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Assessing image quality in a contemporary digital PET/CT scanner using two image acquisition modes: comparison with its analog previous version

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Background: Image quality was evaluated using the digital Siemens Vision 600 PET/CT scanner and its analog predecessor, the Biograph mCT Flow.

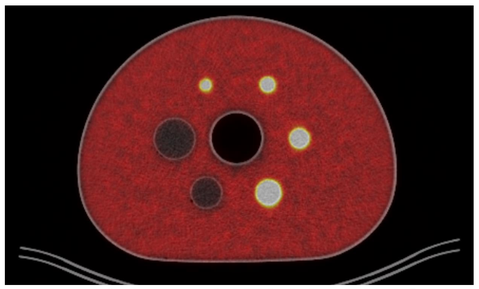

Fig. 1: Axial fused CT and PET central slice of the phantom.

Materials & Methods: The evaluation was performed with a NEMA NU2 body phantom containing six spheres of varying diameters (10–37 mm). The phantom was filled with a uniform 18F-FDG solution, with the four smallest spheres simulating hot lesions and the two largest filled with water for cold lesion imaging (Fig. 1). The activity concentration ratio between the hot spheres and the body phantom was 8:1. For the digital scanner, images were acquired in static mode (0.8–1.6 min/bed) and flow motion mode (table speeds of 1.7–4 mm/s). The analog system used standard flow motion mode with table speeds of 1.1 and 2 mm/s. Image reconstruction parameters were kept consistent across both systems. Contrast and background variability were compared.

Results: In the digital scanner, contrast increased with sphere diameter, ranging from 36% to 66% in static mode and 38% to 74% in flow motion mode (Fig. 2). For the analog system, contrast ranged from 28% to 57% (Fig. 2). Background variability in the digital scanner for smaller spheres was 4.2% with flow motion (2.2 mm/s) and 4% with static mode (1.6 min/bed), compared to 5.6% in the analog system (1.1 mm/s) as presented in Fig. 3.

Conclusion: Digital scanning shows superior image quality, especially with continuous table motion, suggesting that higher velocities and shorter acquisition times are achievable.

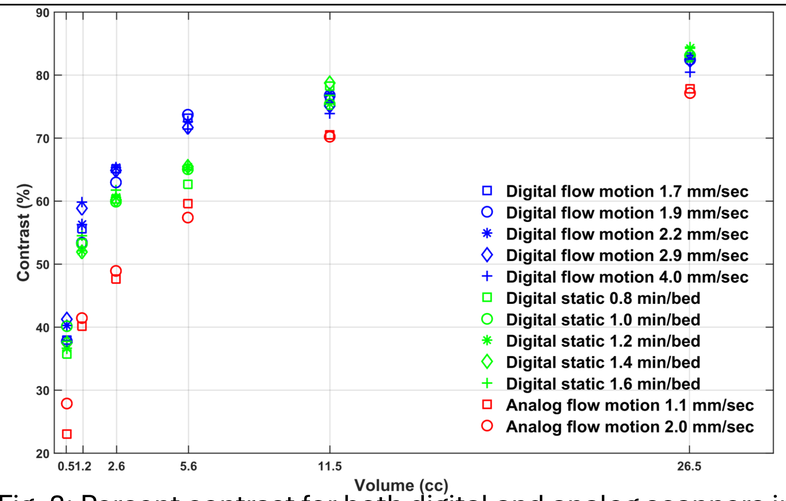

Fig. 2: Percent contrast for both digital and analog scanners in flow motion and static modes.

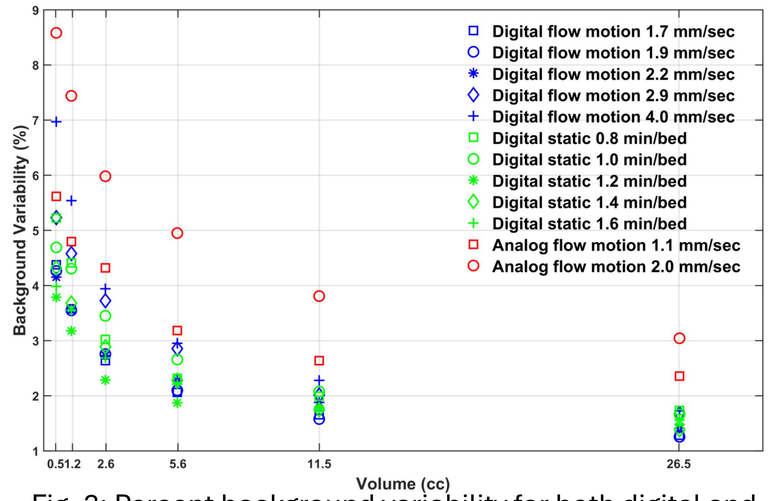

Fig. 3: Percent background variability for both digital and analog scanners in flow motion and static modes.