

July 2024

Tooth Sleuths: THE ROLE OF THE GENERAL DENTIST IN FORENSIC HUMAN IDENTIFICATION

Elif D. Aksoylu DMD, MPH

Follow this and additional works at: <https://commons.ada.org/vadentaljournal>



Part of the [Dentistry Commons](#)

Recommended Citation

Aksoylu, Elif D. DMD, MPH (2024) "Tooth Sleuths: THE ROLE OF THE GENERAL DENTIST IN FORENSIC HUMAN IDENTIFICATION," *Virginia Dental Journal*: Vol. 101: No. 3, Article 6.

Available at: <https://commons.ada.org/vadentaljournal/vol101/iss3/6>

This Article is brought to you for free and open access by the Virginia Dental Association at ADACOMMONS. It has been accepted for inclusion in Virginia Dental Journal by an authorized editor of ADACOMMONS. For more information, please contact commons@ada.org.

• UNIDENTIFIED •

tooth sleuths

WITH DR. ELIF D. AKSOYLU



CONTENT WARNING

THE FOLLOWING PAGES
CONTAIN IMAGES OF
HUMAN REMAINS

TURN THE PAGE >>

THE ROLE OF THE GENERAL DENTIST IN FORENSIC HUMAN IDENTIFICATION

Elif D. Aksoylu, DMD, MPH

Imagine this scenario: A deceased, unidentified individual in your community is presumed to be one of your patients. The county's medicolegal death investigator contacts your office and requests dental treatment records and radiographs. What happens next? How is this information used? And most importantly, what is your role in the outcome?

Postmortem dental identification is a scientific form of human identification, alongside anthropological identification (comparison of skeletal imaging and medical hardware), friction ridge analysis (fingerprinting), and DNA comparison (Berman et al., 2013). Forensic odontologists are dentists with additional training in dental identification, dental age assessment, bitemark analysis/comparison, and expert witness work for dental civil litigation claims.

A forensic odontologist will use the dental records you provide to either help confirm the identity of the deceased individual or exclude them as the individual in question. In the event of poor quality or quantity of antemortem evidence or postmortem remains, the case outcome may be classified as a "possible" identification or as having "insufficient evidence" for identification (Loomis, 2022).

All methods of human identification possess advantages and drawbacks. Two major disadvantages associated with the use of DNA and fingerprints include the need for both a reference sample and adequate soft tissue. A key disadvantage of anthropological identification is its reliance on medical records and radiographs. Therefore, dental identification is particularly useful in circumstances involving fragmented, incinerated, mixed, decomposed,

or skeletonized remains with poorly preserved, inadequate tissues that limit the use of other forms of identification (Berman et al., 2013).

Dental identification is also more expedient and economical than other forms of scientific identification (Loomis et al., 2018). Additionally, dental features are distinct from individual to individual (de Villiers & Phillips, 1998). Furthermore, teeth (and dental restorations) are exceptionally resilient relative to other tissues in the human body (Loomis et al., 2018). The calcium phosphate content in teeth (Lacruz et al., 2017) allows them to withstand extreme heat, cold, humidity, desiccation, and acidic environments with a high degree of fidelity, as demonstrated in Figures 1 and 2 (Loomis et al., 2018).



Figure 1.
Resistance of Teeth to Thermal Destruction

Note. Anterior teeth are the least protected by facial soft tissues (Source: American Board of Forensic Odontology [ABFO], 2016).



Figure 2.
Resilience of Hominin Dentition

Note. 1.2-million-year-old maxilla of Paranthropus boisei (top) and 60,000-year-old maxilla of Homo sapiens (bottom) (Sources: ABFO, 2016; Schroer, 2011).

Forensic dental identification relies upon a skill dentists have used and honed in daily clinical practice for centuries: pattern recognition. Morphological features of the craniofacial complex can be compared from an earlier time (antemortem) to a later time (postmortem) to establish elements of concordance, identified as "consistencies" (Figure 3). This is typically achieved radiographically but can also be accomplished using photographs.



Figure 3.
Consistencies in Comparative Dental Radiography

AM and PM radiographs illustrating the matching morphology of alloy at #K (ABFO Image Series).

Note. Consistencies between these antemortem and postmortem radiographs include root morphology of the lower left first premolar (yellow arrows), and morphology of the alloy restoration at the lower left primary second molar (orange ovals) (Source: ABFO, 2016).

