

Extremely early structural failure of a self-expanding transcatheter aortic valve secondary to leaflet dehiscence



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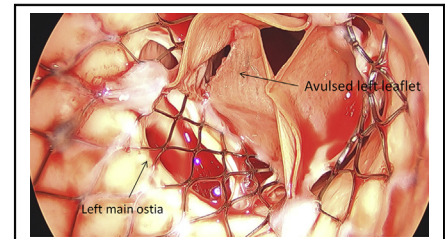
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Left coronary leaflet avulsion off nitinol frame at the left-right commissure.

CENTRAL MESSAGE

Structural valve deterioration after TAVR has been reported years after implantation. We report a case of extreme early failure secondary to leaflet avulsion within 10 months of implantation.

See Commentaries on pages 89 and 91.

▶ Video clip is available online.

Transcatheter aortic valve replacement (TAVR) has become an established treatment option for patients with intermediate, high, prohibitive, and more recently low surgical risk. As the indications expand and an increasing number of younger patients undergo TAVR each year, valve durability has yet to be established. Reports have elucidated structural failure of transcatheter aortic valves several years after implantation via valve thrombosis, cusp rupture, and accelerated calcification.¹⁻³ However, very early deterioration of the latest-generation prosthetic transcatheter valves has not been reported. We report early TAVR structural failure within 1 year, resulting in severe aortic regurgitation.

We present a 78-year-old man with history of chronic lymphocytic leukemia, hypertension, dyslipidemia, obesity, paroxysmal atrial fibrillation, and severe aortic stenosis who had previously undergone transcatheter aortic valve replacement with 34-mm CoreValve (Evolut-R; Medtronic, Minneapolis, Minn) 10 months before presentation. Pre-TAVR workup with an electrocardiogram-gated computed tomography scan showed annular perimeter 85.9 mm, perimeter-derived diameter 27.3, and area 576.7 mm². The original TAVR implantation was followed by a post deployment balloon dilatation with a 28 × 40 mm Z-MED (B. Braun Medical, Bethlehem, Pa) balloon for residual moderate paravalvular aortic insufficiency. The patient recovered

well with uneventful postoperative course and was discharged home on postoperative day 4. Pre-discharge echocardiogram demonstrated no aortic regurgitation with mean pressure gradient of 3.4 mm Hg. Thirty-day follow-up

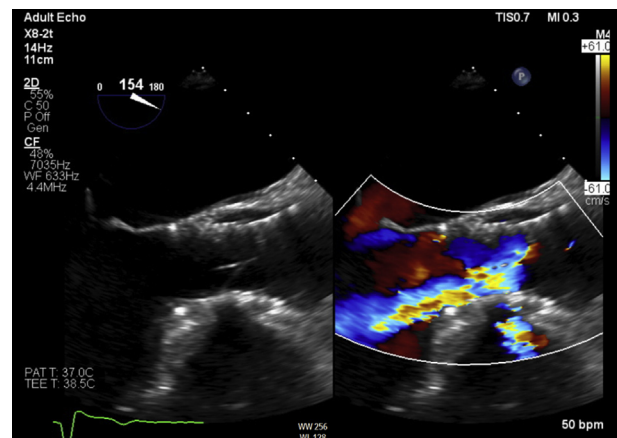


FIGURE 1. Transesophageal echocardiogram showing transcatheter aortic valve with severe eccentric aortic insufficiency secondary to flail leaflet.

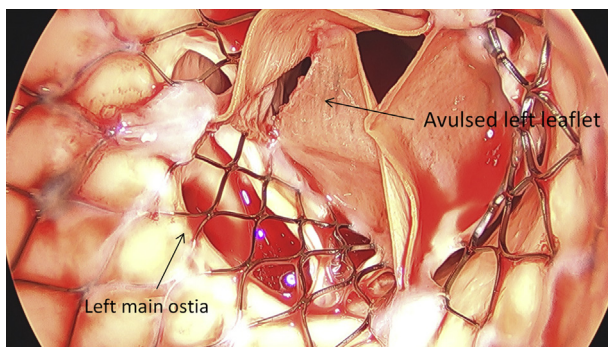
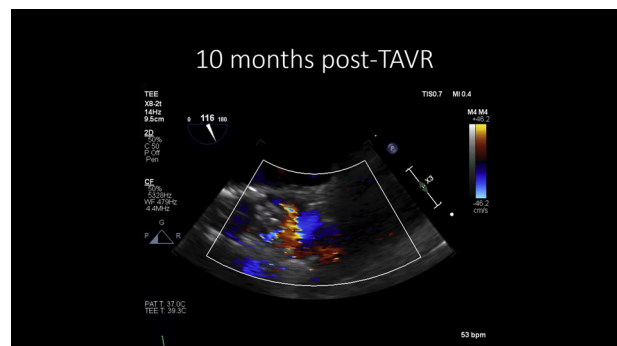


FIGURE 2. Well-incorporated transcatheter valve with normal-appearing leaflets and avulsion of left coronary leaflet (*arrow*) off nitinol frame at the left-right commissure. Other *arrow* indicates the left main ostia.

echocardiogram showed mild paravalvular aortic regurgitation, with a mean gradient 8.4 mm Hg.

Approximately 10 months after his TAVR, he presented with sudden onset of shortness of breath, consistent with New York Heart Association functional class III symptoms. Severe bioprosthetic aortic valve insufficiency was seen on transthoracic echocardiography. Transesophageal echocardiography confirmed severe eccentric regurgitation secondary to flail leaflet (**Figure 1** and **Video 1**). He reported no history of febrile illness, and blood cultures were negative. In preparation for surgery, he underwent a left heart catheterization, which demonstrated severe stenosis of the mid-right coronary artery; this artery had not been significant by fractional flow reserve 10 months previously. The patient was taken to the operating room for explantation of the CoreValve, followed by aortic valve replacement with a 27-mm AVALUS (Medtronic), coronary artery bypass grafting to posterior descending artery, as well as pulmonary vein isolation and left atrial appendage clip for paroxysmal atrial fibrillation. The intraoperative findings revealed left coronary cusp avulsion off the nitinol frame at the left-right commissure (**Figure 2**). The leaflets appeared normal without any thickening, no vegetations, and without perforation. Tissue, blood, and valve swab cultures showed no growth. The patient provided informed consent for the publication of the study data.

Structural failure after TAVR has been reported immediately as well as several years after implantation.



VIDEO 1. Transesophageal echocardiogram displaying severe aortic regurgitation across the transcatheter valve. Video available at: [https://www.jtcvs.org/article/S2666-2507\(20\)30126-7/fulltext](https://www.jtcvs.org/article/S2666-2507(20)30126-7/fulltext).

However, most involved the earliest-generation transcatheter valves. We report extreme early failure secondary to mechanical failure of the leaflet within 10 months of implantation of the latest generation of transcatheter valve. As valve leaflets become thinner to accommodate smaller deployment sheaths sizes, studies have demonstrated significantly greater stress values in the leaflet's fixed edge during systole and commissures during diastole.⁴ We hypothesize that increased mechanical stress on transcatheter valve leaflets via balloon dilatation may also lead to increased structural stress as well as accelerated tissue degeneration affecting overall transcatheter valve durability. This case should bring to light the potential complications of balloon dilatation on the integrity of transcatheter valve leaflets. Long-term follow-up may eventually reveal the effect of balloon valvuloplasty nuances with respect to size, type, and methods, on valve durability.

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