Q.A. Collectible

Sponsored by CRCPD's Committee on Quality Assurance
in Diagnostic X-ray (H-7)

A BRIEF OVERVIEW OF COMPUTED RADIOGRAPHY

Computed radiography (CR) uses a cassette similar to a film cassette. Instead of film, the cassette holds an imaging plate (IP), which is similar to an intensifying screen. Instead of emitting light when x-rays interact with it, the IP stores the x-ray energy in proportion to the intensity it receives. The stored energy is released as visible light when a laser in the CR Reader scans the IP. The Reader creates a digital image file after processing the raw image. This image file may be displayed on a video monitor (softcopy) or printed on a laser printer (hardcopy).

CR captures a latent analog image, which is subsequently digitized in the Reader. The translation process can introduce artifacts in the image that could result in an image that is not clinically acceptable. The CR process also decreases the efficient use of x-ray energy. In most clinical settings, radiographic technique factors are increased when using CR to reduce noise in the image. Changing from a 400-speed film/screen system to CR, which predominantly seems to be equivalent to a 200 speed film/screen system, usually will result in an increased radiation dose.

Most manufactures employ an exposure index/indicator value for CR imaging to indicate the average incident exposure delivered to the IP after x-ray transmission through the object. The exposure index/indicator is important to verify proper radiographic technique. Each IP manufacturer will supply their own exposure indicator/index value. Some examples of this manufacturer's exposure index/indicators are the Fuji sensitivity "S" value, the Kodak exposure index "EI" value, the AGFA log of the median exposure "LgM" value, and the Konica relative exposure "REX" value.

The advantages of CR are numerous. Since CR cassettes replace film cassettes, the same x-ray generator and x-ray tube equipment can be used, which saves considerable costs. Digital images may be viewed in multiple locations at the same time. Images may be rapidly transferred to other locations. Storage of digital images takes less space than film storage. Image retrieval is less labor intensive and faster. Since software enhances the image, CR reduces retakes. Repeats will be primarily due to positioning errors and motion blurring. Darkroom problems, such as odor, chemical hazard and darkroom integrity maintenance QA, are eliminated.

There are disadvantages of CR imaging. There is no significant time saving over the use of film. The images still require processing to retrieve the image, and CR plates must be erased in the Reader prior to reuse. Artifacts unique to CR can be introduced in the digital image acquisition

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and /or retrieval process. Finally, patient dose (on average) does increase in most cases as compared to the 400 speed screen-film detector system that CR usually replaces.

Inspector Beware!

* Do not make multiple exposures on the same imaging plate during equipment testing. Overloading can cause ghost patterns that are visible on subsequent radiographs. Work with the radiologic technologist (RT) to ensure the CR cassette, if used, is completely erased and have the RT run a test exposure to ensure there are no ghost patterns. Hang lead, such as an apron, over the CR cassette to prevent saturation of the plate, or use manual techniques without a cassette in the field of view.
* CR cassettes are more expensive than conventional screen/film cassettes. Dropping may damage or break them.
* Ask staff at the facility for assistance when using their CR system. Beware using the "Troubleshooting" setups as suggested by the manufacturer. CR system defaults can be easily changed without realizing it. Many computer defaults could be involved. Do not make adjustments to a facility's CR reader. If you feel adjustments are needed, consult the facility, the manufacturer, or service personnel.

The information contained herein is for guidance. The implementation and use of the information and recommendations are at the discretion of the user. The mention of commercial products, their sources, or their use in connection with material reported herein is not to be construed as either an actual or implied endorsement by CRCPD.

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