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IMAGES IN INTERVENTION

Aorto-Left Ventricular Fistula From Aortic Pseudoaneurysm After TAVR

Transcatheter Treatment With Multimodality Imaging



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A 77-year-old gentleman with history of severe aortic stenosis status post-implantation of a 29-mm SAPIEN 3 (Edwards Lifesciences) transcatheter aortic valve replacement (TAVR) valve 6 years prior was admitted to our institution with acute on chronic diastolic heart failure. His past medical history included recent severe coronavirus disease 2019 infection, diabetes mellitus, coronary artery disease with prior stenting, bradycardia status post-permanent pacemaker implantation, and atrial fibrillation. Transesophageal echocardiography (TEE) demonstrated presence of severe paravalvular leak localized to the region of the native left coronary cusp of the aorta surrounding the TAVR device (Figure 1A, Video 1A). An aortogram demonstrated presence of an aortic pseudoaneurysm (AP) adjacent to the TAVR valve (Figure 2A, Video 2A). Three-dimensional computed tomography (CT) reconstruction demonstrated the aortic (inflow) side of the AP was through the frame of the TAVR valve. The only possible way to access the AP was to go through one specific strut of the upper frame of the TAVR valve,

which measured to be 2.8 mm in maximal diameter (Figures 3A to 3C). This information, combined with the angiographic images, enabled us to plan the type, size of the device delivery sheath, and the device we chose to use.

Transcatheter closure of aortic pseudoaneurysm and aorto-left ventricular (Ao-LV) fistula was performed, utilizing pre-procedural CT angiographic planning and TEE guidance. The aortic side of the AP was engaged with a 7-F JL4 guiding catheter through the upper cell of the TAVR frame on the aortic side under prespecified CT-generated fluoroscopic angles (Figure 3A). Initial closure was attempted with a 5 × 4 mm Amplatzer Duct Occluder II (Abbott Structural Heart) (Figure 2B), with the distal disc and majority of the body of the plug deployed inside the AP. However, after the proximal disc of the device was deployed across the TAVR frame inside the aorta, it interfered with the opening and closure of the TAVR valve. Closure with a smaller sized 3 × 4 mm Amplatzer Duct Occluder II was reattempted but yielded a similar result. Hence, both were recaptured

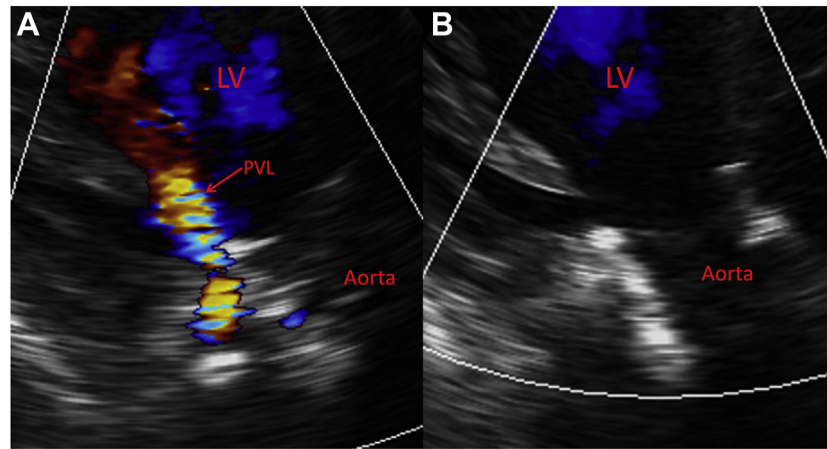
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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit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

