

# Repair of giant pulmonary artery aneurysm by reimplantation valve-sparing pulmonic root replacement



Hanjay Wang, MD,<sup>a</sup> Stefan Elde, MD,<sup>a</sup> Yuanjia Zhu, MD, PhD,<sup>a,b</sup> and Y. Joseph Woo, MD,<sup>a,b</sup> Stanford, Calif

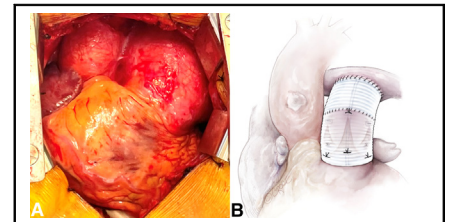
From the Departments of <sup>a</sup>Cardiothoracic Surgery and <sup>b</sup>Bioengineering, Stanford University, Stanford, Calif. Received for publication Nov 22, 2023; revisions received May 20, 2024; accepted for publication May 23, 2024; available ahead of print June 3, 2024.

Address for reprints: Y. Joseph Woo, MD, Department of Cardiothoracic Surgery, Stanford University, Falk Cardiovascular Research Building, CV-235, 300 Pasteur Dr, Stanford, CA 94305-5407 (E-mail: [joswoo@stanford.edu](mailto:joswoo@stanford.edu)).

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A, Giant pulmonary artery aneurysm. B, Aneurysm treated by valve-sparing reimplantation repair.

Aneurysms of the pulmonary artery (PA) are rare but may become complicated by dissection or rupture if left untreated.<sup>1</sup> Previously, our team described the repair of a PA aneurysm using a remodeling valve-sparing root replacement (VSRR) strategy.<sup>2</sup> Here, we present a new case of a giant PA aneurysm with severe pulmonic regurgitation (PR) that we successfully repaired using a reimplantation VSRR technique.

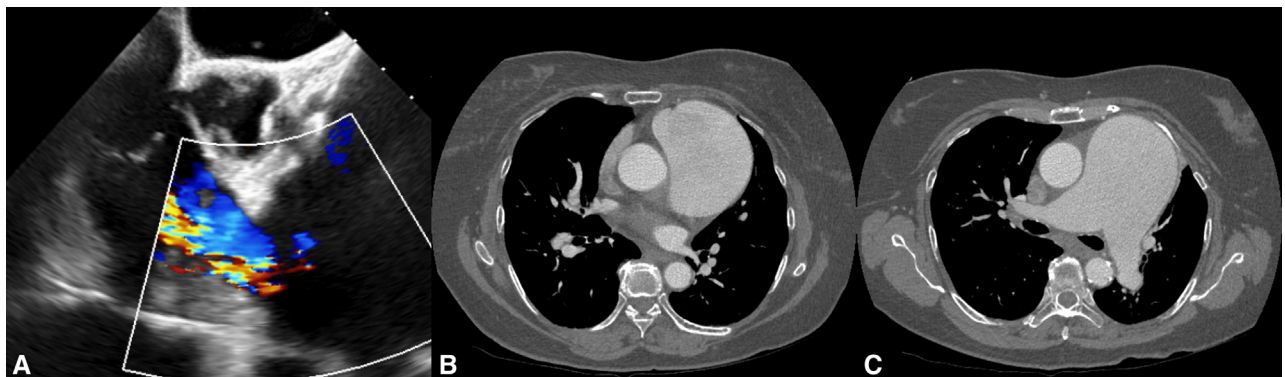
## CASE REPORT

The patient is a 58-year-old woman with group 1 pulmonary hypertension, or pulmonary arterial hypertension (PAH), diagnosed 17 years prior in the setting of methamphetamine abuse. She was drug-free for 10 years; was actively treated with ambrisentan, treprostinil, and sildenafil for PAH; and she maintained a vigorous lifestyle. Over a period of 3.5 years, she was noted on echocardiography to have developed severe PR (Figure 1, A) and new-onset right ventricular dysfunction associated with a main PA aneurysm that had enlarged from 6.0 to 7.8 cm, including a 1.0-cm increase over the previous year. Computed tomographic

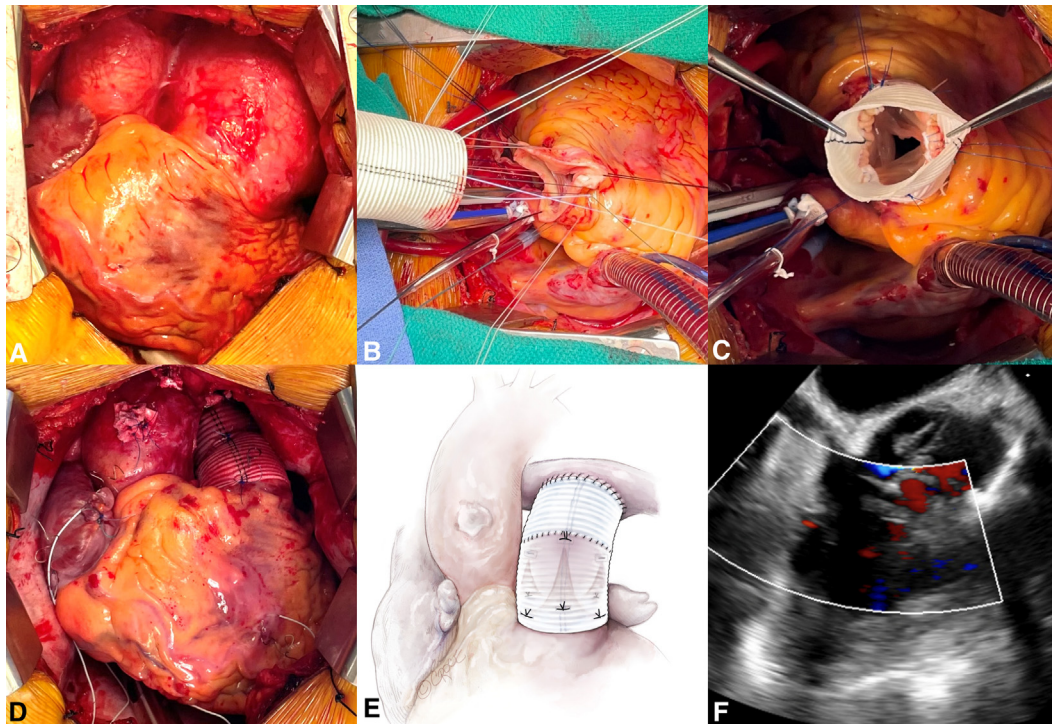
angiography confirmed a nearly 8 cm aneurysm spanning the main PA to the proximal branch PAs bilaterally (Figure 1, B and C). Right heart catheterization showed PA pressure 73/34 mm Hg (mean, 49 mm Hg). Given these findings along with new complaints of exertional dyspnea, the patient was transferred to our institution for surgical repair. The patient consented to this case report. Institutional review board approval was not required per Stanford University policy.

