goal is to identify an individual based on the features of their dental structure.[2]

Many cases present difficulties for forensic identification, including mutilated bodies, victims of fire, bodies that have undergone additional decomposition or skeletonization, and victims who suffered severe head trauma or were doused in corrosive substances.[3] The primary principle of dental identification involves verifying an individual's identity by comparing their postmortem dental remains with their antemortem dental data. This method is more reliable and easier than other methods.[4] If a positive dental identification cannot be achieved due to the lack of antemortem data, postmortem dental profiling is conducted. The forensic odontologist can provide clues regarding the age, sex, and population affinity of the deceased based on dental evidence found at the scene.[5,6]

This case report outlines the management of the identification process of an unidentified mutilation victim

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who was already in the skeletonized phase. The purpose of this case report is to demonstrate the role of forensic odontology in the identification of skeletonized mutilation victims using dental findings.

CASE

In December 2022, police officers discovered two plastic boxes that contained body parts in Bekasi, Indonesia (Figure 1). The boxes contained skeletonized human body parts that were highly decomposed. It was believed that the body had been mutilated. Following a crime scene investigation, the unidentified body was sent to the Forensic Medicine Installation of Bhayangkara Level I Hospital to determine the cause of death and the identity of the victim through dental identification.

CASE MANAGEMENT

Preliminary medical assessment: The body was delivered in two plastic-box containers. The first was a transparent plastic box with a brown cover. It contained soil and a black plastic bag containing six human body parts. The second box was a brown plastic container with a yellow lid fastened with black duct tape. Inside the second box were two black plastic bags and two red plastic bags. One of the red bags contained two sections of human legs and the remains of soft tissue that was beginning to decompose. One of the black plastic bags contained a head-to-chest fragment of a human body, and the other contained human body parts in the form of right and left upper limbs.

The tissue from the remains was meticulously removed and dissected to reconstitute the skeletonized features of the human remains, which were examined by pathologists to determine the cause of death (Figure 2). On examination of the severed bones, no signs of blood leakage were found, indicating that the mutilation process was performed after the victim had died. The cause of death was blunt force trauma to the neck, which blocked the breathing, resulting in death from suffocation.

Postmortem dental examination: After the pathologists examined the body parts, the odontologists performed a dental examination. The corpse was heavily decayed, and it had teeth in both the upper and the lower jaws. Examining the teeth allowed for revealing the presence of postmortem missing teeth, veneer work, attrition, and residual roots.

Dental charting was conducted using Interpol's standard guidelines, including Interpol postmortem forms and Interpol

Figure 1. The two plastic boxes that contained various human body parts.

Figure 2. The remains in an advanced stage of putrefaction were reconstructed.

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standard abbreviations. Each tooth was specified using the World Dental Federation's nomenclature (Figure 3).

Digital single-lens cameras were used to take dental photos in view of maintaining the veneer's characteristics and tooth features (Figure 4). Second molars on the upper right and left sides and a femur were preserved for DNA samples.

The examination revealed that, based on the mandibular canine index and mesiodistal crown breadth, the victim was female. The population affinity was determined to be Mongoloid due to the presence of shovel-shaped features on the lingual surfaces of the lateral upper incisor and a torus palatinus (Figure 5). Using Lamendin's method, the age was estimated to be 55 years old, with a standard deviation of 3.3 years (Figure 6).

Figure 3. Postmortem dental charting showing both the maxilla and mandible covered with veneer.

Figure 4. The maxilla and mandible showed the presence of veneer traits.

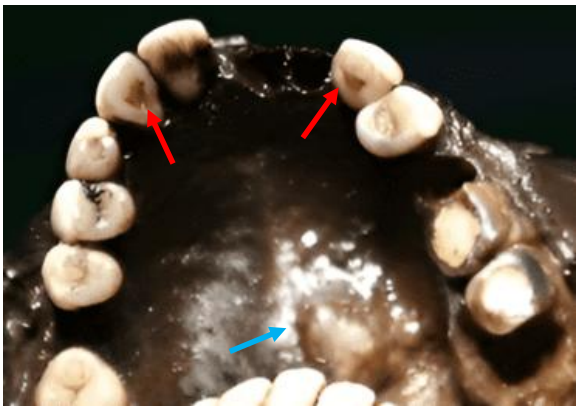

Figure 5. Shovel-shaped upper right canines; incisors lateral left (red arrow) and torus palatinus (blue arrow).

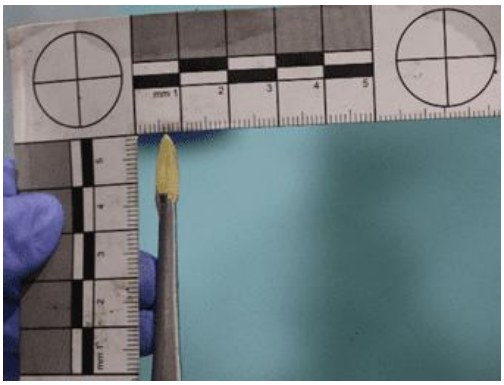

Figure 6. Root translucency was observed on the maxillary central incisor. The length of the translucent part was measured using Lamendin's formula. The estimated age was 55 years old, with a standard deviation of 3.3 years.

