G24 Improvements to Digitized Radiographic Images Using Adobe® Photoshop®

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Learning Overview: After attending this presentation, attendees will have improved their understanding of: (1) problems that exist when faced with underexposed or overexposed radiographs in comparative dental identifications; (2) methods to use a raster graphics editor to change exposure factors of problematic radiographic images; and (3) simple, straightforward steps that can be taken to adjust the radiodensity of images.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by increasing attendees' understanding of the issues and provide methods to improve their approaches to routine dental identification casework (increased performance).

It is believed that most odontologists are faced routinely with analogue intraoral radiographs within supplied antemortem records from missing persons that are not optimal for use in comparative dental identification cases because of image mode, exposure, and radiodensity limitations.

This presentation will discuss problematic issues that the forensic odontologist often faces when responding to requests for forensic physical comparison of dental records produced on unidentified found human remains to dental records of a missing person. Typically, because of available circumstantial evidence, death investigators have already established a putative identification of the human remains. For example, when a wallet is found among the possessions on or near the body or the decedent is the driver of a registered motor vehicle with a license plate and vehicle registration number. This putative identification then must be confirmed through reliable methods. Based on the investigative leads and this putative identification, a search is conducted for the person's Antemortem (AM) dental records.

Postmortem (PM) dental records are produced by the odontologist at the time of the dental examination during the dental autopsy. Quality control measures are used by the odontologist to determine if the PM records meet the standard of care for living persons by the person's dentist of record. This will ensure that the interpretation of data from the PM records can be directly compared to the data present in the AM records from the missing person. If the PM dental records (e.g., PM radiographs) are determined to be suboptimal, the attending odontologist can re-take them to obtain high-quality data that will enable direct comparisons to any available AM records.

The quality of AM dental radiographs obtained from the missing person's dentist of record may be suboptimal, with variations in radiodensity and exposure factors, processing errors, etc. Of particular concern are analog, film-based AM radiographs that are supplied and are the only ones available. These AM radiographs may be original films, digital images, or scanned images produced from the original films. There are various reasons why the dentist of record may not have been able to produce high-quality AM films. A patient's fear of radiation exposure; tolerance of closing the mouth to hold the image receptor or film packet adequately; the over- or underexposure of the image by the X-ray generator from mistakes or misunderstanding of the dental assistant; and improper development, fixation, or washing of the film prior to long-term storage are but a few examples of how less-than-ideal AM radiographs may be present in a submitted dental record for any missing person. Further problems arise when film-based images are copied for submission into the death investigation system since copy-film does not contain information regarding directionality. How can the odontologist maximize the ability to interpret adequately what is recorded in such problematic radiographs?

Methods are available to the odontologist to increase the ability to review, find, and employ various key dental traits useful in forensic comparisons. These methods enhance the ability for the odontologist to visualize data that is present but is hidden or masked by the problem factors previously mentioned. By making corrective adjustments to problematic AM films or scanned images, meaningful comparisons may still be possible.

Adobe® Photoshop® is a raster graphics and image editor that is used on Windows® and MacOS® computers for imaging processing. This computer application has become so popular that it is considered a generic trademark and the word "photoshop" is often used as a verb when one is describing the process of adjusting an image. Methods utilizing Photoshop® will be demonstrated during this presentation to allow attendees to appreciate the dramatic and significant changes that can be achieved with simple steps to change certain images factors, including but not limited to color versus grayscale image modes, exposure factors to change the tonal range, and color balance of an image (i.e., levels adjustment), etc. A handout will be available in PDF format that will summarize these steps.

Odontology, Dental Identification, Image