

AbstractID: 6792 Title: A new antiscatter grid for high-resolution region-of-interest (ROI) x-ray imaging

Purpose: A new custom-designed antiscatter grid for high-resolution angiographic detectors is presented that would improve the image quality without introducing substantial grid-line artifacts.

Method and Materials: The new antiscatter grid is a custom-made, parallel-focus, crisscross cellular grid that employs gold septa material (CREATV MicroTech, Potomac, MD). The prototype 4.25 cm x 4.25 cm field-of-view grid has 20 μm thick septa with interspace distance of 380 μm , height 1.95 mm, and grid-ratio of 5. This study was performed with the Microangiographic detector (43 μm pixel, 1024x1024 pixel matrix, 4.5 cm x 4.5 cm field-of-view, 250- μm -thick structured CsI(Tl) scintillator coupled to a CCD camera via minifying taper) in simulated neurovascular angiographic conditions, where a uniform head-equivalent phantom was used as scattering media. The air-gap between the phantom and the detector-with-grid was kept at 2.5 cm as used in clinical conditions for minimal blurring, but increased scatter. The standard lead-beam-stop technique was employed to determine the scatter-fraction with and without the grid. In order to evaluate the low-contrast imaging performance of the grid, phantoms with three different bone patterns of varying thickness and three different simulated iodinated vessel inserts in acrylic were imaged with and without-grid at 70 kVp.

Results: The grid demonstrated approximately 59% scatter reduction at 70 kVp for the uniform head-equivalent phantom without introducing substantial grid-line artifacts following flat-field correction. The average contrast-improvement-factor for the low-contrast vessel-phantom was found to be 1.75, whereas for the relatively higher contrast bone-phantom it was 1.5. The primary transmission factor was measured to be 66%.

Conclusion: The grid demonstrated significant scatter reduction when used in simulated neurovascular angiographic conditions even for the small FOV. Use of this grid with the Micro-angiographic detector with reduced air-gap can provide substantially improved image quality.

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