In addition to normal dentition, dental restorations, and dental anomalies, craniofacial elements used in comparison can include the palatal rugae, cranial shape, orbit and sinus morphology, fixation hardware, bony trabeculation patterns, and beyond (Figures 4, 5, and 6). Dental casts and removable appliances, such as full and partial dentures, orthodontic aligners, bleaching trays, and occlusal guards, are also useful to the forensic odontologist (American Board of Forensic Odontology [ABFO], 2016). The patient identifiers that accompany these items, such as names and identification numbers, can be particularly helpful as well for establishing a treating dentist and presumptive identification. As illustrated by Figure 7, even a single consistent, distinct feature present in both the antemortem and postmortem dental records can establish a positive identity.

Adequate antemortem records for use in comparison against the results of postmortem examination can promote positive identifications. This punctuates the importance of acquiring and

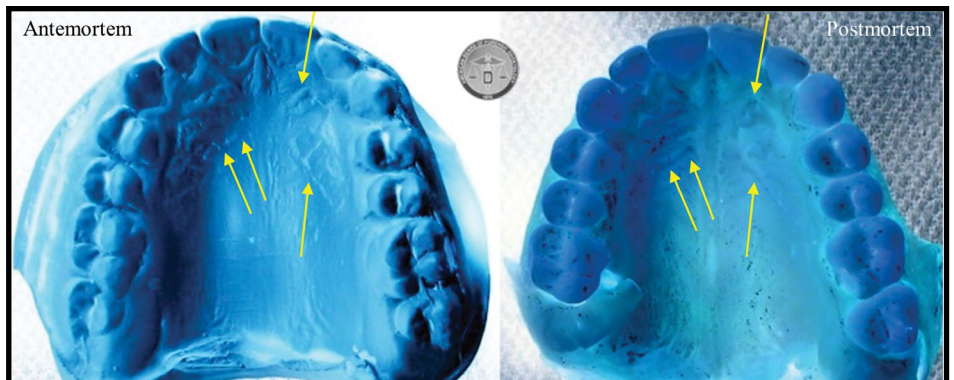


Figure 4
Antemortem and Postmortem Consistencies in Palatal Rugae

Note. Yellow arrows illustrate consistencies between the antemortem stone model on the left and the postmortem human remains on the right (Source: ABFO, 2016).

maintaining high quality radiographic images, treatment notes, and odontogram charting in day-to-day practice.

Positive identification of human remains is valuable for multiple reasons: closure for survivors, insurance settlements, estate transfers, adoption, remarriage

of a surviving spouse, and criminal prosecution (Berman et al., 2013). If you are asked for records of a patient involved in a medicolegal death investigation, consider the positive ramifications of providing those records, including both x-rays and treatment notes. Forensic odontologists work to identify the

>> CONTINUED FROM PAGE 15

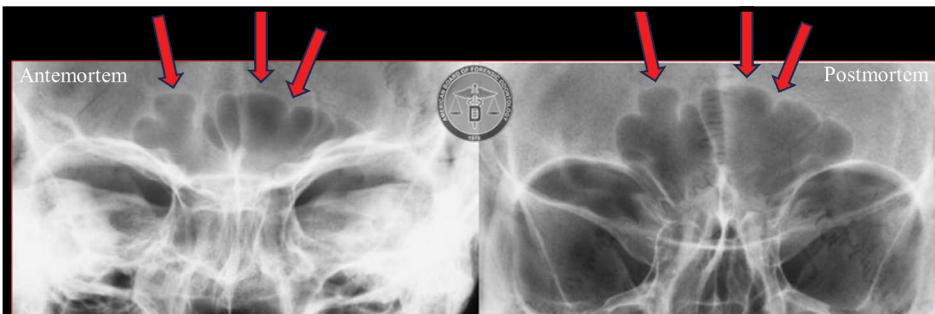


Figure 5
Antemortem and Postmortem Consistencies in Frontal Sinus Morphology

Note. Consistencies illustrated by red arrows (Source: ABFO, 2016).

