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Commentary: Aortic function: It's more than just a tube

Mohamad Rabbani, MD, CM, and
Michael W. A. Chu, MD, FRCSC

Mohamad Rabbani, MD, CM (left), and Michael W. A. Chu, MD, FRCSC (right)

CENTRAL MESSAGE

Investigating aortic stiffness and pulsatile arterial load are important to understanding the physiology and biomechanics of proximal aortic reconstruction.

The aorta is far more than just a conduit for blood that occasionally becomes aneurysmal requiring surgical correction. Much attention has justifiably focused on aortic diameters and risks of rupture, dissection, and/or death; however, there are many other equally important non-size-related factors. Assessment of aortic function including overall aortic health, aortic stiffness, and pulsatile load are often overlooked and have systemic consequences.¹ We as surgeons are naturally attracted to the technical aspects of aortic root and ascending aortic surgery with postoperative residual aortic function often considered in retrospect, if at all. As a result, the overall impact of various surgical techniques of proximal aortic reconstruction on post-repair hemodynamics and aortic function remain poorly understood.

In this issue of the *Journal*, Salvi and colleagues² investigated the hemodynamic effects, as assessed by arterial tonometry, of replacement of the aortic root and ascending aorta of 30 patients matched with 30 control patients and have refuted the previous assumptions that replacement of the ascending aorta with a Dacron graft would cause serious downstream hemodynamic alterations, which is reassuring for surgeons. Intuitively, finding a more natural aortic substitute that recreates similar viscoelasticity properties with important diastolic and pressure buffering function would be optimal. Perhaps Dacron replacement of only a short segment of aorta is still able to allow overall preserved aortic function, or alternatively, arterial tonometry lacks

the sensitivity required to assess limited segment replacement. Unfortunately, the sample population was quite heterogeneous in both aortic pathology (tricuspid, bicuspid, Marfan syndrome) and root-reconstruction techniques (re-implantation, biological and mechanical roots), which limits the interpretation of this study on the more interesting questions of whether one surgical technique may better preserve postoperative aortic function and in which patient populations may derive the most benefit.

This study brings to light the value of using noninvasive arterial tonometry to assess aortic stiffness, which has important short- and long-term cardiovascular implications.³ It also nicely complements advances in 4-dimensional flow cardiac magnetic resonance imaging, which can also demonstrate aortic pulsed-wave velocity but also volumetric maps of peak velocity, viscous energy loss, wall shear stress, and turbulent kinetic energy. Together, these modalities can help us better understand individualized aortic function and, subsequently, ideal reconstructive techniques. The ultimate utility of these noninvasive techniques may rest with their ability to better characterize patient's aortic stiffness and predict which aneurysms may be at greater risk for acute complications to enable earlier, life-saving surgery.

References

1. Coutinho T, Turner ST, Kullo IJ. Aortic pulse wave velocity is associated with measures of subclinical target organ damage. *JACC Cardiovasc Imaging*. 2011; 4:754-61.
2. Salvi L, Alfonsi J, Grillo A, Pini A, Soranna D, Zambon A, et al. Postoperative and mid-term hemodynamic changes after replacement of the ascending aorta. *J Thorac Cardiovasc Surg*. 2022;163:1283-92.
3. Garcia J, Barker AJ, Markl M. The role of imaging of flow patterns by 4D flow MRI in aortic stenosis. *JACC Cardiovasc Imaging*. 2019;12:252-66.

From the Division of Cardiac Surgery, Western University, London, Ontario, Canada.

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Address for reprints: Michael W. A. Chu, MD, FRCSC, B6-106 University Hospital, London Health Sciences Centre, 339 Windermere Rd, London, Ontario, Canada N6A 5A5 (E-mail: Michael.Chu@lhsc.on.ca).

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