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Commentary: Making a difference: Pressure differential corrected during thoracoabdominal aortic repair

Heidi Reich, MD,^a and Danny Ramzy, MD, PhD^b

In the modern era, open surgical repair of thoracoabdominal aortic disease has an estimated mortality of approximately 10%, and although patients with Marfan syndrome frequently have more complex, extensive pathologies, results are also good-to-excellent for this subset of patients, with mortality ranging from 0% to 7%.¹ In this issue of *JTCVS Techniques*, Tully and colleagues² from St Bartholomew's Hospital in London share an interesting case regarding the recognition and correction of pressure gradient at the proximal anastomosis in a patient with Marfan syndrome during thoracoabdominal repair of a chronic type B aortic dissection. When left heart bypass was discontinued, a >70-mm Hg discrepancy was noted between the right radial and femoral arterial lines. This finding immediately raises concerns for an anastomotic issue, given the expectation of little-to-no gradient across an aortic-caliber anastomosis, and warrants an urgent investigation of the cause. The authors confirmed the gradient by direct aortic pressure measurement and transesophageal echocardiography. They localized the issue to the proximal aortic anastomosis, which demonstrated flow acceleration and a pressure gradient in both systole and diastole. A gradient that persists throughout the entire cardiac cycle indicates a fixed obstruction, which would definitely require a revision. This finding is what the authors call a pseudocoarctation.

From ^aCentral California Heart and Lung Surgery, Clovis; and ^bSmidt Heart Institute, Cedars-Sinai Medical Center, Los Angeles, Calif.

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Address for reprints: Danny Ramzy, MD, PhD, Cedars-Sinai Medical Center, 127 S San Vicente Blvd, Suite A3105, Los Angeles, CA 90048 (E-mail: danny.ramzy@cshs.org).

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Danny Ramzy, MD, PhD

CENTRAL MESSAGE

Preoperative planning and intra-operative vigilance are key to avoid potentially devastating complications following open surgical repair of thoracoabdominal aortic disease.

The traditional description of pseudocoarctation is an aortic condition that radiographically appears similar to coarctation but with little-to-no gradient. The hallmarks of pseudocoarctation include an elongated, tortuous, S-shaped aorta, often with a prominent kink at the level of the isthmus, without a significant gradient.³ In contrast, the authors encountered a residual dissection flap proximal to the proximal anastomosis creating a coarctation-like pressure gradient. Confirming the location and cause of the issue is critical for an optimal correction and result. The authors rightfully recrossclamped the aorta proximal to the left subclavian artery for the revision and extended the surgical fenestration more proximally. This maneuver relieved the pressure gradient, and the patient recovered uneventfully. The authors should be commended for this rescue of a potentially catastrophic complication.

The differential diagnosis for the pressure gradient suggests many causations and issues. These include graft redundancy, twist, or kink; misidentification of the true versus false lumen; and size discrepancy between the native aorta and graft. Considerations also include flow-limiting intussusception of flap; excessive narrowing of the anastomosis; extrinsic compression; aortic injury at crossclamp site; or retrograde acute type A aortic dissection. Postoperative computed tomography or invasive angiogram could have provided additional diagnostic information, although we agree with their approach of not leaving the operating room until this potentially serious complication had been addressed.

All strategies to avoid leaving residual flow-limiting dissection flap tissue during thoracoabdominal aortic repair include preoperative recognition of the extent of repair required. In our practice, as a rule-of-thumb, we apply a “20-mm rule” to estimate the aortic length required to both crossclamp and perform an anastomosis. Ideally, at least 20 mm of disease-free normal caliber aorta is measured on the preoperative computed tomography scan and can offer important clues as to the extent of repair required. In the case of Tully and colleagues, the measurement was 20 mm distal to the origin of the left subclavian artery. With Marfan syndrome, it is important to balance the risks of the extent of aortic repair against the risk of leaving native aorta behind. In a series of more than 120 patients with Marfan syndrome undergoing open thoracoabdominal aortic repair, 43% required clamping proximal to the left subclavian artery.¹ Alternatively, in a patient with Marfan syndrome, moderate aortic insufficiency, and proximal aortic dimensions that were not reported, a 2-staged approach is used. This begins with a procedure to comprehensively address the aortic valve, root, and arch with a valve-sparing root replacement and total arch repair with a frozen elephant trunk. This, in turn, is followed by an open thoracoabdominal aortic repair at a later date that would have facilitated the author’s initial intent to avoid clamping the arch.^{4,5}

Discussion of informative cases such as this can be enhanced by using the recently updated Society for Vascular Surgery/Society of Thoracic Surgeons classification of aortic dissections. This approach provides a systematic method to clearly convey the location of the entry ear

plus the proximal and distal extent of dissection by zone.⁶ The case of Tully and colleagues demonstrates the potential high complexity of aortic surgery, and this author believes that we have reached a stage at which thoracoabdominal aortic repairs should be done in high-volume centers.^{7,8} Similar to the heart team approach for heart failure and aortic stenosis, an aortic center team approach, including high-quality imaging and image analysis, is key to achieving the best results for patients with complex aortic diseases.⁹

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