

Dental Identification of the Putative Body of a Most Wanted Fugitive

Sang-Seob Lee,
Han Young Lee,
Joong-Seok Seo

Medical Examiner's Office,
National Forensic Service, Wonju,
Korea

Received: October 8, 2014
Revised: October 23, 2014
Accepted: February 12, 2015

Correspondence to
Sang-Seob Lee
Medical Examiner's Office, National
Forensic Service, 10 Ipchun-ro, Wonju
220-170, Korea
Tel: +82-33-902-5212
Fax: +82-33-902-5911
E-mail: komiyama@korea.kr

Dental identification was conducted on the putative body of a most wanted fugitive who was considered to be the *de facto* owner of the ferry MV Sewol. Postmortem examination showed many dental characteristics, including gold crowns, a porcelain-fused-to-metal crown, a gold fixed bridge, and resin restorations. The estimated age of the body was approximately 73 years. Antemortem data collected by the fugitive at private dentist showed that 10 teeth had dental features. When the antemortem data on the 10 teeth were compared with the corresponding teeth by using postmortem data, there was no discrepancy in the remaining teeth. The number of possible combinations was calculated, and the likelihood of this fugitive and any other person having the same dental features was one in 14 billion. Using the results of dental examination, the body was successfully identified.

Key Words: Age determination by teeth; Forensic dentistry

Introduction

Identification of humans is usually performed by various scientific means, but comparisons of fingerprints, DNA profiles, and dental characteristics are the only accepted stand-alone forms of identification. Comparative dental identification is useful in the case of a heavily decomposed body because the fingerprint no longer exists and DNA profiling takes time. In comparative dental identification, collection of antemortem dental data is crucial because the identification cannot be performed with postmortem data alone. In most cases of

identification of a decomposed or skeletonized body, the possible candidate for identification cannot be determined and collection of antemortem data is impossible. If there are no antemortem records, information that is helpful in identification is provided by forensic odontological and anthropological examinations.

The postmortem examination process of estimating biological profiles such as age, sex, and stature is called postmortem profiling. With the postmortem profiling process, the search range of missing persons can be narrowed to determine a possible candidate for identification and collect antemortem data. With advances in technologies for analyzing DNA profiles,

the number of cases of comparative dental identification has been reduced but the number of cases of postmortem dental profiling has increased. Lee et al. [1] reported that approximately 85% of forensic odontological cases in Korea involve postmortem profiling.

Although the demand for comparative dental identification has decreased, it is still a reliable tool in certain cases. Dental identification played an important role in the identification of a heavily decomposed body that was suspected to be that of the *de facto* leader of the company operating the ferry MV Sewol, which sank in April 2014. The aim of this report is to allay suspicions regarding the identification process and discuss the scientific evidence of positive identification.

Case Report

On June 12, 2014, a decomposed body was found in a plum field in Suncheon, Korea. The body was clad in a winter sweater and hat and was seriously decomposed. The police concluded that the body might be of an ill wayfarer, and an autopsy was performed at St. Carollo Hospital (Suncheon, Korea) the next day. The person who conducted the autopsy determined that the cause of death was unknown

because of decomposition and took samples from the right femur and maxillary teeth for DNA profiling and toxicological analysis.

The DNA profile of the sample from the femur was shown to match DNA taken from the wanted fugitive's nearby vacation home and that of his elder brother on July 21, 2014. A postmortem inspection was performed by a forensic pathologist and odontologist from the medical examiner's office on the same day, and the body was transferred to the Seoul National Forensic Service for a second autopsy and radiologic examination with computed tomography. The second autopsy and postmortem dental examination were conducted the next day.

On macroscopic examination, several dental characteristics in both dentitions were observed. In maxillary dentition, the right central incisor, lateral incisor, canine, and second premolar and left central incisor were missing on postmortem examination. A porcelain-fused-to-metal crown was cemented on the left canine. Gold crowns, which were linked together, were cemented on the right first and second molars. Antemortem loss of the left second premolar and first molar was observed, and a four-unit gold crown and bridge was cemented with support on the left first premolar and second molar as abutments for restoring an edentulous area (Fig. 1). In mandibular dentition,



Fig. 1. Two gold crowns, one porcelain-fused-to-metal crown, and one gold bridge are observed in maxillary dentition. The right first premolar and left lateral incisor are not shown because they were extracted for DNA profiling and estimation of age.



Fig. 2. Four gold crowns and two composite resin restorations are observed in mandibular dentition. The right lateral incisor and left canine are not shown because they were extracted for estimation of age.

postmortem loss of teeth was observed for the right central incisor and canine and left central incisor, lateral incisor, and first and second premolars. Gold crowns were cemented on both the first and second molars. The occlusal surfaces of the right first and second premolars were restored with dental composite resin (Fig. 2). Periapical radiographs were taken for all remaining teeth in both dentitions (Fig.

