Aorta to RV Fistula: A Rare Complication of TAVR

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Abstract

An 80-year-old man with symptomatic severe aortic stenosis presented with worsening exertional dyspnea and heart failure symptoms. He was evaluated for transcatheter aortic valve replacement (TAVR) after being deemed a high-risk surgical candidate. During the pre-procedural angiogram, significant coronary artery disease was noted, requiring stent placement to the right coronary artery prior to valve intervention. The patient subsequently underwent TAVR and required several balloon dilations intra-procedurally due to paravalvular leak. Intra-procedural transesophageal echocardiogram revealed small aortic to right ventricular fistula. A second valve was deployed without further incident. The patient also developed complete heart block during the procedure and required permanent pacemaker implantation the following day. He was managed conservatively with imaging and clinical evaluations while remaining asymptomatic from the fistula.

Introduction

Transcatheter aortic valve replacement (TAVR) is a percutaneous option for high-risk surgical patients requiring valve replacement due to severe aortic stenosis.[1] Recent data presented at the American College of Cardiology 2018 Scientific Session indicates that TAVR may be a safe option for low-risk surgical patients as well.[1] Major reported complications of TAVR include paravalvular leak, aortic root rupture, moderate to severe aortic insufficiency, complete heart block, ventricular arrhythmias, and stroke.[2] Aorta to right ventricular (RV) fistula formation is a rare complication of surgical aortic valve surgery (SAVR) and TAVR. As of 2017, there were more than 120,000 TAVR procedures performed and only five cases of aorto-RV fistula reported.[2-6]

Case Report

An 80-year-old man with a medical history of coronary artery disease requiring bypass graft surgery in 2005, colon cancer status post resection, heart failure with preserved ejection fraction, and known severe aortic valve stenosis presented with decreased exercise tolerance, fatigue, and shortness of breath. He presented with New York Heart Association (NYHA) class III symptoms which progressed over six months. Transthoracic echocardiogram (TTE) showed left ventricular ejection fraction of 55%, and severe aortic stenosis with an aortic valve area (AVA) of 0.7cm^2, mean pressure gradient of 45 mmHg, and velocity of 316 cm/second. The patient's case and images were reviewed by two cardiothoracic surgeons and the TAVR team. He was planned for TAVR as a high-risk surgical candidate, given his age and comorbidities. A pre-procedural angiogram demonstrated patent grafts from the left internal mammary artery (LIMA) to the left anterior descending artery (LAD), saphenous vein graft (SVG) to the obtuse marginal (OM) artery, and SVG to the right posterior descending artery (RPDA). A 95% stenosis in the proximal right coronary artery (RCA) with TIMI-2 flow was noted, and a bare-metal stent was successfully placed, resulting in TIMI-3 flow.

The TAVR procedure was performed one month later via right femoral access using the standard technique. Pre-dilatation with a 22 mm balloon was required, due to severe calcification of the valve leaflets. A 29 mm CoreValve Evolut (Medtronic) was advanced and appropriately positioned. A severe paravalvular leak was noted after valve deployment. Three serial dilatations were performed with 24 mm, 25 mm, and 28 mm balloons, respectively. Intraprocedural imaging revealed a mild paravalvular leak with a new severe central valvular leak, likely secondary to serial balloon dilatations. A second 29 mm CoreValve Evolut was subsequently deployed 3-4 mm above the initial valve with an excellent result. A transesophageal echocardiogram (TEE) revealed a small fistula between the aortic root and the right ventricle without a significant shunt. On the table, the patient developed complete heart block with a junctional escape rhythm. A temporary pacemaker was inserted, and he was monitored on telemetry throughout recovery. The following day, a permanent pacemaker was placed, secondary to persistent third-degree heart block. Post-operative TTE showed a normally functioning bioprosthetic valve, trace aortic regurgitation, calculated AVA 2.5 cm^2, and a mean gradient of 6 mmHg. A fistula between the aortic root and RV was confirmed and unchanged. Mildly increased velocity across the pulmonic valve was noted without a change in RV pressure.

