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CARDIOVASCULAR IMAGES

Ascending Aortic Pseudoaneurysm: A Rare Complication of Transcatheter Aortic Valve Replacement and Thoracic Surgery

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A 64-year-old man with a history of transcatheter aortic valve replacement (TAVR) and bilateral orthotopic lung transplant was found to have a retrosternal hematoma on annual surveillance chest computed tomography (CT). The patient had a CoreValve Evolut R 34-mm valve (Medtronic, Inc, Minneapolis, MN) implanted for moderate aortic stenosis and severe aortic regurgitation at an outside hospital 2 years before the surveillance CT. One year prior, the patient underwent bilateral orthotopic lung transplant through midline clamshell approach for chronic obstructive pulmonary disease secondary to α -1-antitrypsin deficiency. Intraoperative transesophageal echocardiogram during bilateral orthotopic lung transplant revealed normal position and function of the TAVR prosthesis with trace perivalvular leak and a normal aortic root and ascending aorta.

He reported no concerning symptoms. His lung allograft function was excellent. CT chest without contrast reported a retrosternal mediastinal hematoma measuring 3.1×2.6 cm that was contiguous with the ascending aorta. A chest CT angiogram showed a large ascending aortic pseudoaneurysm measuring 4.9 cm in maximum longitudinal length with a 1.8×2.6-cm-wide neck (Figure [A]). The pseudoaneurysm extended to the retrosternal region and the posterior plate of the sternum with multiple midline sternal wires passing through. The inferior portion of the pseudoaneurysm was in close proximity to the upper portion of the TAVR prosthesis and abutted the ostium of the right coronary artery without obvious compression. Three-dimensional relationships among

the pseudoaneurysm, TAVR prosthesis, and sternal wires were generated by volume rendering (Figure [B]; Video S1). There was unchanged nonspecific soft tissue swelling and fullness adjacent to the prior left lateral clamshell chest wall without localized fluid collection, suggestive of subcutaneous soft tissue infection.

The patient was admitted for management of the ascending aortic pseudoaneurysm and surgical wound infection. The decision was made to proceed with concomitant emergent pseudoaneurysm repair and surgical aortic valve replacement. When the pseudoaneurysm sac was opened, the TAVR struts were easily seen in the open pseudoaneurysm sac with the valve prosthesis protruding outside the aorta. Clots were seen on the cusps of the TAVR prosthesis leaflets. The native aortic valve leaflets were resected and replaced with a 25-mm Edwards Inspiris Resilia (Edwards Lifesciences LLC, Irvine, CA) bioprosthetic valve.

The left chest wall clamshell infection was managed by wound debridement and irrigation. No direct communication between the pseudoaneurysm and chest wall infection was noticed. Cultures from the chest wound and the pseudoaneurysm were positive for *Staphylococcus epidermidis*. Blood cultures and cultures of the explanted TAVR prosthesis and native aortic valves showed no bacterial growth. The patient underwent a 6-week course of daptomycin treatment followed by lifelong suppression with doxycycline given his immunosuppression status.

Pathological examination of explanted native aortic valve leaflets and TAVR prosthesis (Figure [C]) and

