

## Letter to the Editor

## Treatment of a Severely Degenerated Mitral Bioprosthesis with Transcatheter Valve-In-Valve Implantation

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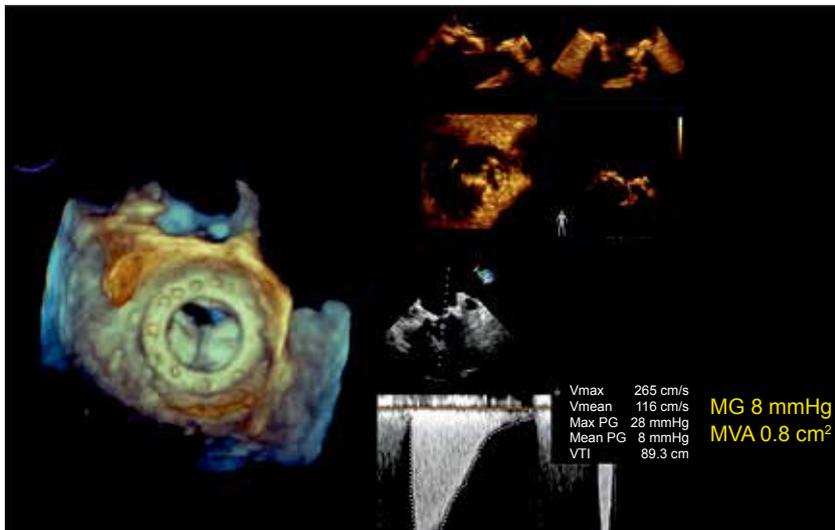
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**P**rogressive structural deterioration of surgical bioprostheses in the mitral position is a challenging clinical problem that manifests with stenosis, regurgitation, or both and leads to the reappearance of heart failure symptoms. In these, often high-risk, patients an attractive alternative to surgical redo valve replacement is emerging in the form of transcatheter mitral valve replacement (valve-in-valve, ViV).<sup>1</sup> Three-dimensional echocardiography plays a pivotal role in understanding the mode of failure as well as assessing the outcomes of the ViV procedure.

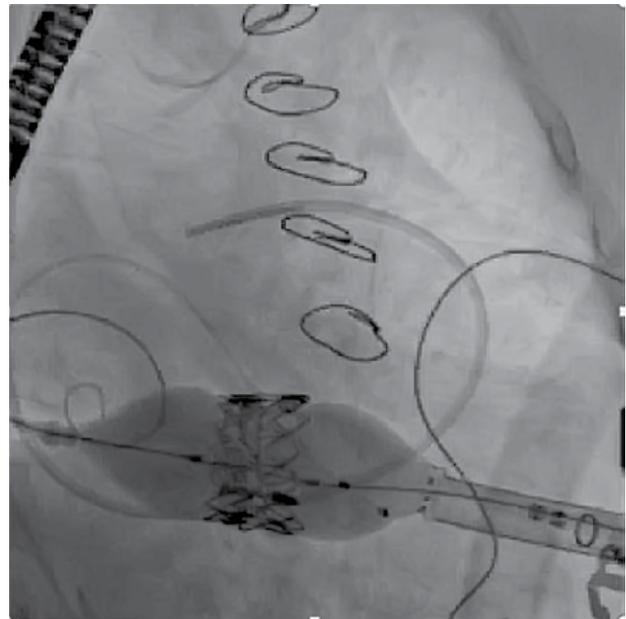
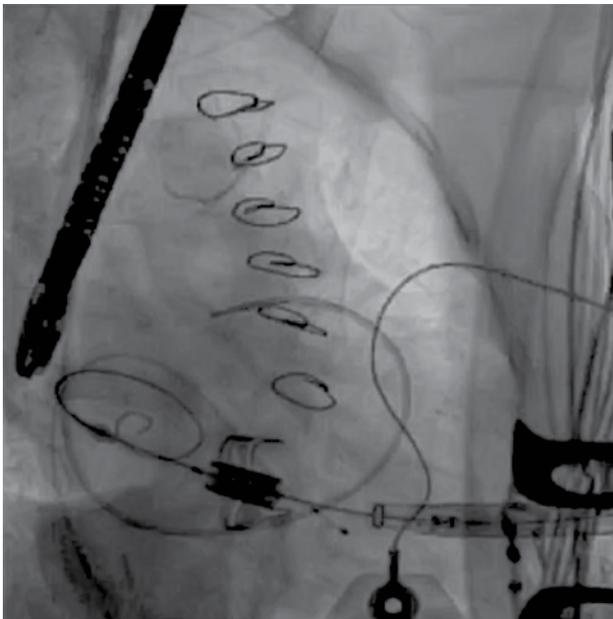
A 74-year-old female had undergone surgical mitral valve replacement 10 years prior to presentation with a 27 mm Edwards Perimount bioprosthesis. Over the last 18 months she had progressive worsening of heart failure symptoms (New York Heart Association functional class IV), with multiple admissions for decompensation and gradual development of right ventricular dysfunction and severe tricuspid valve regurgitation. She was found to have severe stenosis of the mitral bioprosthesis, with an estimated valve orifice area of 0.8 cm<sup>2</sup> and a mean gradient of 9 mmHg (Figure 1). She was evaluated for redo surgical mitral valve replacement

