

OPTIMAL SCANNING PROTOCOLS OF DUAL SOURCE CT ANGIOGRAPHY IN AORTIC STENT GRAFTING: AN IN VITRO PHANTOM STUDY

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Purpose: The aim of the study was to investigate the optimal protocols of dual source CT angiography in aortic stent grafting in terms of image noise and radiation dose, based on a vitro aorta phantom study.

Materials and Methods: The study was performed on a human abdominal aortic phantom which was housed in a perspex container filled with contrast medium having CT attenuation similar to that used in the patient's abdominal CT angiography scan. A commercial Zenith endovascular stent graft with a suprarenal component was deployed inside the phantom to simulate the aneurysm repair. A series of helical CT cans were performed using a dual source CT scanner with kVp of 100, 120 and 140, corresponding mAs of 180, 150 and 100, slice thickness of 1.0, 1.5 and 2.0 mm, pitch value of 0.5, 1.0, and 1.5, respectively. Image quality was determined by measuring the standard deviation (SD) on 3D virtual intravascular endoscopy (VIE) images. Signal to noise ratio (SNR) and contrast to noise ratio (CNR) were measured on 2D axial images at three anatomic levels, namely, superior mesenteric artery (SMA), renal arteries and aortic aneurysm. The wire thickness of suprarenal stent struts were measured at SMA and renal arteries corresponding with each scanning protocol. Effective dose was determined based on dose length product.

Results: SD measured on VIE images was independent of kVp and pitch values but was determined by the slice thickness ($p < 0.05$) at the SMA and renal arteries. SNR and CNR measured on 2D images showed significant differences between variable kVp values and slice thicknesses ($p < 0.05$), but were independent of pitch values. When kVp was lowered from 140 to 100, the effective radiation dose was reduced by 26.5% without significantly affecting image quality. Stent wire thickness was independent of the scanning protocols, and the thickness was measured between 1.13 and 1.41 mm.

Conclusion: A scanning protocol of 1.5 mm slice thickness, pitch 1.5 with 100 kVp is recommended for a dual source CT angiography in aortic stent grafting as it allows for acquisition of diagnostic images and leads to significant reduction of radiation dose.