3). No morphological variation or pathological findings were observed in the radiographs; only a radiopaque prosthesis and restorations were shown, and they were also demonstrated on macroscopic examination. The maxillary right first premolar and mandibular right lateral incisor and left canine were sampled for estimation of age. These teeth were prepared with ground sections; six indicators of age were evaluated

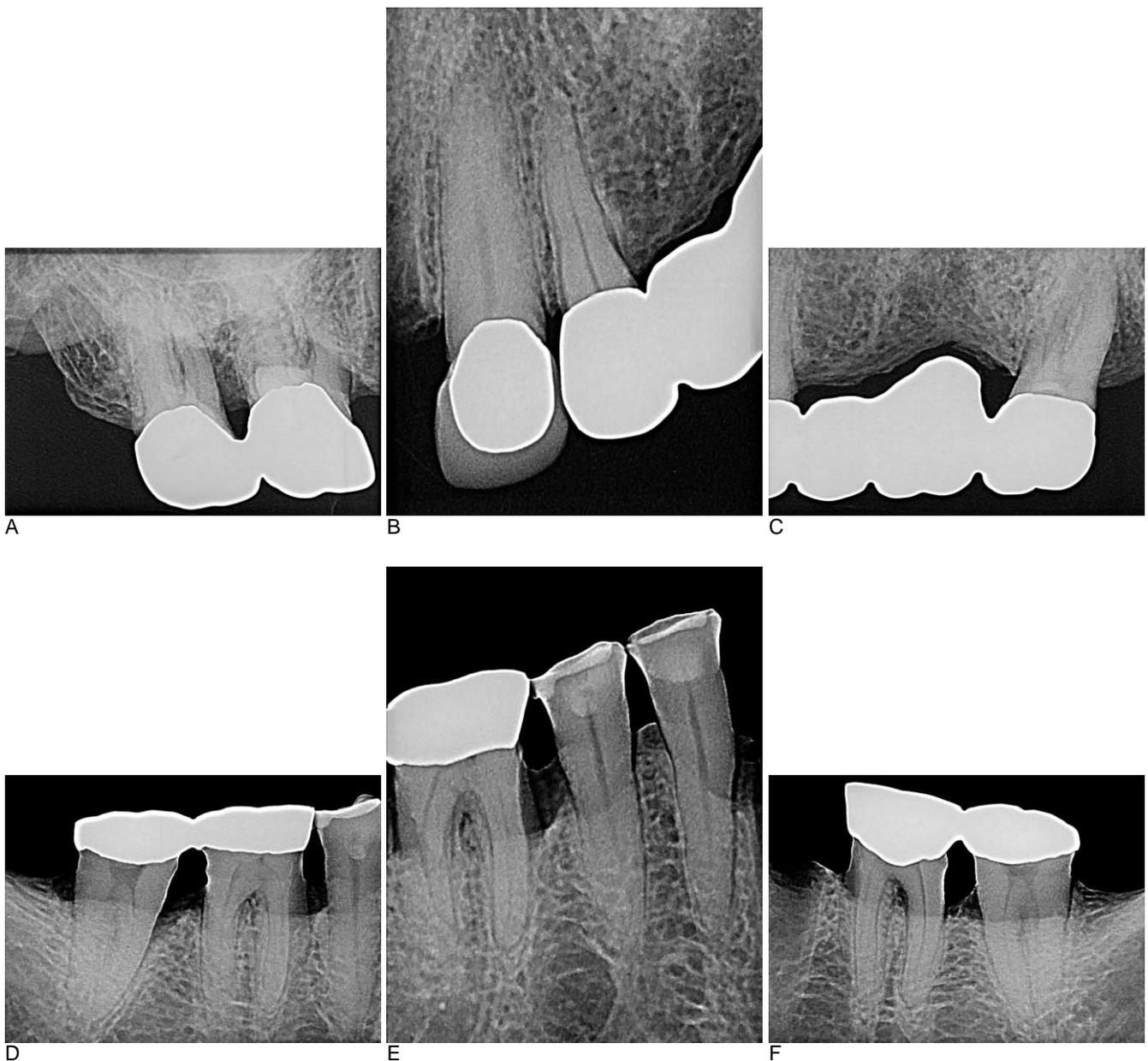


Fig. 3. There are no specific findings in the postmortem periapical radiographs. (A) The radiograph of the maxillary right first and second molars. (B) The radiograph of the maxillary left canine and first premolar. (C) The radiograph of the maxillary left second premolar, first molar, and second molar. (D) The radiograph of the mandibular right first and second molars. (E) The radiograph of the mandibular right first and second premolars. (F) The radiograph of the mandibular left first and second molars.