Figure 7. Antemortem image. The teeth are covered with veneers.

Figure 8. Postmortem dental image. The teeth were covered with veneers.

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Antemortem data was obtained for profiling, initiated by a missing person report from the local police. The proceeding data was gathered through interviews with suspected family members. Information provided by the family stated that the victim wore dental veneers and detailed characteristics of the victim pointed to a 58-year-old woman who had been missing since 2019 (Figure 7). Postmortem dental examinations revealed that the teeth were covered with veneer (Figure 8). It was also found that the deceased had a daughter who died in 2018. In comparative analysis, reconciliation was accomplished by comparing and correlating antemortem and postmortem dental findings and DNA analysis results.

DISCUSSION

Forensic identification is a process that helps investigators determine a person's identity. Determining individual identity can involve visual identification methods and document, property, medical, dental, serologic, fingerprint, and DNA analysis methods. A person's identity can be confirmed if at least two of the methods used provide positive ("no doubt") results.[6] When antemortem dental records are not available for comparison, the teeth can be used to determine an individual's age, sex, population affinity, habits, occupation, and other details that may provide additional insight into their identity. This assessment helps to focus the investigation, making it easier to identify the deceased body.[7]

Dental age estimation techniques used on adults evaluate the variance of particular metrics, including apposition of secondary dentin, ligament periodontal retraction, and progression of radicular dentine transparency. The use of dental age estimation techniques varies according to the deceased person's case type and biological materials. The most used techniques in forensic odontology are the Gustafson,[8] Johanson, cementum annulation, and Lamendin methods.[9] In the present case, the odontologist used the Lamendin method. Published guidelines on age estimation indicate that the Lamendin method is one of the most widely used methods in forensic investigations. The technique is rapid, low-cost, and adaptable to various population affinity categories.[10]

The Lamendin method was created to estimate the age at death of adults. The method involves extracting the teeth. Two dental factors are analyzed in this process (periodontosis and transparency) and three measures of height (transparency, root, and periodontosis), utilizing the following formulas:

A (age) = (0.18 x P) + (0.42 x T) + 25.53, where A = age, P = periodontosis, and T = transparency,

$$P = \frac{Periodontosis\ height}{root\ height} x\ 100\ T = \frac{Transparency\ height}{root\ height} x\ 100$$

,

In this case, the age was estimated to be 55 years old, with a standard deviation of 3.3 years. The real age of the victim was 58 years old, which was within the range of the estimated value. This demonstrates that age estimation using Lamendin's method is reliable, with the method proving effective in forensic cases. It can be applied to estimate a person's age in the range of 30–69 years, while in individuals under 30 and over 69, higher error rates are observed.[11] Since root translucency appears after the age of 20, Lamendin's approach has the drawback of being inapplicable to young people.

All measurements were performed using the American Board of Forensic Odontology scale, and the root transparency was visualized with the aid of a light. The distance from the root to the apex to the highest height of transparency along the root surface is known as dentinal translucency. Once the dentinal tubules are occluded, the reactive indices equalize because of hydroxyapatite crystal deposition in the tubule. This explains why the dentin turned transparent. Age and translucency have a strong correlation.[12]

In addition, the determination of population affinity and sex is also an essential part of the identification process.[13] It is challenging to determine an individual's population affinity for identification purposes based on their dentition. Nonetheless, certain dental traits are more common in specific population affinity groupings, and these serve as crucial markers in the identification process. In this case, forensic odontologists concluded that the population affinity of the unidentified skeletal remains was Mongoloid, based on the distinctive shovel-shaped features found on the palatal surface of the maxillary incisive teeth and the torus palatinus. This agrees with other authors who reported that most noticeable feature in Mongoloid teeth is found on the lingual surface of upper incisors, which forms a cingulum and creates a deep lingual fossa, giving the tooth a "shovel-" or "scoop-" shaped appearance. Approximately 90% of Mongoloids have this characteristic.[14]

To determine the sex of the skeletal remains in this case, the forensic odontologist used the method encompassing the mesiodistal width of the mandibular and the index of the mandibular canine. Due to its simplicity, dependability, affordability, and ease of use, this method has been used in numerous large-scale populations. This measurement was taken using a digital caliper. To study canine dimorphism, the mandibular canine index was calculated based on Rao's method, which is expressed as follows:

$$Mandibular\ canine\ index = \frac{Mesiodistal\ crown\ width\ of\ mandibular\ canine}{Mandibular\ canine\ arch\ width}$$

The standard mandibular canine index is 0.240. If the canine index is higher than the standard, the individual is classified as male, whereas if the index is lower than the standard, the individual is classified as female.[15] In this case, the standard canine index of the victim was less than 0,240, and the victim was thus determined to be female.