along with tricuspid valve repair; however, she was judged to be at prohibitive surgical risk due to frailty, advanced right heart failure and overall clinical status. Thus, she was referred for ViV implantation of a Sapien XT bioprosthesis via the transapical approach.

The procedure was performed in the hybrid operating room. After the position of the cardiac apex had been identified by echocardiography, a mini thoracotomy was performed and the apex of the left ventricle was prepared using purse string sutures. Apical puncture was performed and a 6 F sheath was inserted in the left ventricle. Subsequently, a hydrophilic 0.035" wire was advanced via the stenotic mitral valve via a multipurpose catheter. A 260 cm extra-stiff Amplatz 0.035" guidewire was reshaped and advanced into the left atrium. After insertion of the Ascendra Plus 26F sheath, a 29 mm balloon-expandable Sapien XT valve was appropriately oriented and mounted on the delivery catheter, advanced to within the annulus of the mitral bioprosthesis, and gradually deployed under rapid ventricular pacing (Figure 2). The immediate echocardiographic and fluoroscopic images revealed stable positioning and excellent functionality of the newly im-



**Figure 1.** Baseline 3-dimensional transesophageal echocardiography of the mitral bio prosthesis (focused wide sector – zoom mode). The valve is anatomically oriented (surgeon’s view from the left atrial side). Two of the three leaflets remain in the closed position throughout the cardiac cycle, causing severe stenosis. Using multiplanar reconstruction, the mitral valve orifice was estimated at 0.8 cm<sup>2</sup>. Continuous wave Doppler measured the mean transmitral gradient as 8 mmHg, probably an underestimate of the severity of stenosis, given the coexisting low flow state from right ventricular dysfunction and severe tricuspid regurgitation.



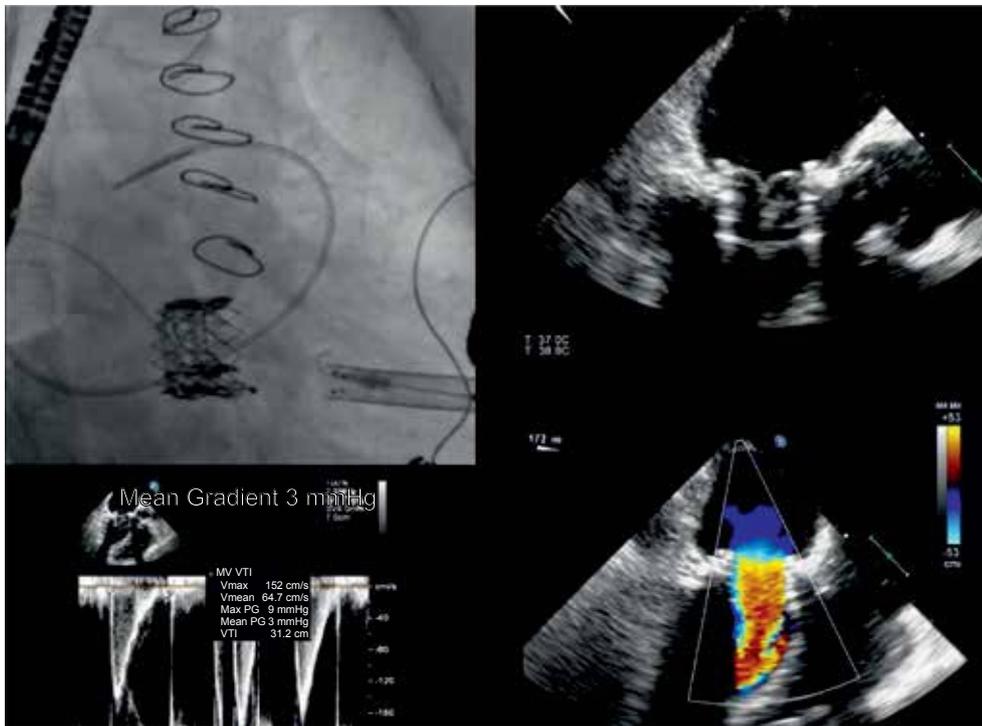
**Figure 2.** Transapical delivery, positioning, and deployment of a 29 mm Sapien XT valve under rapid ventricular pacing. Note the flaring of the ventricular aspect of the Sapien XT valve, a feature that is desirable in order to minimize the risk of atrial migration of the valve in response to ventricular systolic forces.

