Purpose:
To investigate the effects of reconstruction field-of-view (FOV), slice increment and kernel on the quantification of kidney stone volume.

Methods:
Three concentrations (200, 400 and 800 mg/cc) and two sizes (21.87 and 99.9 mm3) of hydroxyapatite (HA: Ca5(PO4)OH) cylinders were used to simulate kidney stones of 3 and 5 mm diameter, respectively). These were submerged in a 30 cm wide water phantom and scanned on a dual-source CT scanner operating in dual-energy mode. Reconstruction was performed with a) FOVs from 50 to 300 mm at 50 mm interval; b) image reconstruction increments of 0.1, 0.3 and 0.6 mm; c) 6 recon kernels, from very smooth to medium sharp, all using a 0.6 mm image thickness. CT data were segmented and volumes calculated using volume-rendered 3D images of each stone, commercial software (Analyze, version10.0) and fixed CT number thresholds (130, 250 and 550 HU for HA200, HA400 and HA800, respectively). Differences in volume between measured and reference values, normalized to the reference values were calculated. The range (maximum – minimum) in normalized volume differences were used to assess the overall influence of various reconstruction parameters.

Results:Although normalized volume differences varied with cylinder concentration and size, the differences among FOVs were not substantial (<10.61%). The normalized volume differences among image increments were very small (< 2.45%), except for the lowest concentration/smallest size (differences up to 8.14%), where the smallest image increment was most accurate (differences < 3.02%). Very smooth kernels decreased volume accuracy by as much as 16.19%.

Conclusions:Reducing reconstruction FOV did not increase accuracy of volume measurements. Overlap between reconstructed images was beneficial for volume measurement of low concentrations of HA (200 mg/cc) and small size (3 mm diameter) objects. Very smooth kernels were not suitable for volume measurement due to too much edge blurring.