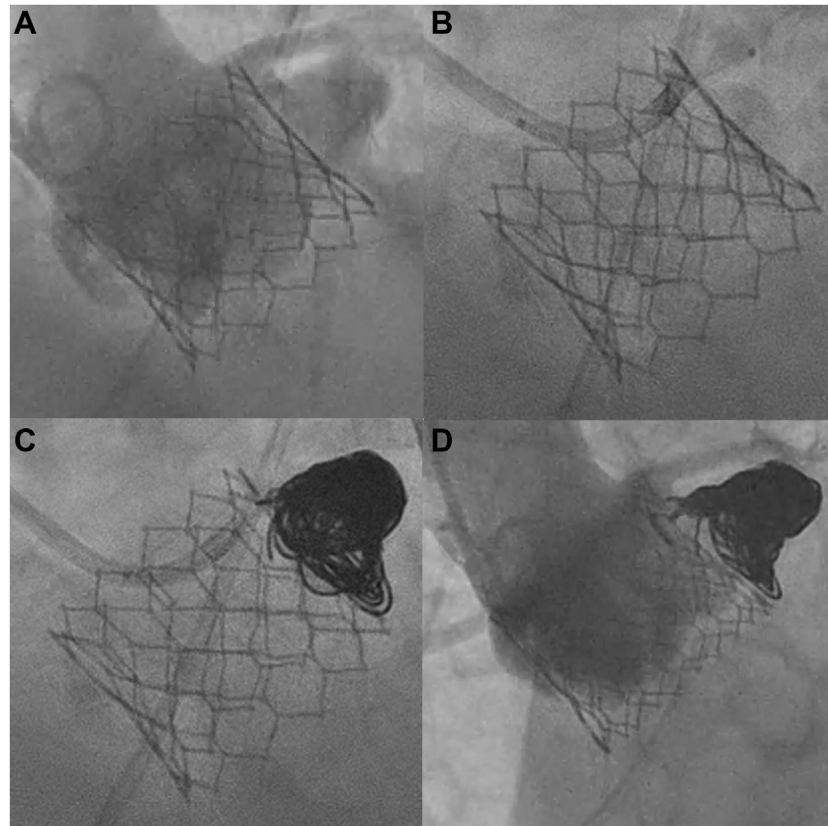
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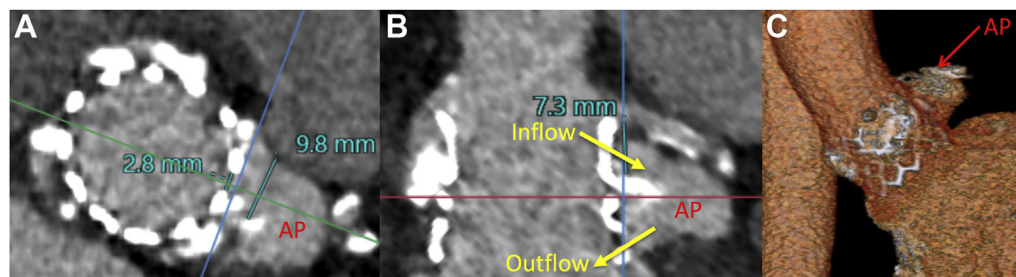
<https://doi.org/10.1016/j.jcin.2022.02.034>

FIGURE 1 TEE Before and After the Procedure

(A) Transesophageal echocardiography (TEE) of the aorto-left ventricular fistula. (B) Post-coiling TEE. LV = left ventricle; PVL = paravalvular leak.

FIGURE 2 Intraoperative Angiographic Images

(A) Aortogram of pseudoaneurysm with aorto-left ventricular fistula. (B) Attempted plug closure. (C) Post-coiling. (D) Post-coiling aortogram.

FIGURE 3 Computed Tomography Image of the Pseudoaneurysm With Aorto-Left Ventricular Fistula

(A) Computed tomography showing the size of the aortic pseudoaneurysm (AP) opening through the transcatheter aortic valve replacement frame. (B) Inflow and outflow of the aorto-left ventricular fistula. (C) Three-dimensional visualization of the AP.

and removed. Given access to preoperative CT-based computer simulation, an alternative approach with a coil-based closure of the defect was attempted. The inflow and outflow of the AP was sequestered by the TAVR frame. However, the use of smaller or shorter coils would predispose a higher risk of coil embolization without a plug closure. Hence, longer and larger coils were used. A total of 5 Ruby Coils (Penumbra) were introduced into the pseudoaneurysm. Two Standard (12×600 mm and 10×350 mm) Ruby Coils followed by 3 Soft (8×350 mm, 3×150 mm, and 8×600 mm) Ruby Coils were deployed (Figure 2C). TEE (Figure 1B, Video 1B) and an aortogram (Figure 2D, Video 2B) showed full sealing of the AP with resolution of the associated Ao-LV fistula. The patient was discharged 1 day post-operatively. At 60-day follow-up, transthoracic echocardiography showed no residual Ao-LV fistula or paravalvular leak. The patient's symptom improved to New York Heart Association functional class I.

APs associated with concomitant Ao-LV fistulas post-TAVR are exceedingly rare and present many anatomical challenges to successful intervention. To our knowledge, this is the first report of such a condition treated via a transcatheter approach utilizing CT case planning. Application of multimodality interventional imaging is crucial for diagnosis,

planning, and facilitating treatment of this complicated condition.

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Dr Villablanca has served as a consultant for Edwards Lifesciences and Teleflex. Dr O'Neill is a consultant to and receives research support from Edwards Lifesciences. Dr Frisoli has served as a proctor for Edwards Lifesciences, Abbott, Boston Scientific, and Medtronic. Dr Wang has served as a consultant to Edwards Lifesciences, Abbott, NeoChord, and Boston Scientific; and received research grant support from Boston Scientific assigned to her employer, the Henry Ford Health System. Dr Eng has served as a proctor for Medtronic and Edwards Lifesciences. Dr O'Neill has served as a consultant for Abiomed, Edwards Lifesciences, Medtronic, Boston Scientific, Abbott Vascular, and St. Jude Medical; and served on the Board of Directors of Neovasc. 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 pseudoaneurysm, aorto-left-ventricular fistula, aortic stenosis, TAVR, transcatheter

APPENDIX For supplemental videos, please see the online version of this paper.