

AbstractID: 13701 Title: A method to evaluate the effect of automatic brightness control tracking on image quality and patient dose for interventional fluoroscopic systems

Purpose: Automatic-brightness-control (ABC) tracking is used to maintain a constant image-receptor signal independent of changes in the attenuation of the patient. The manner of tracking impacts image quality as well as patient dose. We have developed a procedure to evaluate the effect of the ABC-operation logic on both dose and contrast-signal-to-noise ratio (CSNR) for interventional-fluoroscopic systems.

Method and Materials: Two vascular-angiography systems, one with an image intensifier (II) and the other with a flat-panel detector (FPD), were used for assessment of the testing procedure. A phantom insert containing iodine-filled disks was sandwiched within a variable-thickness, uniform PMMA phantom. The variation of contrast visibility and patient dose was assessed as the ABC system automatically adjusted technique parameters to compensate for changes in phantom thickness. The x-ray techniques, filter selected by the system, acquisition rate, patient entrance exposure and detector input exposure were recorded as a function of phantom thickness. The CSNR and CSNR per entrance exposure were plotted as a function of phantom thickness for all fluoroscopic modes.

Results: All systems and modes had a decrease in CSNR and an increase in dose with patient thickness, but different modes resulted in different rates of change due to the manner of mAs and kVp selection. Although noise varied between fluoroscopy modes for the II and FPD, it was almost constant for a given mode as a function of thickness since the ABC tries to maintain a constant detector exposure rate.

Conclusion: The method is easy to implement with a standard phantom and is an important adjunct to evaluate ABC system performance and to allow inter-system comparisons. Understanding the tradeoffs between patient dose and CSNR due to the operation of a specific ABC mode can help optimize system utilization.