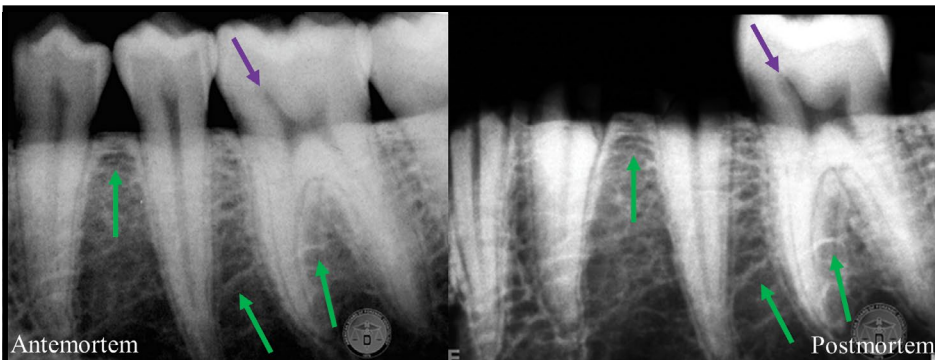


Figure 6
Comparative Dental Radiography in the Absence of Dental Restorations

Note. Pulpal morphology (purple arrows) and bone trabeculation (green arrows) can be distinctive and help establish identity in the absence of dental treatment. (Source: ABFO, 2016).

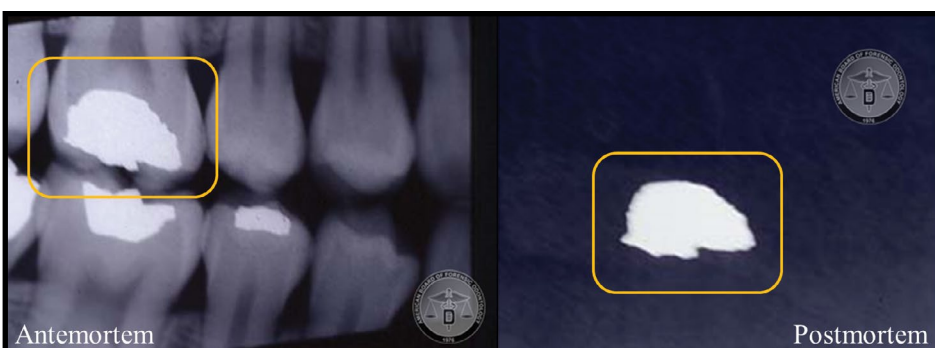


Figure 7
Utilization of a Single Distinctive Dental Feature in a Human Identification

Note. This positive identification was made from a single dislodged alloy restoration postmortem (right), whose morphology is illustrated by the orange rectangles (Source: ABFO, 2016).

deceased and do not judge your dentistry. Every piece of evidence could help identify an individual. By collecting and maintaining comprehensive, accurate and timely dental records, you may one day provide a vital puzzle piece in the death investigation process. Laws dictating the minimum period dentists must retain patient records vary from state to state; consider keeping records beyond the minimum required by law. Your professional diligence has the capacity to give a name to an unidentified decedent and help return them to their loved ones.

References

- American Board of Forensic Odontology (2016). Image series [PowerPoint slides]. <https://abfo.org/>
- Berman, G. M., Bush, M. A., Bush, P. J., Freeman, A. J., Loomis, P. W., & Miller, R. G. (2013). Dental identification. In D. R. Senn & R. A. Weems (Eds.), *Manual of forensic odontology* (5th ed., pp. 75–127). CRC Press.
- de Villiers, C. J., & Phillips, V. M. (1998). Person identification by means of a single unique dental feature. *Journal of Forensic Odontostomatology*, 16(1), 17–19.
- Lacruz, R. S., Habelitz, S., Wright, J. T., Paine, M. L. (2017). Dental enamel formation and implications for oral health and disease. *Physiological Reviews*, 97(3), 939–993. <https://doi.org/10.1152/physrev.00030.2016>
- Loomis, P. W. (2022). Human identification: Dental identification [PowerPoint slides].
- Loomis, P. W., Reid, J. S., Tabor, M. P., & Weems, R. A. (2018). Dental identification and radiographic pitfalls. In T. J. David & J. M. Lewis (Eds.), *Forensic odontology: Principles and practice* (pp. 25–46). Academic Press.
- Schroer, K. (2011, February 11). Developing models of premolar molarization in primates. George Washington University Center for the Advanced Study of Human Paleobiology. <https://cashp.columbian.gwu.edu/developing-models-premolar-molarization-primates>