G25   Digital Techniques for Dento-Facial Superimposition

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Learning Overview: After attending this presentation, attendees will be able to outline a method of utilizing postmortem and antemortem victim portraits with Adobe® Photoshop® CS and other software to generate both still and sequential "movie" comparisons of the visible smile. Attendees will also be able to appreciate how computer techniques learned in bitemark comparison and age estimation can be repurposed for dento-facial superimposition. A case report using this method that supported a positive victim identification will be presented. Current limitations and recommendations will also be discussed.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by discussing an alternate dental method via digital images to support identification of a presumed victim when traditional antemortem dental records do not exist or are not recovered.

In March 2018, a decedent was recovered from the water. The probable victim's identification was presumed from circumstances of a one-week missing 72-year-old woman with Alzheimer's disease from northeast Philadelphia, PA. Although there were no existing antemortem dental records for the presumed victim, her anterior dentition was reported as "distinctive," and the family had supplied several family photographs exhibiting her smile. The medical examiner asked to perform a photographic dento-facial superimposition to corroborate other findings.[1]

As instructed, included in the autopsy were several digital images of the decedent's face, to include lip retraction and a two-legged, photomacrographic #2 scale, from several angles. The postmortem image with the closest matching plane of view was superimposed onto one of the digitized antemortem images, utilizing digitally constructed hollow volume and solid volume exemplars using Photoshop® CS. All images used for overlay comparisons were individually scaled to a 1:1 ratio, first using the photometric scale in the postmortem image, then scaling the antemortem image by using the maximum width of the left central incisor as the standard in both. Metric analysis of anatomical landmarks, using the corrected image scale, was also performed as appropriate. Comparison of the maxillary and mandibular portions of the known dentition to the hollow and solid volume exemplars of the presumed dentition were analyzed for concordance with respect to arch width; the morphology, positions, angles, and spacing of individual teeth; and incisal edge topography.[2,3] As a visual aid to presenting the comparative findings, the images in the Adobe® Photoshop® CS workspace were then exported to Techsmith Camtasia software to create a sequential video file.

The unidentified decedent demonstrated individual arch and tooth characteristics that were consistent with the dentition of the presumed individual, with no unexplainable discrepancies. Therefore, the visible dentition of the presumed individual could NOT be excluded as being the same as the decedent. This conclusion supported the medical examiner's corroboration of findings in a positive identification.

In conclusion, this case shows utilization of digital tools and techniques, borrowed from other odontological disciplines, in the dento-facial superimposition of strategically produced postmortem coronal head images to family photographs to corroborate unknown victim identification.

Reference(s):
1. de Angelis D., Cattaneo C., Grandi M. Dental Superimposition: A Pilot Study for Understanding the Method. *Int J Legal Med.* 2007;121: 501–506.
2. Bollinger S.A., Brumit P.C., Schrader B.A., et al. Grinline Identification Using Digital Imaging and Adobe Photoshop®. *J Forensic Sci.* 2009;54:422–427.
3. Sauer N.J., Michael A.R., Fenton T.W. Human Identification Using Skull-Photo Superimposition and Forensic Image Comparison. In: Dirkmaat D., ed. *A Companion to Forensic Anthropology.* Chichester, West Sussex, UK: Wiley-Blackwell; 2012:432-446.

Superimposition, Photoshop®, Comparison