Fig. 4. Comparison of postmortem (PM) and antemortem (AM) dental data is expressed in a schematic odontogram.

according to Gustafson's criterion [2], and the age at death was estimated by using Johanson's regression equation [3]. The mean value of the estimates was 73.77, and the age of the body was estimated to be 73.77 ± 5.60 years.

The antemortem dental data for the wanted fugitive were collected from his private dentist. The dentist visited the Seoul National Forensic Service on July 23, 2014, for confirmation of the body, which was identified as that of the fugitive by matching of DNA profiles. The dentist did not have or bring any antemortem dental materials, such as a dental chart or panoramic radiograph; therefore, the only way to collect antemortem information was his testimony. Before viewing the body, the private dentist and forensic odontologist from the National Forensic Service participated in an interview for collection of antemortem dental data with a policeman from Suncheon Police Station (Korea). The dental characteristics provided by the fugitive's private dentist were as follows. There were six gold crowns on the maxillary right first and second molars and the mandibular right and left first and second molars. There was also a four-unit fixed dental prosthesis

made of gold on the maxillary left premolars and molars. The abutments of this bridge were the first premolar and second molar, and the replaced teeth with pontics were the second premolar and first molar. There was no additional information about the fugitive's dentition except these 10 teeth.

The postmortem and antemortem dental data were compared (Fig. 4) by using a dental module of Mass ID Manager (MIM). All teeth that showed dental features on antemortem data were matched with the corresponding teeth on postmortem data, and the total number of matching teeth was 10. There was no unexplainable discrepancy in the remaining teeth. In addition, the chronological age, according to date of birth and disappearance, of the fugitive was calculated to be 73.33 years, which was within the estimated age range (73.77 ± 5.60 years). The identity of the body was confirmed to be that of the fugitive based on the matching dental characteristics and result of dental age estimation.

Discussion

The most-wanted fugitive discussed in this case report

was a South Korean religious leader, businessman, and inventor. He was believed to be the *de facto* leader of the company that operated the ferry MV Sewol, which sank on April 16, 2014. After the accident, he went into hiding and soon became Korea's most wanted fugitive. His body was suddenly found approximately 100 days after the ferry accident. Many people did not believe or accept his death, and they thought that the fugitive was still alive or was murdered in a conspiracy. However, his identity was confirmed not only by dental matching but also by DNA profile matching, comparison of fingerprints, and physical evidence.

Dental identification of an unknown body, especially a victim of a mass disaster, can be performed by using effective methods for human identification [4,5]. Forensic odontologists have considered the mathematical probability of an individual dentition having a unique combination of missing or present teeth, restored and unrestored teeth, or restored and unrestored surfaces of those teeth [6]. Keiser-Nielsen [7] presented a mathematical model to calculate the number of possible combinations for a person. In this case, there were two missing teeth and eight restored teeth of the 30 remaining teeth antemortem. For the two missing teeth, the number of different possible combinations was calculated to be 496; for the eight restored teeth of the remaining 30, the number of combinations was calculated to be 30,045,015. The number of different possible combinations for two missing teeth and eight restored teeth was then calculated to be 14,902,327,440. In other words, the likelihood of this most wanted fugitive and any person having the same

two missing teeth and the same eight restored teeth is one in 14 billion, more than twice the estimated number of people alive in the world in 2013. This mathematical verification confirms the fact that the body found in Suncheon is that of the most wanted fugitive. Considering that these combinations were calculated based on dental characteristics alone, the identification of the body leaves no room for doubt. Rumors and conspiracies about the identification of the fugitive must stop, and forensic experts must continue to explain scientific evidence to people who are unfamiliar with forensic science.

Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

References

1. Lee S, Lim SB, Kim DW, et al. A statistical analysis on forensic odontological examination at the NFS from 2007 to 2010. *Korean J Leg Med* 2011;35:32-41.
2. Gustafson G. Age determination on teeth. *J Am Dent Assoc* 1950;41:45-54.
3. Johanson G. Age determinations from human teeth: a critical evaluation with special consideration of changes after fourteen years of age. *Odontol Revy* 1971;22 Suppl:1-126.
4. Lee SS, Seo JS, Kang MH. Identification of Korean victims in PMT-air airplane crash accident. *Korean J Leg Med* 2007;31:157-61.
5. Lee SS, Kim DW, Yoon SH, et al. Dental identification of the victims of the cold storage warehouse fire in Icheon. *Korean J Leg Med* 2009;33:74-8.
6. Senn DR, Stimson PG. *Forensic dentistry*. 2nd ed. New York: CRC Press; 2010. p. 172-7.
7. Keiser-Nielsen S. Dental identification: certainty V probability. *Forensic Sci* 1977;9:87-97.