Purpose:To evaluate the feasibility of Volume-of-Interest (VOI) scanning in multi-slice CT to reduce radiation dose while maintaining image quality within the VOI.

Methods:Scanning patients with a limited scan field-of-view can substantially reduce radiation dose but usually cause severe truncation artifacts. VOI scanning involves adding a filter in the x-ray beam to strongly attenuate peripheral photons, so that much lower x-ray intensity is delivered to the region outside a preselected VOI while allowing the original intensity within the VOI. A semi-anthropomorphic abdominal phantom was sequentially scanned with 240, 180, 120, 60, 30, 15 and 10 mAs at 120 kVp on a dual source CT scanner. A 10-cm diameter cylindrical VOI was selected at the center of phantom. Six rods with various attenuation levels were located within the VOI. Projection data outside the VOI were replaced with data acquired with lower mAs to simulate VOI projection data. CT images were reconstructed using same reconstruction kernels as the full dose scan. CT numbers and noise were measured on images with and without the VOI filter. Radiation dose with and without the VOI filter was estimated using 16 projection views over a 180 range where the VOI filter was manually placed in the x-ray beam.. A simulated VOI study was also performed using patient data.

Results:CT numbers and noise inside the VOI were comparable to those obtained with a full dose scan for mAs level outside the VOI as low as 6.25% of the full mAs. Radiation dose outside the VOI was reduced up to 50%-65%, while dose inside the VOI was reduced by 25%-30%. Diagnostic information within the VOI appeared to be preserved, although only large anatomic structures outside the VOI were visible.

Conclusions:VOI scanning is feasible in multi-slice CT and may substantially reduce patient dose, while preserving image quality inside the VOI.