

Towards the perfect anastomosis - quantitative assessment of simulated anastomoses

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INTRODUCTION

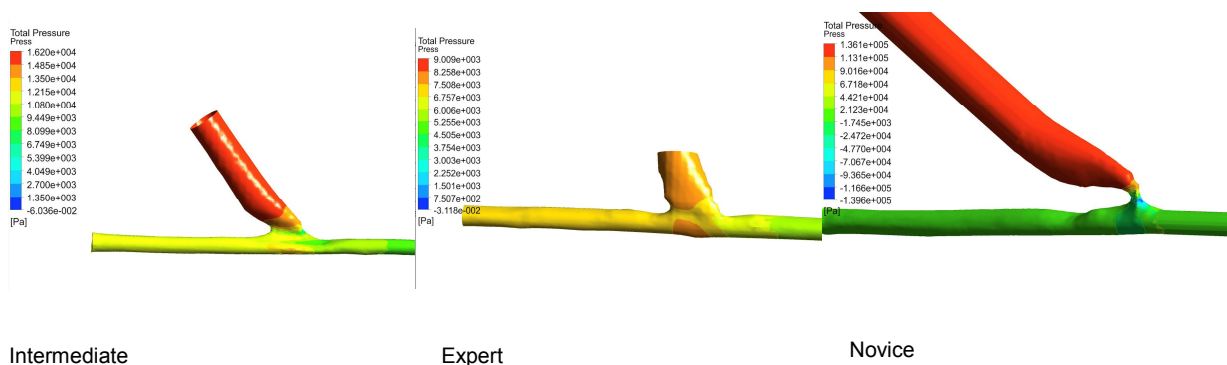
Simulation training in coronary anastomosis has been demonstrated to improve the ability to carry out an anastomosis on simulated vessels. Performance has been measured using well-validated rating scores to provide a structured objective assessment of simulated surgical skills on video review (OSATS). We perceive barriers to the incorporation of such simulations into cardiothoracic surgical training to be the reliability, consistency and considerable surgeon review hours required to generate these reviews. We have sought to develop quantitative assessment of several aspects of anastomotic skills to offset this.

METHODS

Five cardiothoracic surgical trainees and three cardiac surgeons were asked to perform two simulated coronary anastomoses each using silicon vessels of 3mm internal diameter. The forces exerted on the recipient vessel and the operator's heart rate were monitored continuously and later synchronized with a 3-camera video recording of the procedure to produce a composite assessment tool. Data extracted from CT scanning of the completed anastomoses was used to observe the vessel internal geometry. 3D computational fluid dynamic (CFD) technology was applied to estimate the haemodynamic outcomes of the anastomoses.

RESULTS

Using the composite assessment tool it was possible to correlate force data accurately with events and supplement an OSATS with more detailed advice regarding technique. Using velocity streamlines, pressure and wall shear contours generated from CFD simulations it was possible to differentiate between novice and expert operators and provide trainees with quantitative data as part of a formative feedback. With our small numbers at each stage of training it was not possible to demonstrate significant differences.



DISCUSSION

Our initial findings suggest that it is possible to measure quantitative data that is useful for the assessment of performance in simulated coronary anastomosis. We believe that continued refinement of our model would allow us to complement the feedback provided by tools such as the OSATS and provide a more detailed evaluation of surgical skill. This will be invaluable for both formative feedback and ultimately summative assessment both in the simulated and clinical environments.