AbstractID: 10547 Title: Performance evaluation of a custom-made anti-scatter grid used for the high-resolution Micro-Angiographic Fluoroscope (MAF).

Purpose: Performance evaluation of a unique custom-made anti-scatter grid for the MAF in terms of primary transmission, scatter fraction, scatter degradation factor, Bucky factor, and contrast improvement factor.

Method and Materials: Although the high-resolution (35 µm pixels, 1024x1024 matrix) MAF field-of-view is only 3.6 cm, scatter may still be substantial. A prototype nonfocused, criss-cross anti-scatter grid was constructed (CREATV Micro Tech, Potomac, MD) with 20 µm thick gold septa, 380 µm interspace, height of 1.95 mm, and grid ratio of 5. The MAF detector was used under simulated neurovascular angiographic conditions to image a head-equivalent phantom, which created scatter. The air gap between the detector and phantom was kept at 2.5 cm, similar to clinical conditions. For the scatter measurement, a lead beam-stop technique was used. To calculate the contrast improvement factor with the grid, a 1 mm thick aluminum disc with radius 2.5 mm was imaged. All the experiments were carried out for a clinically relevant range of x-rays energies from 60 kVp to 110 kVp and grid-line artifacts were eliminated using a flat-field correction.

Results: The scatter fraction was reduced by the grid from 0.53 to 0.31 at 60 kVp and from 0.55 to 0.39 at 110 kVp. The primary transmission for the grid was found to range from 0.47 to 0.55 for x-rays energies from 60 kVp to 110 kVp with no non-uniform cut-off. The scatter transmission reduction factor was in the range of 0.19 to 0.29 with a contrast improvement factor of 1.53 to 1.41. The Bucky factor for the grid was 2.44 to 3.15 for the range of x-rays energies used.

Conclusion: For simulated clinical neurovascular conditions, the unique anti-scatter grid shows a substantial but energy-dependent reduction in scatter and provides substantial contrast improvement for the MAF with minimal grid-line artifacts.
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