F12 The Use of Digital Gamma Correction Curves in Bone Trabeculation Mapping for Victim Identification

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The goal of this presentation is to deal with the use of digital photo editing software as an aid in accentuating boney landmarks. This will aid the forensic odontologist in being able to utilize all devices and methods available in the quest for victim identification.

This presentation will impact the forensic science community by encouraging forensic odontologists to be aware of the various investigative modalities available.

The forensic odontologist may not be able to identify every victim he or she encounters due to a multitude of reasons. One situation arises when a victim presents with few or no restored teeth. It is particularly challenging when a victim is edentulous. To receive a few or outdated antemortem radiographs further compounds a difficult situation. The following case is an example of an identification that was made based on a single radiograph that was several years old. What is particularly unique is that the boney identifiers were highlighted through the use of digital photo gamma correction editing software.

This case involved partially decomposed remains found in a wooded area near an irrigation recharge basin. The body was that of a 25 to 30-year-old male. The head and neck were badly decomposed with marked presence of insect larvae. The police had ruled this case an execution-style homicide associated with an illicit drug transaction. Initial dental examination revealed a nearly complete dentition with relatively few restorations. Radiographs were taken and clinical charting was performed. The victim had several items of identification on his person and an attempt was made to locate a family dentist to verify an identification but to no avail. A check with the victim's insurance company revealed a dental visit comprised of one radiograph and an extraction performed approximately three years earlier. The single radiograph was sent to the medical examiner's office and compared to the victim's postmortem records.

The radiograph received as the only antemortem record consisted of a periapical projection of the lower right first molar area. Teeth numbers 27, 28, 30, and 31 were present and numbers 29 and 32 were missing. All teeth were virgin except number 30 which showed an extensive carious lesion. Initial comparison with the postmortem radiograph showed great similarities, except that tooth number 30 was now missing. Because no other records were available, both images were saved as TIFF files for further comparison pending digital enhancements. The files were then opened in a digital photo editing software application and adjustments were made to the brightness, contrast, and sharpness of the image as well as enlarging certain areas of interest. Further enhancements were achieved by the use of alteration of the gamma correction curve. This last procedure elicited a striking detailed image of the bone trabeculation anatomy, especially the interradicular area of tooth number 30. This postmortem area image, when compared to the antemortem image area, showed an exact outline of the trabeculation anatomy sufficient to ascertain identification.

The resultant enhanced images afforded the opportunity to more accurately compare antemortem and postmortem radiographs sufficient to establish identity. The use of these techniques allows the forensic odontologist the opportunity to view, compare, and, in many cases, certify identification which would otherwise remain covert. Areas of increased calcification such as retained root fragments, hyperostotic borders, and bone trabeculation patterns can be compared. Many radiolucent areas containing unique morphology are also greatly enhanced.

Radiograph, Enhancement, Gamma Curve

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