G44 Imaging Techniques for Intraoral Postmortem Dental Radiographs

Ann M. Bruhn, MS, Old Dominion University, 4608 Hampton Boulevard, Norfolk, VA 23529; Tara L. Newcomb, MS*, Old Dominion University SODH, 4608 Hampton Boulevard, Norfolk, VA 23529; and Bridget Giles, PhD, Old Dominion University, VMASC, 1030 University Boulevard, Suffolk, VA 23435*

After attending this presentation, attendees will better understand that dental hygienists are important active members of the forensic odontology team — specifically their ability to expose Postmortem (PM) intraoral dental radiographs for Antemortem (AM) comparison and identification using two different techniques. PM and AM intraoral radiographic image comparisons are among the most accurate and common methods of identifying human remains.[1-7] Imaging PM dental radiographs is part of the defined role of dental hygienists as mass fatality response team members, among others; however, this can be challenging when imaging fragmented, burned, and sheared dental remains.[4] While the paralleling and bisecting techniques are accepted practice for imaging PM periapical intraoral radiographic images, it is unknown which technique produces PM radiographs with fewer errors. This presentation presents a protocol for radiation safety and evidence-based practices for obtaining optimal dental forensic images utilizing dental hygienists as part of forensic radiography teams.

This presentation will impact the forensic science community by providing a training assessment tool and comparisons of two PM intraoral radiographic techniques. Attendees will also be updated on results of safety standards used in the study. Data presented will be beneficial to forensic odontologists, dental hygienists, and other bench-level forensic workers in staying informed about various techniques in the disciplines other than those in which they work.

Radiographers (N=38) obtained images using a hand-held dental X-ray system (NOMAD Pro™) with a Schick Elite digital sensor. Each radiographer obtained intraoral radiographic images of five fragments of fragile, broken, lubricated, real human skulls. Bisecting and paralleling techniques were used on the same five fragments for each skull, producing 10 images per radiographer, and generating a total of 380 images. All radiographic images were scored based on criteria adapted from Kieser et al. and using a Radiographic Evaluation Form (training assessment tool), which identified errors in the following categories: angulation, placement, exposure, and any other errors that did not fall within these categories.[8] Total errors and error scores were compared for statistical significance via one-tailed t-tests. The significance level was adjusted to α=0.01 (or α=0.05/5 comparisons).

It was hypothesized that the mean error for the bisecting technique would exceed the mean error for the paralleling technique, which was proven statistically. Mean total errors for the bisecting technique (M=12) exceeded mean errors for the paralleling technique (M=8) (p <0.001) with a large effect size of d=1. Participant dosimeter badges read a zero exposure count.

In conclusion, the results successfully differentiated between two different radiological techniques and proved that the paralleling technique had superior performance over the bisecting technique. The results also support participation of dental hygienists in initial and annual training for the proper protocols involved in obtaining high-quality PM intraoral radiographs. Further intraoral forensic radiographic imaging studies should include multidisciplinary teams (dentists, dental assistants, computer technicians, and dental hygienists) who are trained together for producing optimal PM images.

Reference(s):

1. Pittayapat P., Thevissen P., Fieuws S., Jacobs R., Williams G. Forensic oral imaging quality of hand-held dental X-ray devices: Comparison of two image receptors and two devices. *Forensic Science International.* 2010, 194, 20-27.
2. Trochesset D., Serchuk R., Colosi D. Generation of intra-oral-like images from cone beam computed tomography volumes for dental forensic image comparison. *Journal of Forensic Sciences.* 2014, 59(2), 510-513.
3. Stoeckel D.C., Merkley P.J., McGivney J. Forensic dental training in the dental school curriculum. *Journal of Forensic Sciences.* 2007, 52(3), 684-686.
4. Brannon L.M., Connick C.M. The role of the dental hygienist in mass disasters. *Journal of Forensic Sciences.* 2000, 45(2), 381-383.
5. Chiam S. A note on digital dental radiography in forensic odontology. *Journal of Forensic Dental Sciences.* 2014, 6(3), 197-201.
6. Leo C., O'Connor J.E., McNulty J.P. Combined radiographic and anthropological approaches to victim identification of partially decomposed or skeletal remains. *Radiography.* 2013, 19(2013), 353-362.
7. Pinchi V., Norelli G.A., Cputi F., Fassina G., Pradella F., Vincenti C. Dental identification by comparison of antemortem and postmortem dental radiographs: Influence of operator qualifications and cognitive bias. *Forensic Science International.* 2012, 222(2012), 252-255.
8. Kieser J.A., Laing W., Herbison P. Lessons learned from large-scale comparative dental analysis following the South Asian tsunami of 2004. *Journal of Forensic Sciences.* 2006, 51(1), 109-112.

Mass Fatality, Intraoral Radiography, Dental Hygiene