Passing needle through stone: A novel surgical technique for porcelain aorta

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Pavan Atluri, MD (left), and Mark Helmers, MD (right).

Central Message

An oscillating saw for aortotomy and a hand drill to facilitate distal aortic anastomosis are integral to a novel surgical technique for porcelain aorta.

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Extensive calcification of the ascending aorta or porcelain aorta (PA) poses unique challenges to safe central cannulation, aortic crossclamping, aortotomy, and aortic closure. Although it is rare in the general population, PA has been reported in 7.5% of patients undergoing evaluation for aortic stenosis.¹ This population has increased morbidity and mortality with surgical aortic valve replacement. Notably, these patients are subject to perioperative stroke at a rate of 10%.²

Several strategies have been described for dealing with the technical challenges that PA portends. Axillary or femoral arterial cannulation strategies prevent direct cannulation of the calcified aorta.³ Furthermore, external aortic clamping can be avoided by intraluminal balloon occlusion of the aorta.⁴ Others advocate for aortotomy under hypothermic circulatory arrest, which may allow the identification of a safe aortic clamp site. If no clamp site is identified, aortic valve replacement may be performed under deep hypothermic circulatory arrest. Severely calcified ascending aortas can be replaced with prosthetic grafts, and aortic endarterectomy has also been described.²

With the advent of transcatheter aortic valve replacement, an additional weapon has been added to the PA arsenal that does not require cardiopulmonary bypass or aortic clamping. Success rate is high among patients with PA who undergo transcatheter aortic valve replacement, and stroke rate and mortality are similar to those among patients without PA.⁵ Nonetheless, PA can pose technical challenges to transcatheter aortic valve replacement,⁶ and certain clinical circumstances necessitate surgical intervention. It is important that surgeons have the knowledge to be able to manage these difficult scenarios.

In this issue of the *Journal*, Jacob and colleagues⁷ provide a case report detailing a novel method of homograft reconstruction in a patient with prosthetic aortic valve endocarditis and PA. They describe aortotomy with an oscillating saw with the patient under deep hypothermic circulatory arrest. A hand drill was used to create 0.6-mm holes circumferentially in the calcified distal ascending

aorta. This enabled distal anastomosis of a synthetic interposition graft with a 4-0 polypropylene running suture. A 2-cm bovine pericardial patch was secured over this suture line with biologic glue for hemostasis. Clamping of the prosthetic graft then allowed the reinstitution of cardiopulmonary bypass and reconstruction of the aortic root with a homograft.

Potential drawbacks of this technique include deposition of calcium debris into the distal aorta. As the lack of neurologic complications in the presented case implies, however, meticulous removal of debris from the open aorta can mitigate stroke risk. In addition, hemostasis at the distal suture line is an inevitable challenge, which Jacob and colleagues⁷ overcame by using a bovine pericardial patch and biologic glue. Anastomotic bleeding could be further addressed with the increasing variety of topical hemostatic agents commercially available. Finally, although the degree of calcification in the arch and descending aorta may have been prohibitive in this case, consideration should be given to performing total arch replacement as an alternative that can be performed with comparable circulatory arrest times.⁸

The described approach prevents the mural thinning, fissuring, and perforation, which may complicate aortic endarterectomy. Furthermore, the use of a prosthetic interposition graft provides a safe cannulation and clamp site for future reoperation. Jacob and colleagues⁷ are to be

commended for their innovative technique, which should add value to the aortic surgeon's practice.

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