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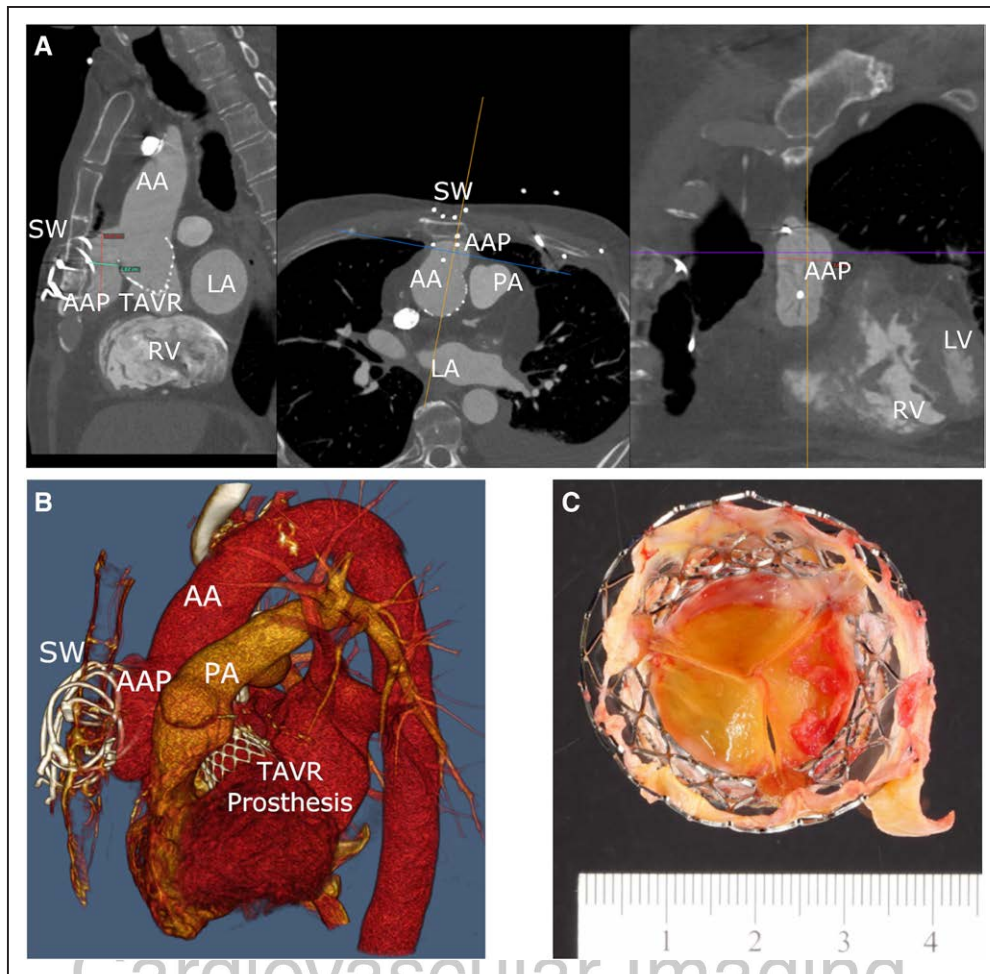


Figure. Computed tomography (CT) chest angiogram showing the aortic pseudoaneurysm and pathological exam of the explanted transcatheter aortic valve replacement (TAVR) prosthesis.

A, Sagittal, axial, and coronal views of CT chest angiogram reveal details on the location of the pseudoaneurysm. The pseudoaneurysm is juxtaposed to the posterior plate of the mid-sternum, measuring 4.9 cm in maximum longitudinal length with a 1.8×2.6-cm-wide mouth. Multiple sternal wires pass through the pseudoaneurysm. The inferior portion of the ascending aortic pseudoaneurysm (AAP) neck is in close proximity to the TAVR prosthesis. **B**, Volume rendering of the CT chest angiogram, left anterior oblique projection, shows the detailed 3-dimensional relationship of the pseudoaneurysm with the sternum, sternal wires, and TAVR prosthesis. **C**, Mural thrombus is seen on the aortic side of the TAVR prosthetic valves. AA indicates ascending aorta; LA, left atrium; LV, left ventricle; PA, pulmonary artery; RV, right ventricle; and SW, sternal wires.

excised pseudoaneurysm showed organizing mural thrombus, consistent with findings observed during surgery.

Repeat CT chest 2 months later showed stable post-surgical changes. At 5 months, the patient reports no significant cardiovascular symptoms. His lung allograft continues to maintain good function.

Ascending aortic pseudoaneurysms are an uncommon but potentially life-threatening disorder of cardiothoracic surgery. Aortic pseudoaneurysms are found in 2% of all postoperative thoracic aortic cases¹ while reported cases after TAVR implantation are extremely rare.² Large ascending aortic pseudoaneurysms with anterior location and sternal erosion are prone to rupture. Urgent surgical management is usually indicated, although endovascular repair or percutaneous closure might be considered in select cases.

Common risk factors for developing aortic pseudoaneurysm include traumatic injury, cardiothoracic surgery, catheter-based cardiovascular interventions, penetrating thoracic trauma, and infectious aortitis.³ The etiology of the pseudoaneurysm in our case is likely multifactorial. First, CT imaging and intraoperative findings suggest that the TAVR prosthesis might have caused frictional effects on the aortic wall against the sternal wires, which led to the formation and sternal adherence of the pseudoaneurysm. Second, α 1-antitrypsin deficiency is associated with chronic damage to vascular wall integrity resulting in aneurysmal pathology.⁴ Third, the positive intraoperative culture implicates *S epidermidis* as an infectious culprit. Last, the administration of immunosuppression agents after lung transplant might have increased the risk for aortic pathology.³

Although the incidence of ascending aortic pseudoaneurysms after cardiothoracic surgery is rare, these

acquired and inherited factors might have combined to cause the development of the pseudoaneurysm. Emergent surgical repair of large ascending aortic pseudoaneurysms is warranted.

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Supplemental Material

Video S1

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