G35 Single Tooth Dental Identification Assisted by Digital Superimposition

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After attending this presentation, attendees will better understand how specific utilization of Adobe® Photoshop® features may assist their ability to examine dental evidence forensically.

This presentation will impact the forensic science community by informing attendees that forensic dental comparison is an ideal instrument in death investigation because of the longevity and durability of the dental anatomy, even in scenarios of extreme heat, trauma, and decomposition.

In this case, there were numerous obstacles to performing a traditional, straightforward dental identification, not the least of which were the age of the antemortem dental records furnished for comparison, but even more significant to the investigation was the scarce amount of postmortem dental evidence that was provided by investigators for analysis, which consisted of only one tooth.

In November 2012, family members of a man reported missing found and turned in a single tooth from a site where previously skeletonized human remains and personal effects had been recovered in Imperial County, CA. Forensic dental consultants examined the tooth to determine: (1) if it was indeed a human tooth; and, (2) if it would be significantly unique for an expert opinion to identify or exclude the missing person.

There was discussion of using the tooth in an attempt to recover DNA from the pulp tissue for comparison with known family sources; however, any collection procedures would destroy the tooth for further odontological evaluation and it was uncertain that useable tissue for DNA analysis could even be collected from the tooth. Therefore, it was agreed that the risk of destroying the very limited evidence was too high and a dental comparison was the first and best option to investigate identity.

A full series of dental radiographs dated August 5, 1996, were collected from the missing person's dentist and multiple radiographic and photographic images were taken of the single tooth at the Office of the Medical Examiner in San Diego, CA. It was determined that the tooth was a virgin, permanent lower right molar. Based on the size, anatomy, distal curvature, and lack of space between the roots, it was agreed that the tooth was most likely a third molar, tooth #32 in the Universal Numbering System, or tooth 48 in the **Fédération Dentaire Internationale (**FDI) World Dental Federation notation.

Both the antemortem and postmortem radiographs were digitized and uploaded into Adobe® Photoshop® to allow a digital superimposition of the radiographs at varying opacities from 10% to 100%. The software also allowed the tooth images to be realigned on a consistent, measured, and reproducible gradient as well as their size enlarged to examine and measure minute and intricate anatomical details from both antemortem and postmortem images, without distortion and with a reproducible history of any manipulations made to the original image.

The chief forensic dental consultant using digital superimposition, digital enhancement of anatomical landmarks, and the measuring tools available in Photoshop® determined that the postmortem single tooth evidence and the antemortem dental records of the missing person were consistent to the level of probable (more likely than not). The Chief Medical Examiner signed the case out as positive identification based on the supporting quantitative data provided in the consultant's report detailing the process used and the images and data upon which his opinion was based.

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