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Synchrotron radiation imaging of aortic stent grafting: An in vitro phantom study

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This study was conducted on a human aorta phantom with a commercially available stent graft placed in the aorta with the aim of investigating visualization of aortic stent graft by synchrotron radiation. Synchrotron tomography experiments were performed on imaging and medical beamline at the Australian Synchrotron facility, with beam energy ranging from 40 to 100 keV, with spatial resolution of 19.88 μm per pixel. Computed tomography (CT) scans were performed on a 64-slice CT scanner with slice thickness of 1.0, 1.5 and 2.0 mm. Maximal transverse diameter of stent wires was measured on synchrotron radiation and 64-slice CT images at suprarenal stent struts and main body of aortic stent graft. The stent wire diameter measured on synchrotron images was between 0.4 and 0.5 mm, representing the actual diameter of wire thickness, while overestimated wire thickness was seen in 64-slice CT images with measured wire diameter ranging from 1.0 to 1.6 mm. There were no significant differences in stent wire diameter between suprarenal stent struts and main body stent graft by comparing two-dimensional (2D) axial ($p=0.93$) and three-dimensional (3D) synchrotron image measurements ($p=0.07$). Significant difference was found between 2D and 3D synchrotron measurements of stent wire diameter in the main body of stent graft ($p=0.001$). In contrast, significant differences were found in stent wire diameter at the levels of suprarenal stent struts and the main body of stent graft by comparing 2D axial and 3D CT image measurements ($p=0.03$ and 0.001 respectively). Also, significant differences were reached by comparing measurements taken at the suprarenal stent struts and main body of stent graft with use of 2D axial ($p=0.04$) and 3D CT images ($p=0.001$). Synchrotron radiation provides superior advantages over multislice CT for visualization of aortic stent wire structure with measurements representing the actual diameter, thus allowing accurate assessment of endovascular stent graft repair.

Keywords or phrases (comma separated)

Are you a student?

No

Do you wish to take part in the Student Poster Slam?

No

Are you an ECR? (<5 yrs since PhD/Masters)

No

What is your gender?

Male

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