In this case, certain difficulties were faced, such as the lack of antemortem data from dental records. Not every person in Indonesia has access to dental treatment. A lack of data means forensic odontologists must make a greater effort to obtain and use clues effectively. For example,

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pictures from social media can provide more clarity and information that family members are unaware of. This helps forensic odontologists to obtain further data to achieve a more definitive result. A profile picture sometimes helps to provide additional information. If an antemortem image of the individual clearly shows their anterior teeth, and there are specific dental characteristics, these can be compared to those of postmortem photos. If the image is clear, certain features can be determined, including crown shape, size, outline, morphological characteristics, width, face profile, dental anomalies, alignment, and distances between the teeth.[16,17]

In the present case, the postmortem images were compared with the antemortem photographs. A postmortem photograph revealed that the teeth of the upper and lower jaws were covered with veneers. The antemortem photograph (a selfie photo) of the deceased person showed the same dental condition, with the teeth of the upper and lower jaw covered with veneers. Characteristics of the teeth were helpful in the comparison process in this case.

DNA profiling is a reliable method for identification.[18] Kaur et al.[19] used a DNA profile from the teeth of a deceased, unidentified person to prove paternity between the deceased and presumed children. Sweet and Sweet[20] investigated a case of female homicide in which identification of the victim was difficult due to severe gasoline burns. The victim's teeth managed to withstand the exceedingly high temperature of the burning gasoline, and the researchers successfully extracted high molecular weight DNA from the dental pulp of the molar teeth.[20]

In the present case, the biological profile of the deceased was revealed following analysis of DNA taken from the teeth and bones, which was matched to the DNA of the deceased daughter. Technical exhumation was conducted to recover DNA samples from the suspected victim's daughter. The upper molars of the left and right sides and the femur were preserved for DNA sampling and sent to the Central Forensic Laboratory. When identifying damaged or dispersed human remains, teeth and bones are frequently the only accessible sources of DNA. In many situations, teeth are a preferable source of DNA because of their unique characteristics and position within the jawbone, which helps protect DNA better than bone. Compared to canines and premolars, molars are more frequently utilized as a source of DNA because they are thought to be the best teeth for extracting DNA. They have larger pulps, more roots, and produce more pulp cells than canines and premolars.[21] Prior studies have demonstrated that dense, cortical, weight-bearing long bones such as the femur should be the preference for sampling. The femur contains a greater number of DNA sources compared to trabecular bones such as the skull, ribs, or vertebrae.[22]

The typing results of the analyzed samples are shown in Table 1. Amelogenin is a gender-determining marker and was used to help determine the sex of the victim. As shown in the table, amelogenin displayed XX alleles in the victim's profile, which confirmed that the victim was female. A complete DNA profile with 23 autosomal STR loci was also obtained from the suspected victim's daughter, with the presence of XX alleles on amelogenin testing. On comparing these DNA profiles, it was observed that one of the two alleles in the genotype of the victim was a match with one of alleles found in the genotype of the suspected victim's daughter.

The probability of paternity was calculated and the result showed that the probability of maternity for the victim and the suspected victim's child was 99.999%. This confirmed the identity of the victim.

The deceased person was determined to be a victim of a murder. The body of the victim was mutilated and stored in two plastic containers inside the suspected murderer's house. The court sentenced the suspect to life in prison.

In conclusion, identification of skeletal mutilation victims cannot be achieved through visual methods alone, meaning other examinations—such as forensic odontology and DNA profiling—must be used. A forensic odontologist can perform dental profiling to determine a victim's sex, estimated age, and population affinity. The postmortem dental profiling in this case revealed that the victim was a female, with an estimated age of 55 years old with a standard deviation of 3.3 years. The postmortem dental findings were compatible with the biological profile of a missing person, which was confirmed by DNA profiling. This case report provides an example of the standard procedure for dental profiling and forensic odontology's role in identifying human remains, especially in cases where the body is skeletonized.

Table 1. The typing results of the analyzed samples

Genetic markers	Victim's profile		Suspected Victim's daughter	
	Allele 1	Allele 2	Allele 1	Allele 2
D3S1358	15	17	15	17
vWA	14	17	17	17
D16S539	12	13	12	12
CSF1P0	10	11	11	11
TPOX	8	11	11	11
D8S1179	10	18	10	11
D21S11	30	30.2	30	30
D18S51	15	16	16	16
DYS391	-	-	-	-
D2S441	11	12	12	12
D19S433	12	13	13	14
TH01	8	9	7	8
FGA	22	23	22	22
D22S1045	15	15	15	17
D5S818	10	10	10	10
D13S317	8	10	8	8
D7S820	10	11	11	12
SE33	23.2	28.3	-	-
D10S1248	13	15	13	15
D1S1656	15	17.3	-	-
D2S391	19	20	18	20
D2S1338	17	19	-	-
Amelogenin	X	X	X	X

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