Commentary: Knowing what we don't know

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Central Message

Alternative LVAD outflow graft sites are increasingly feasible with smaller devices. Techniques to manage DTA outflow grafts should be tempered by awareness of potential physiologic changes.

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Jouan and colleagues¹ describe use of a thoracic endovascular aortic stent graft (TEVAR) to facilitate heart transplantation in a patient with a left ventricular assist device (LVAD) implanted via left thoracotomy to the descending thoracic aorta. In this case, TEVAR simplified the outflow graft dissection by minimizing the anticipated bleeding risk with dissection.

This is an example of the expanding use of endovascular technology. The patient in this case underwent a successful transplant. However, many questions are raised about the potential risks of this creative approach. In particular, the long-term physiologic alterations of a continuous flow device need to be considered. Frazier's group² demonstrated that aortic remodeling and atrophy occur in patients with nonpulsatile flow devices, with histologic evidence of decreased medial thickness, fewer medial smooth muscle cells, and decrease in the medial layer elastin content. Although the authors deemed the changes unlikely to achieve clinical significance, the same cannot necessarily be said in the face of endovascular intervention and the long-term implications for the TEVAR graft. Second, spinal cord injury (SCI) is a known risk of TEVAR. The described case respected known maneuvers to minimize SCI, including use of a shorter stent and positioning to avoid coverage of the left subclavian artery and purported origin of the artery of Adamkiewicz. However, a third principle of minimizing SCI is avoidance of hypotension, which may be unpredictable in the setting of a subsequent redo sternotomy and heart transplantation.

Finally, nonsternotomy and minimally invasive techniques for left ventricular assist device implantation are growing in popularity, especially as circulatory devices become smaller.^{3,4} The implication is that this case report may become more relevant. Readers should be aware of the potential pitfalls of alternative techniques. Outflow-graft location may impose a change in hemodynamic characteristics throughout the aortic arch and descending thoracic aorta. Compared with an ascending aortic outflow graft, a descending thoracic aorta outflow graft poses

greater flow stagnation in the aortic root and arch. This has been demonstrated in in vitro studies employing ultrasonic flow probes and dye tracers, 4-dimensional-magnetic resonance imaging, and computational fluid techniques.⁵⁻⁷ This flow stagnation has implications for the risk of aortic thrombus formation. The Prospective, Single-Arm, Multi-Center Study in Collaboration With the INTERMACS to Evaluate the Thoracotomy Implant Technique of the HeartWare HVAD System in Patients With Advanced Heart Failure study⁸ will be helpful in determining whether this translates to real clinical events. Just as greater evidence is needed for the theoretical, as-yet-unknown clinical outcomes of alternative outflow graft placement, more experience is needed before recommending the technique presented by Jouan and colleagues.¹

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