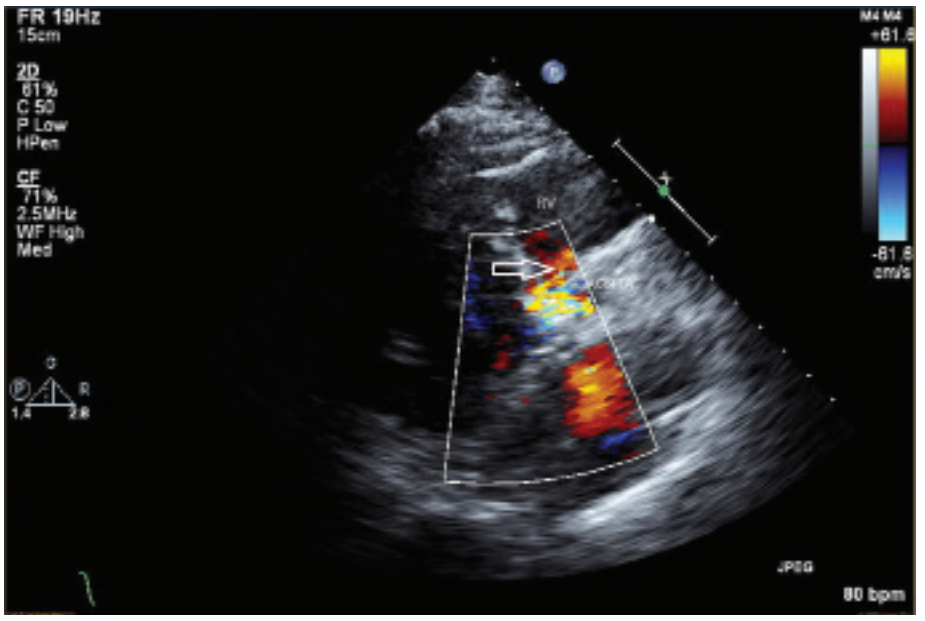

Figure 1. Parasternal long axis view demonstrating flow from aorta to right ventricle after CoreValve Evolut valve placement.

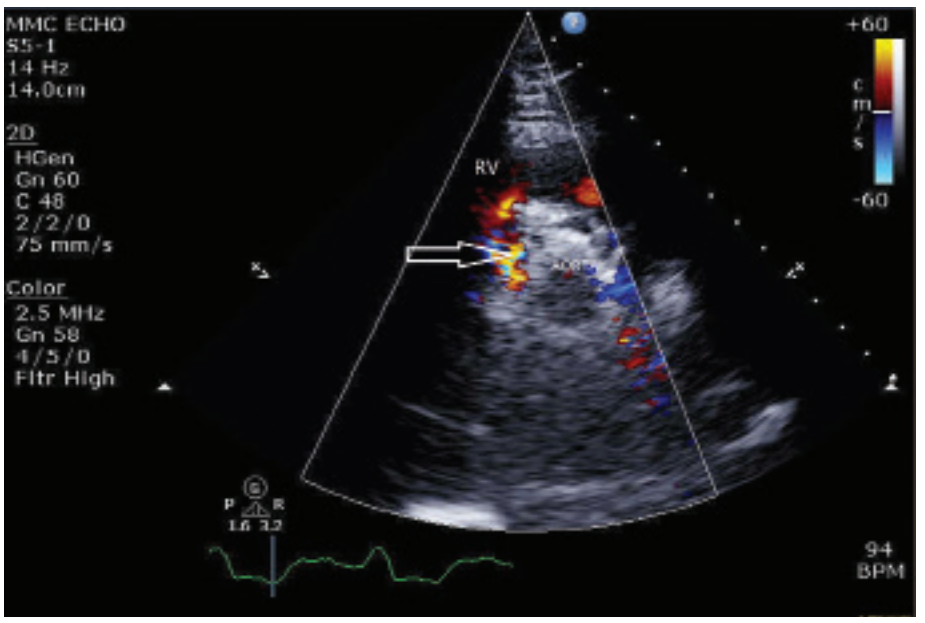

Figure 2. Aortic short axis view demonstrating flow from aorta to right ventricular fistula. (Video available online at cathlabdigest.com.)

The patient remained asymptomatic post-procedure and was discharged on hospital day five. He had an otherwise uneventful hospital course. At 30-day follow-up, the patient denied dyspnea, orthopnea, or lower extremity swelling. He reported an increase in exercise tolerance and his physical exam did not yield any evidence of heart failure. Repeat TTE illustrated a stable aortic to RV fistula without hemodynamic changes. The patient continues to be managed conservatively with repeat imaging and clinical evaluation three years post procedure.

Discussion

TAVR complications include myocardial infarction, annular rupture, vascular complications, conduction disorders, paravalvular leaks, and stroke. Our case illustrates a rare complication of an aorto-RV fistula that did not require repair. The exact mechanism for the development of these fistulas post-TAVR is not fully understood. Aorto-RV fistula formation has been documented after SAVR and TAVR.[2] Possible substrates for the formation of an aorto-RV fistula are the presence of congenital or acquired sinus of Valsalva aneurysms, trauma, and infections.[7,8] An area between the aorta and RV, above the right coronary cusp, is a proposed site of fistula formation.[4] Heavy calcification of the aortic valve and annulus, and the need for aggressive surgical debridement pre-implantation can cause local trauma or tissue displacement, leading to fistula formation.[7] In the first reported case of aorto-RV fistula formation post TAVR, Pilgrim et al stated that erosion of the stent struts of the bioprosthetic valve into the aortic root might have led to the resultant fistula.

Disclosures: Dr. Robert Frankel reports he became certified as an implanting physician proctor for Medtronic TAVR valves after this procedure, but was not at the time of the procedure. Drs Verma, Kakar, Moskovits, and Shani report no conflicts of interest regarding the content herein.

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