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IMAGES IN INTERVENTION

Transcatheter Aortic and Mitral Valve Replacement and Closure of Mitral Ring Perivalvular Leaks

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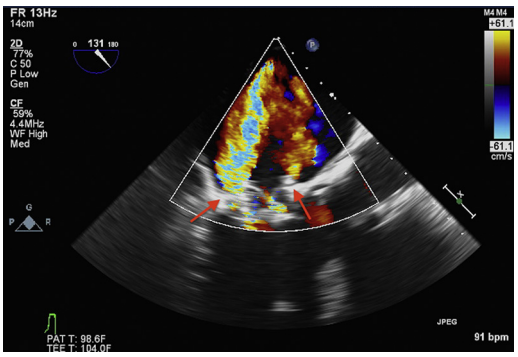
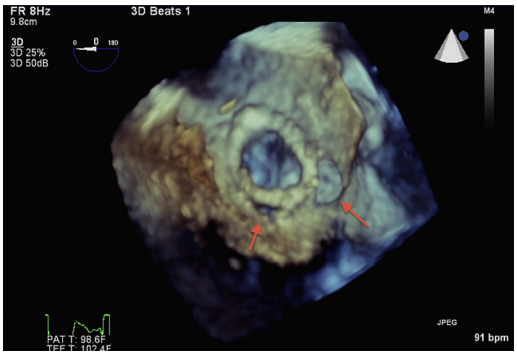
A 55-year-old man with a history of aortic valve (AV) replacement (27-mm Carpentier-Edwards Magna Bovine pericardial bioprosthesis), mitral valve (MV) repair (32-mm PhysioRing and edge-to-edge repair), and coronary artery bypass grafting 8 years before, presented with signs of congestive heart failure consisting of severe ascites, scrotal edema, and lower extremity edema. Consequently, a transesophageal echocardiogram was performed and demonstrated severe left ventricular systolic dysfunction with a left ventricular ejection fraction of 20% to 25%, a prosthetic AV with severe aortic stenosis, severe central, and perivalvular MV regurgitation (Figure 1). Three small MV perivalvular holes were identified around the partially dehisced MV physio ring (Figure 2). The patient subsequently developed a community-acquired pneumonia; his heart failure status further deteriorated. He eventually developed cardiorenal syndrome and ultimately required ultrafiltration. Due to these events, his procedural Society or Thoracic Surgeons mortality risk with open heart surgery increased to almost 30%; therefore, the heart team recommended a transcatheter in-valve AV replacement, a transcatheter in-ring MV replacement, and plugging of the MV ring perivalvular erosions.

FIGURE 1 Mitral Regurgitation With Perivalvular Holes



Two-dimensional echocardiogram demonstrating severe mitral regurgitation arising from the perivalvular holes **(red arrows)**.

FIGURE 2 Perivalvular Holes Around the Mitral Valve



Three-dimensional transesophageal echocardiogram demonstrating perivalvular holes around the partially dehisced mitral valve ring **(red arrows)**.

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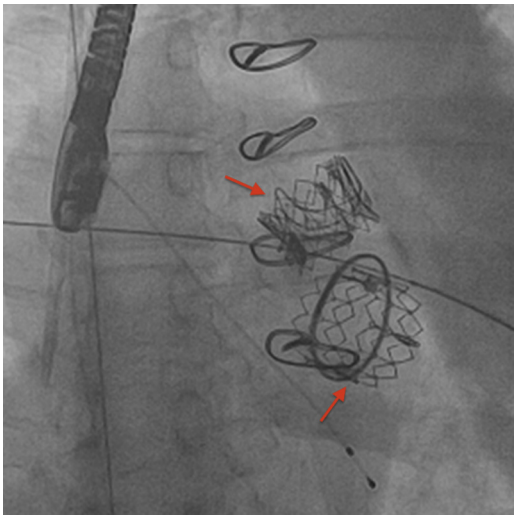
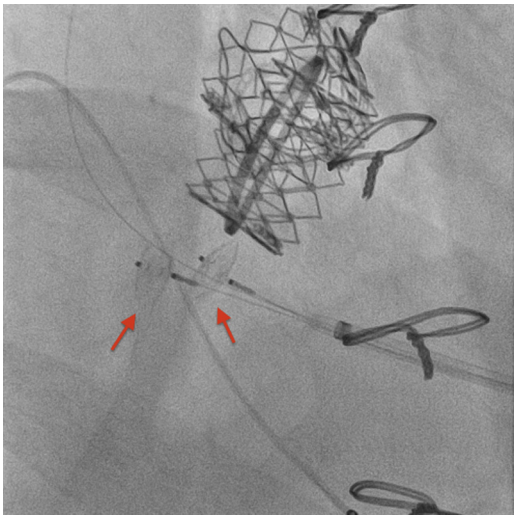
FIGURE 3 Deployed Aortic and Mitral Valves