planted valve (Figures 3 & 4). After removal of the delivery system and sheath, the apical puncture was repaired and the thoracotomy was closed. The patient was treated in the intensive care unit for 24 hours and was discharged home 5 days later. At the 1-month follow up, the patient reported substantial clinical improvement. A three-dimensional transthoracic study showed normal functionality of the implanted valve. Interference of the ViV complex with the left ventricular outflow tract was noted on 3D and X-plane imaging and resulted in dynamic changes in the area of

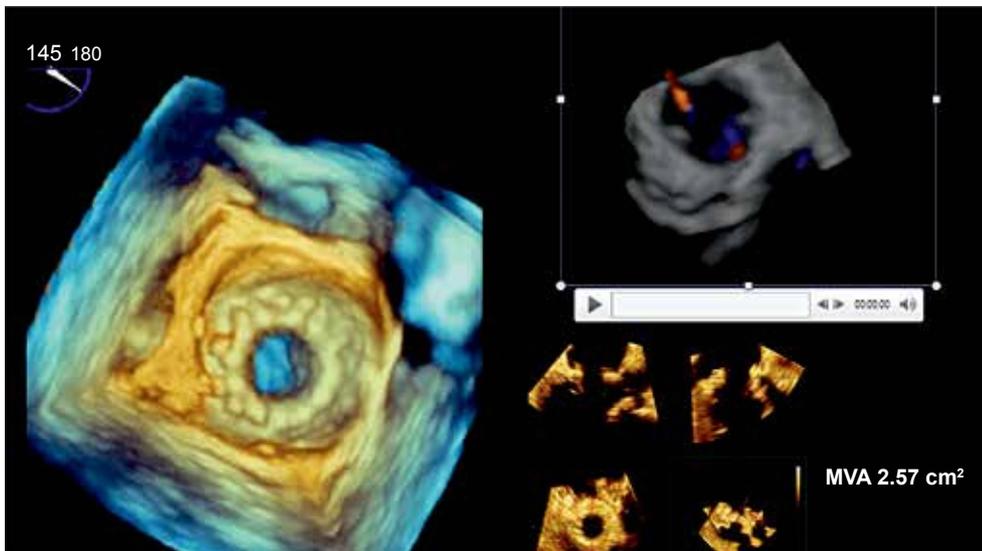
the left ventricular outflow tract (Figure 5). This did not appear to have any clinical consequences. At the 18-month follow up the patient is clinically well without readmissions for heart failure.

