Abstracts

P-002 3D Printed AAA Phantoms for Presurgical Evar Simulation- A Single Center Experience

Abdominal Aortic Diseases

Jasamine Coles-Black, Jason Chuen
Austin Health, Vascular Surgery, Heidelberg, Australia

Introduction: As the field of Vascular Surgery continues to see a fundamental shift with increasing EVAR (endovascular aortic aneurysm repair) and decreasing open repairs, the reach of EVAR increasingly extends to patients with complex anatomy outside of the standard infrarenal abdominal aortic aneurysms (AAA). The variety of open and endovascular surgical approaches adds to the complexity of contemporary AAA repair. 3D printed patient-specific anatomical models are becoming increasingly ideal for preoperative planning, device selection and to aid intraoperative performance.

Methods: Using the open-source medical image processing software 3D Slicer (version 4.10; Harvard, US, 2019), CT aortograms acquired as part of gold-standard care were converted to representative patient-specific 3D models, and then printed using a variety of 3D printing techniques in order to assess their suitability as aortic phantoms. Depending on the 3D printing technology used, these models ranged in cost from €15-€200 and were produced in 12-48 hours. This technique can be used to generate an entire hollow 3D printed thoracoabdominal aorta with branches with which presurgical simulation of the proposed procedure can be performed under fluoroscopy.

Results: In our case series over two years, computer workstation review after 3D segmentation and STL modelling of AAAs has significantly influenced surgical decision making, device selection, and has aided the production of physician modified stent grafts. In addition, these models have been successfully 3D printed and demonstrated to be useful in a variety of settings, including patient education and engagement, surgical and anatomical education, as well as intraoperative visualisation. There remains room for improvement in the manufacturing of these models, in particular in greater cost efficiency and material properties mimicking those of a diseased aorta as we seek to create a AAA phantom with optimal anatomical, haptic and fluoroscopic fidelity.

Conclusion: These models, despite material limitations, successfully mimic the cannulation and deployment challenges encountered during live endovascular surgery. As dimensional and representational material validity is improved, these AAA phantoms have the potential to serve as a powerful adjunct to how complex EVAR cases are planned.

Disclosure: Nothing to disclose

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Author/s:
Coles-Black, J; Chuen, J

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