F25 Image Quality Assessment of Two Portable Handheld Dental X-Ray Units for Forensic Odontologic Applications

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After attending this presentation attendees will be familiar with the evaluation of radiographic image quality acquired on two different image media being exposed by two portable x-ray devices.

This presentation will impact the forensic community by providing knowledge of the quality of dental x-ray images acquired with a portable AnyRay® and Nomad® unit in combination with CMOS and phosphor plates. The image quality will be assessed comparing exposures obtained with the fixed x-ray MinRay® device.

Dental radiography plays a major role in identifying unknown human body remains. Comparing antemortem and postmortem dental radiographs often results in establishing positive identification. Recently developed portable dental x-ray units increase the mobility of the forensic odontologist. They allow more efficient ad hoc x-ray work in a disaster field, especially enabling direct digital management and potential immediate matching when combined with a CCD/CMOS carrier.

In this study in vitro dental x-ray images exposed by two portable and one gold standard x-ray unit and captured on CMOS and phosphor plates are evaluated on image quality. In total thirty samples containing sound, decayed and restored extracted teeth, together with two exemplars of teeth containing skeletal jaw formalin-fixed teeth including the mandible were mounted with a radiolucent polyurethane spray foam on blocks and plates. This allowed standardized and parallel repositioning. A small silver cone includes the foam and serves as a reference point for further measurement. X-ray images are obtained with the MinRay® 60 kVp 0.14-22.4 mAs as gold standard x-ray unit and likewise with two portable x-ray units the AnyRay® 60 kVp, 0.02- 4.00 mAs and the Nomad ® 60 kVp, 0.023-2.277 mAs on Durr® Dental phosphor plates and a Sigma® CMOS image medium. The effect of object-image receptor distance was checked for a mutual length of 0.8 and 2.5 cm keeping the object- source distance constant at 20cm. For each x-ray device all the available exposure times were run from low to high in every different parameter setting and for each sample. The acquired images were randomly presented to four observers for standard image quality and forensic diagnostic parameter quality evaluation on a 4-point rating scale and statistical assessed. A pilot set up with phosphor plate images acquired from gold standard and AnyRay® unit linear measurement for forensic purposes were compared, and tested for inter- and intra-observer variability.

This study indicates the applicability of both portable x-ray units regarding the overall image quality for forensic diagnostic applications. In the pilot set-up significant differences in tooth length, pulp length and root width were found, with enlarged dimensional measures for the AnyRay module around 6%.

The feasibility of the tested portable hand-held dental radiation emitting devices for forensic odontologic identification and certain specific dental age estimation purposes is based on acceptable image quality results and sufficient accuracy for particular forensic measures.

Human Identification, Portable Radiation Emitting Devices, X-Ray Image Quality

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