## Reference

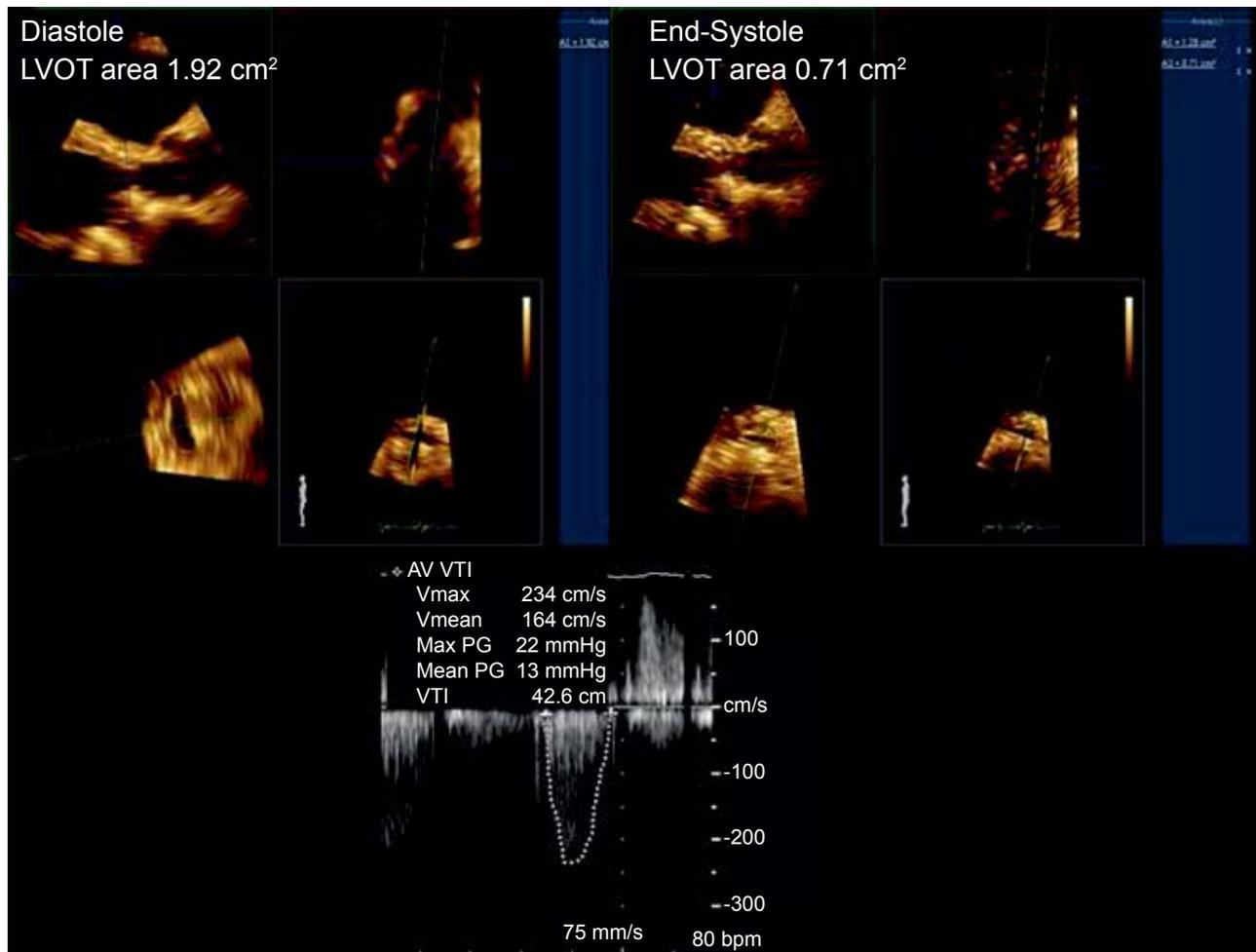
1. Seiffert M, Conradi L, Baldus S, Schirmer J, et al. Transcatheter mitral valve-in-valve implantation in patients with degenerated bioprostheses. *JACC Cardiovasc Interv.* 2012; 5: 341-349.



**Figure 3.** Fluoroscopic and 2-dimensional appearance along with spectral and color-flow Doppler. The mean mitral gradient is now estimated at 3 mmHg.



**Figure 4.** Focused wide sector 3-dimensional transesophageal echocardiography of the newly implanted valve (anatomic orientation, surgeon's view). Well-functioning prosthesis with trivial central regurgitation. Using multiplanar reconstruction, the final mitral orifice was estimated at 2.57 cm<sup>2</sup>.



**Figure 5.** Three-dimensional transthoracic echocardiography at one-month follow up, showing normal functionality of the newly implanted valve. Notably, the valve-in-valve stent frame (acting as a covered stent) protrudes into the left ventricular outflow tract (LVOT). As a result, there is a dynamic change in the area of the LVOT during the cardiac cycle. Multiplanar reconstruction shows the area ranging from 1.92 cm<sup>2</sup> in diastole to 0.71 cm<sup>2</sup> in end-systole, while the mean transaortic gradient is estimated at 13 mmHg.