Angiogram demonstrating the deployed 29 Sapien XT valves in the aortic valve position **(top red arrow)**, and within the old mitral valve ring **(bottom red arrow)**.

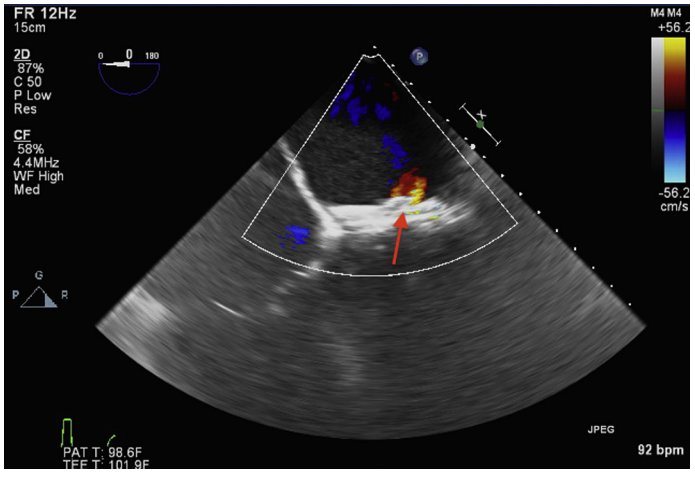
FIGURE 5 Plugged Mitral Perivalvular Holes



Angiogram demonstrating the simultaneous deployment of 2 Amplatzer ductus occluders devices **(red arrows)**.

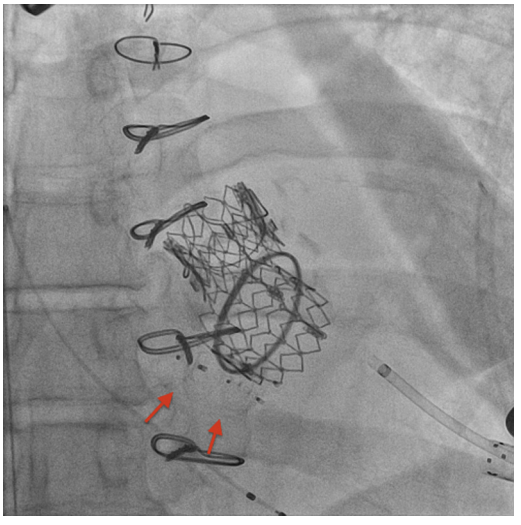
After informed consent was obtained, the patient was brought to the hybrid room and was prepped and draped in standard sterile manner. Briefly, the right common femoral vein was accessed for placement of a temporary pacemaker in the right ventricular apex. A 6-cm left anterior minithoracotomy was performed and the apex of the heart was identified under echocardiographic guidance. Pledgeted, nonabsorbable, 2-0 braided purse string sutures were placed in a selected position in the left ventricular apex. A short 6-F sheath was introduced through the apex. A J wire was advanced through this sheath and into the descending thoracic aorta, traversing through the bioprosthetic AV, ascending aorta, and arch. The J wire was then exchanged over a 6-F Judkins Right

FIGURE 4 Plugged Mitral Perivalvular Holes



Two-dimensional echocardiogram demonstrating trace mitral regurgitation arising from the perivalvular holes now plugged with Amplatzer ductus occluders **(red arrow)**.