## CENTRAL MESSAGE

We present a rare case of a giant pulmonary artery aneurysm with severe pulmonic regurgitation that we successfully repaired using a reimplantation valve-sparing pulmonic root replacement technique.



**FIGURE 1.** A patient with pulmonary arterial hypertension and exertional dyspnea was found to have (A) severe pulmonic regurgitation associated with (B-C) a giant pulmonary artery aneurysm.



**FIGURE 2.** Intraoperative photos of the reimplantation valve-sparing pulmonic root replacement technique. A, A giant pulmonary artery aneurysm before repair. B, A straight tubular graft with 6 subannular sutures placed in a coronet fashion. C, The upper hemostatic suture line sewn as a planar circle without scallops. D, The completed repair. E, An illustrated schematic of the completed repair is shown for clarity. F, Intraoperative transesophageal echocardiography confirmed no residual pulmonic regurgitation after the repair.

The PA aneurysm was exposed via median sternotomy (Figure 2, A). The aorta and right atrium were cannulated for cardiopulmonary bypass, and the aneurysm was resected from the distal PA down to the sinotubular junction (STJ) of the pulmonary valve (PV). Arterioplasty of the distal PA was performed using 3 interrupted 4-0 polypropylene sutures to narrow the distal PA. Next, the PV was inspected, revealing normal leaflets with good potential coaptation. A 32-mm polyethylene terephthalate straight tube graft was selected to narrow the PV annulus and facilitate suitable leaflet coaptation geometry. The aorta was crossclamped and the heart arrested with antegrade cardioplegia. Six subannular sutures were placed at the PV commissures and below the leaflet nadirs, then loaded from the right ventricle into the graft in a coronet fashion (Figure 2, B). The sutures were loosely tied, and the graft was seated. The 3 commissures were then posted on the graft to generate excellent leaflet coaptation geometry. Next, the hemostatic suture line was performed using 3 continuous 4-0 polypropylene sutures, starting at the midpoint of each of the 3 STJ segments and anastomosing the residual PA to the graft in a planar circular fashion (Figure 2, C). STJ tightening was accomplished by narrowing the graft at this level. Finally, the graft was shortened, beveled, and anastomosed to the distal PA using continuous 4-0 polypropylene suture (Figure 2, D and E). The patient weaned off cardiopulmonary bypass without

difficulty, and transesophageal echocardiography confirmed no residual PR postrepair (Figure 2, F). The patient enjoyed an uneventful recovery and continues to maintain an active lifestyle 6 months after surgery.

## DISCUSSION

Due to the rarity of PA aneurysms, there are currently no evidence-based guidelines for surgical management. To avoid rupture or dissection, which may pose further surgical challenges,<sup>3</sup> a diameter threshold of 5.5 cm, a growth rate of 0.5 cm in 6 months, compression of adjacent structures (eg, bronchus and left main coronary artery), thrombus in the aneurysm sac, onset of clinical symptoms associated with valvular pathology, and confirmed PAH have been suggested as surgical indications.<sup>1</sup> Our patient exhibited several of these concerning features warranting intervention.

Although our team and others have reported a variety of surgical strategies for PA aneurysms, including aneurysmorrhaphy,<sup>1</sup> xenograft or homograft replacement,<sup>4</sup> Yacoub remodeling or David reimplantation VSRR,<sup>2,5</sup> and lung or heart-lung transplant in the setting of end-stage PAH and severe distal aneurysmal disease,<sup>1,4</sup> there is no consensus on an optimal strategy. In this case, we successfully employed the reimplantation VSRR technique and identified several technical elements that may simplify and improve the reproducibility of the operation. Specifically, we observed

that the lower suture line is not critical because 6 loosely tied subannular sutures are sufficient. Moreover, the upper hemostatic suture line can be sewn as a planar circle without scallops, unlike the aortic VSRR operation in which the coronary buttons must be accommodated. Finally, by using a straight graft to facilitate annular and STJ narrowing, we were able to eliminate the patient's severe PR. Overall, our experience with this case suggests that the reimplantation VSRR technique may serve as a simple and effective repair operation for carefully selected patients with large PA aneurysms and significant PR.

### Conflict of Interest Statement

The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict

of interest. The editors and reviewers of this article have no conflicts of interest.

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