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CASE REPORT

INTERMEDIATE

CLINICAL CASE

Thoracic Aorta Perforation Treated Conservatively After TAVR in a Patient With Extremely Tortuous Aorta

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ABSTRACT

Aortic perforation is a rare complication of transcatheter aortic valve replacement associated with grim outcomes. Tortuous and calcified aortas increase the risk of aortic trauma and perforation. We report a case in which, despite massive thoracic bleeding, avoidance of thoracic aortic surgery resulted in clinical recovery. (**Level of Difficulty: Intermediate.**) (J Am Coll Cardiol Case Rep 2023;5:101691) © 2022 Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

PAST MEDICAL HISTORY

An 82-year-old woman known to experience hypertrophic obstructive cardiomyopathy underwent septal myectomy and aortic valve replacement (St. Jude Medical Trifecta Valve 23 mm) 8 years before index admission. In addition, the patient is morbidly obese (body mass index 40) and has restrictive and obstructive lung disease with intermittent use of oxygen. She was referred to the hospital because of worsening heart failure symptoms: New York Heart Association functional class III. Transthoracic echocardiography revealed severe biological valve degeneration with a mean gradient of 45 mm Hg and valve orifice area of 0.8 cm^2 (aortic valve area index 0.5 cm^2/m^2 body surface area). The STS score for mortality at 30 days was calculated at 6.7%, and the heart team's decision was to proceed with valve-in-valve transcatheter aortic valve replacement (TAVR) because of increased surgical risk, her age, the need for redo surgery, her morbid obesity, and her lung disease. Computed tomography (CT) angiography multiplanar reconstruction demonstrated severe tortuosity of the descending thoracic aorta (**Figure 1**) with no additional findings that preclude TAVR. Alternative TAVR approaches, including transapical and transaxillary, were considered and deferred because of her lung disease. TAVR was thus performed under mild sedation and local anesthesia by the right transfemoral approach under fluoroscopic

LEARNING OBJECTIVES

In a patient with severely tortuous aorta who presented with dyspnea and chest pain 3 hours after transcatheter aortic valve in surgical aortic valve:

- To be able to make a differential diagnosis of TAVR-associated chest pain and dyspnea.
- Discuss the different therapy options of TAVR-associated aortic trauma in the high-surgical-risk patient.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the Author Center.

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ABBREVIATIONS AND ACRONYMS

CT = computed tomography

TAVR = transcatheter aortic valve replacement

guidance. A Lunderquist Extra-Stiff Wire Guide (Cook Medical) was used, and a 23-mm balloon expandable Edwards SAPIEN 3 (Edwards Lifesciences) was delivered into the old surgical valve and implanted under rapid pacing. Resistance was noted while crossing the thoracic aorta that was negotiated with flexion and rotation of the delivery system. The patient was alert and hemodynamically stable throughout the procedure. Supra-aortic injection revealed no aortic valve insufficiency nor coronary flow impairment, and the patient was transferred to the intensive cardiac care unit.

CLINICAL PRESENTATION OF INDEX PROBLEM

Three hours postprocedure, the patient experienced worsening chest and back pain and shortness of breath.

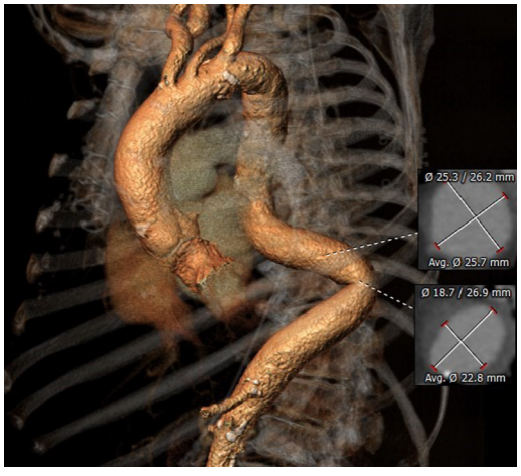
DIFFERENTIAL DIAGNOSIS

Differential diagnosis included acute coronary event, pulmonary edema, and mechanical problems associated with TAVR, such as tamponade, membranous septum injury, and aortic injury.

IMAGING

Her electrocardiogram was normal; echocardiography revealed good LV function with no pericardial effusion. No gradient or insufficiency were noted on the aortic valve, and the septum appeared intact. Chest x-ray revealed large left pleural effusion (Figure 2A), and thus, CT angiography was promptly executed showing perforation of the descending thoracic aorta at the bended segment (Figures 2B and 2C).

FIGURE 1 Computed Tomography Angiography Multiplanar Reconstruction Revealing Severely Tortuous Descending Aorta



MANAGEMENT

A chest tube was inserted immediately at bedside, draining 1,100 mL of bloody effusion. Red packed cells and protamine sulphate were administered. Drug therapy was administered to keep systolic blood pressure at 100 to 120 mm Hg. Chest drainage was maintained for 4 days draining a total of 1,500 mL. CT angiography at day +5 showed trivial effusion and aortic wall perforation site sealing (Figure 3), with bilateral nonobstructive thrombi in both main pulmonary arteries. No signs of right ventricular overload were noted, and the patient was hemodynamically stable while mildly dyspneic. Anticoagulation therapy with low molecular weight heparin was ensued, replaced a day later by full dose apixaban. Dyspnea was resolved and the patient was discharged on the ninth postoperative day.

