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Commentary: The problem with reversing flow

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CENTRAL MESSAGE

Reversal of flow in the descending thoracic aorta can compress a conventional elephant trunk and this can have significant sequela.

At times, more aggressive interventions are warranted either to better address the needs at hand or to facilitate a future intervention. That is the thinking with extended aortic arch repairs that incorporate the elephant trunk (ET) technique. When Borst first described developing the ET technique, it was done to facilitate surgery on the "formidable problem of further surgery on the downstream portions of the aorta."[1] The ET technique can sometimes result in exclusion of the primary entry tear and remodel the distal aorta, negating the necessity for a distal aortic procedure. However, lifelong surveillance is required for the diseased aorta, as progressive dilation can occur. With dilation, a cul-de-sac between the native aorta and the ET can develop. If this blind pocket is not thrombosed, eddies of flow can hemodynamically impact the patient, as described by the case report of Ohashi and colleagues.[2]

They described a case where, 16 years earlier, a patient had an ascending aorta and extended arch replacement using a conventional elephant trunk (cET) technique for an acute type I aortic dissection. There was positive remodeling of the dissection in the descending thoracic aorta (DTA) but also progressive dilation in both the native aortic root and the DTA. The root dilation resulted in progressively worsening insufficiency of the aortic valve that likely resulted in diastolic flow reversal in the DTA. This flow reversal may have induced transient collapsing forces on the cET as blood was sucked from the ET lumen while, at the same time, blood filled the cul-de-sac between the ET and the native DTA. The flow of blood in this cul-de-sac would tamponade the cET during systole inducing a pressure gradient across the ET, resulting in increased afterload on the left ventricle (LV), worsening heart failure. That thoracic endovascular aortic repair stenting within the cET (converting it to a frozen elephant trunk [FET]) resulted in reverse remodeling of the LV before performing the root replacement suggests the obstruction in the ET was contributing to the insult on the LV.

Reverse flow in the DTA with its hemodynamic implications on a cET is a concern not only here but in other situations that have thankfully been averted with the advent of FET. When performing the completion procedure on the distal aorta circulatory arrest is sometimes employed. While cooling and upon ventricular fibrillation, perfusing via cannulation of the DTA or femoral artery will result in exclusively retrograde flow in the proximal DTA. There was concern that upon ventricular fibrillation this reversal of flow could collapse a cET and result in cerebral ischemia starting before achieving the targeted deep hypothermic temperature that affords greater cerebral protection. With the FET, this particular concern has been all but eliminated. Similarly, in the case report of Ohashi and colleagues, the pliability of the cET was addressed by freezing open the cET with a thoracic endovascular aortic repair, alleviating the lesion that had been contributing to the heart failure.

References

1. Borst HG, Walterbusch G, Schaps D. Extensive aortic replacement using "elephant trunk" prosthesis. *Thorac Cardiovasc Surg*. 1983;31:37-40.
2. Ohashi Y, Washiyama N, Tsuda K, Shiiya N. Dynamic obstruction of the elephant trunk caused by vortex flow in the descending aorta. *J Thorac Cardiovasc Surg Tech*. 2022;13:22-4.

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