Proper sizing of aortic endografts from bench to bedside

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When planning thoracic endovascular aortic repair, there are general principles of sizing—10% to 30% oversizing for aneurysmal disease and ∼10% oversizing for dissections to prevent propagation. Clinical data have borne out worse outcomes (either an increased rate of type I endoleak or stent graft-induced tear) when straying too far from these rules of thumb.[1,2] However, the clinical data associated with these guidelines are based on landing stents in native aorta. The study by Prendes et al[3] looks at the optimal degree of oversizing when landing the Zenith TX2 endograft into a Dacron Gelweave graft.

The figures in the article provide a nice visualization of the risks of oversizing (>50%)—in-folding of the graft that is resistant to balloon dilation. However, the authors also highlight the importance of some degree of oversizing—an almost doubling in the force needed to pull out the endograft when 8% oversizing was compared with >25% oversizing. Ballooning also significantly increased the radial force of the graft by almost 20%, regardless of the diameter.

It is heartening to see that what we do in clinical practice, even in prosthetic grafts, is supported by in vitro evidence. As the benchtop model is brought closer to the reality of a pulsatile, dynamic aorta, several further questions need to be answered in the future. Do the results remain consistent as the Dacron graft dilates in the pressurized aorta over several months and/or years? Are the results consistent across different manufacturers of stent grafts? Are specific stent grafts more suited in specific aortic configurations (eg, angulation, diameter)?

The most exciting end point of this research is a better understanding of which endografts are best suited to a patient's particular anatomy. There are multiple commercially available thoracic endografts that are often used interchangeably, given a particular physician's preference. However, there could be aortic configurations or findings (eg, calcifications, thrombus) that would make one graft a better choice than its competitors. Rather than looking at the clinical outcomes, because it would be difficult to randomize patients with the exact same pathology to multiple different devices, using bench top testing, grafts from different companies can be rapidly compared in hundreds of varied aortic configurations. Taking this a step further, some investigators have used computational modeling to determine the effects of aortic configuration (ie, aortic curvature, arch angle) on thoracic endovascular aortic repair outcomes.[4]

The future of personalized medicine might allow the surgeon to use data from bench top testing and computer modeling to determine the optimal endograft for a particular patient's aortic pathology. The authors should be commended for laying the groundwork for future research in this important area to better help surgeons treat this complex patient population.

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Author conflict of interest: none.

The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

J Vasc Surg Cases Innov Tech 2023;9:101196

2468-4287

https://doi.org/10.1016/j.jvscit.2023.101196