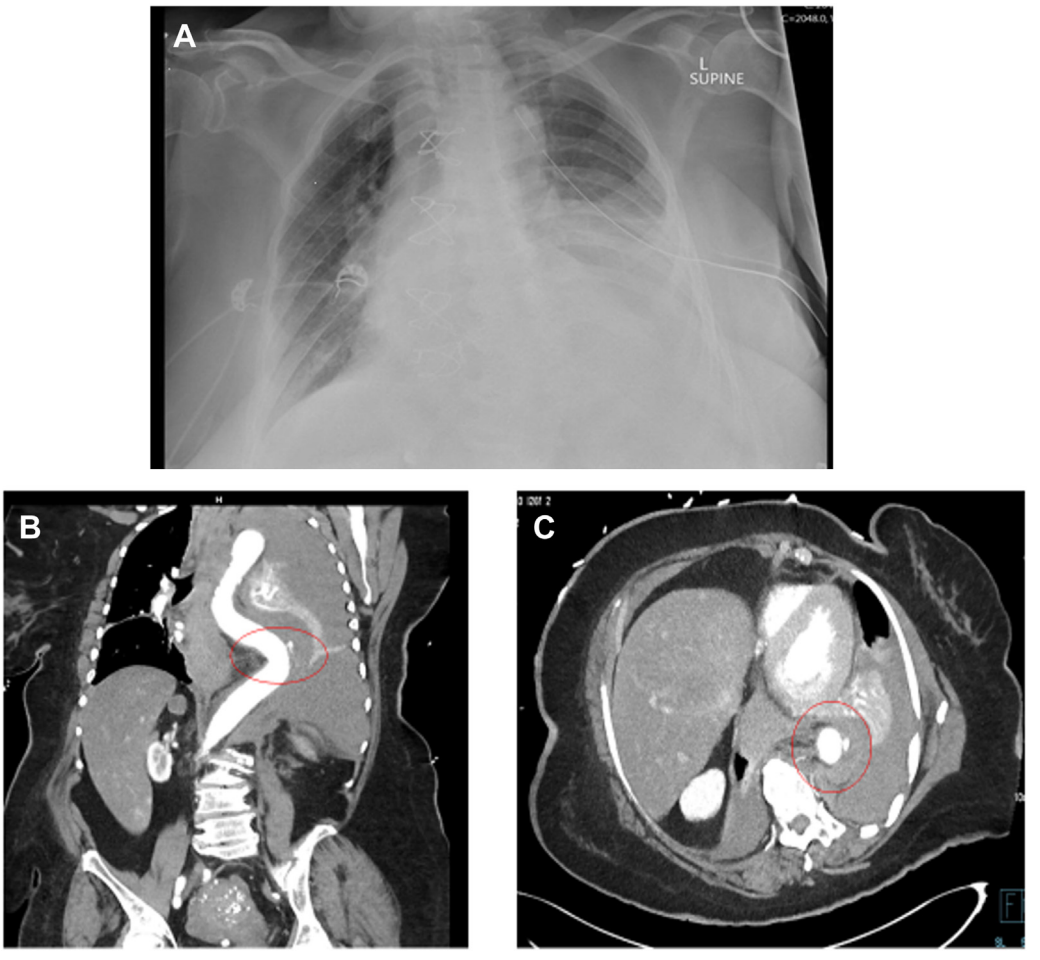
FOLLOW-UP

At 30-day follow-up, the patient reported symptomatic relief with no exertional dyspnea. Echocardiography revealed good left and right ventricular function and good function of the new bioprosthetic valve.

DISCUSSION

Thoracic aortic dissection and perforation are rare complications of TAVR occurring in 0.2% to 0.3% of cases.[1,2] There are numerous possible mechanisms by which an aortic injury can develop during TAVR, including wire perforation, interaction of the delivery system with tortuous aorta, and retrieval of a balloon or valve system. Open surgery is often declined because of the extreme surgical risk in these patients who are already often considered to be frail and at high risk. A few cases of TAVR-related aortic perforation reported either conservative or endovascular therapy and were associated with high mortality.[3,4] Yet, endovascular therapy is not always feasible. Both options, surgical and endovascular, were available for our patient. Yet, the risks associated with these modalities appeared to be too high while clinical stabilization was attained without. Thus, the presented patient was treated with blood and blood supplements while maintained at controlled blood pressure with continuous drainage of the pleural space. This therapy resulted in cessation of bleeding and

FIGURE 2 Chest X-ray and CT Scan Following Perforation



(A) Chest x-ray: large left pleural effusion. **(B and C)** Perforation of the descending aorta at the bend of the tortuous segment, demonstrated on CTA frontal **(B)** and transverse **(C)** planes. The **red circles** mark the perforation site.

FIGURE 3 CTA of Descending Aorta at Day +5 Showing No Leakage at the Perforation Site

sealing of the aortic rupture. Severely tortuous aortas should warrant the consideration of an alternative approach, such as axillary or carotid, or the use of "buddy wire"—a stiff wire within the pigtail catheter—to facilitate smooth transition of the valve system within challenging anatomies.

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Dr Danenberg serves as a clinical proctor for Medtronic and Edwards Lifesciences. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

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KEY WORDS **aortic perforation, aortic valve stenosis, TAVI, TAVR**