FIGURE 6 Plugged Mitral Perivalvular Holes



Angiogram demonstrating the deployed Amplatzer ductus occluders **(red arrows)**.

catheter for an Amplatz stiff wire. The Edwards Lifesciences Ascendra AVR dilator and sheath were introduced 4 cm into the heart over the Amplatz stiff wire. The dilator was then removed. A number 29 SAPIEN XT valve was introduced. With rapid ventricular pacing and under fluoroscopic guidance, the 29 SAPIEN XT was deployed over the existing AV bioprosthesis. Post-procedure transesophageal echocardiogram demonstrated normal pressure gradients, and no evidence AV perivalvular insufficiency.

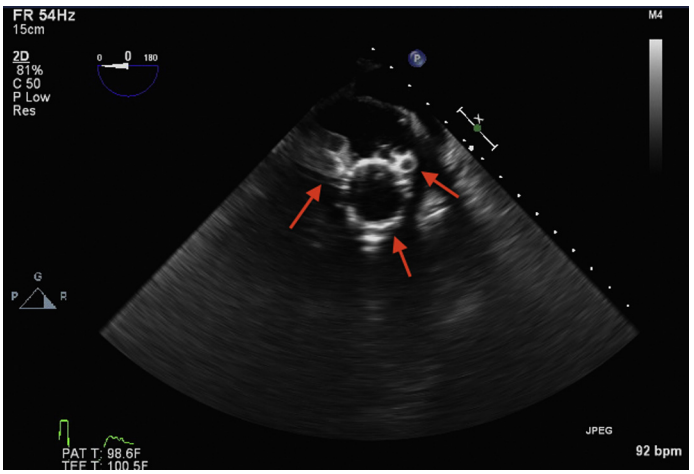
Subsequently, a JR4 catheter was reintroduced over the stiff Amplatz wire, which was then removed. The JR4 catheter was directed toward the MV apparatus. A glide angled tip stiff 0.035 wire was introduced through the JR4 catheter and carefully manipulated through the MV ring and into the right pulmonary vein. The wire was then exchanged over the JR4 catheter for a 0.035 Amplatz stiff wire. A number 29 SAPIEN XT valve was introduced within the MV ring with 20% extending into the left atrium. Under rapid ventricular pacing, it was deployed successfully under fluoroscopy (**Figure 3**). Post-procedure transesophageal echocardiogram demonstrated normal pressure gradients, and no central MV regurgitation. There was, however, evidence of 3+ perivalvular MV insufficiency around the dehisced MV ring.

A 5-F angled tip glide catheter and glidewire were manipulated through one of the perivalvular orifices under 3-dimensional echocardiographic image guidance. Once the wire was through a 1 × 1.8-cm orifice, we exchanged our glidewire for the Amplatz stiff wire and introduced an 8-F transeptal Amplatzer torque view 45° sheath. Subsequently, we deployed a 10-mm Muscular ventral septal defect septal occluder. Post-procedure transesophageal echocardiogram demonstrated proper occlusion of that orifice. Using similar technique, 2 Amplazter Ductus Occluders, 6 × 4 mm and 5 × 4 mm, were advanced simultaneously and successfully deployed in the remaining orifice. Post-procedure transesophageal echocardiogram demonstrated only trace MV perivalvular regurgitation (**Figures 4 to 6**).

A transthoracic echocardiogram performed 14 weeks after the procedure demonstrated an ejection fraction of 40% to 45%, trace perivalvular AV regurgitation, mild to moderate perivalvular mitral regurgitation, and mild pulmonary hypertension (**Figure 7**). Three months into recovery, the patient was back home and had completed cardiac rehabilitation. During his most recent clinical evaluation, he relayed New York Heart Association functional class 1 symptoms.

A review of the literature uncovered several other case reports with the use of Amplatzer Ductal Occluders and Amplatzer Muscular VSD Occluders for addressing transcatheter perivalvular leaks (1,2). However, to the best of our knowledge, this is the first reported case of these devices being used simultaneously with transcatheter in-valve AV replacement and transcatheter in-ring MV replacement.

FIGURE 7 Plugged Mitral Perivalvular Holes



Two-dimensional echocardiogram demonstrating the mitral valve perivalvular holes now plugged with Amplatzer ductus occluders **(top red arrows)**, and the 29 Sapien XT valve deployed within the mitral valve ring **(bottom red arrow)**.

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KEY WORDS mitral valve perivalvular leaks, transcatheter aortic valve replacement, transcatheter mitral valve replacement