Cardiac Imaging

Transcatheter Valve-In-Valve Implantation for a Degenerated Mitral Valve Bioprosthesis under Echocardiographic Guidance

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Over 70,000 surgical mitral valve replacements have been performed over the past 10 years in the USA. In an aging population, a growing number of patients are requiring redo surgery. In-hospital mortality for patients older than 75 years is estimated at 15%, with a 3-year mortality close to 40%.[1] While transcatheter aortic valve replacement (TAVR) is now established as the standard of care for high-risk elderly patients with severe aortic stenosis, there are limited data on the use of transcatheter technology for mitral valve replacement.[2] The first successful transcatheter mitral valve-in-valve (MVIV) implantation was performed in 2009.[3] Several centers have reported case series of patients undergoing MVIV with favorable results.[4] Transcatheter valve deployment in this setting may be challenging, as certain stented surgical bioprosthetics lack the radio-opaque markers necessary to guide placement under fluoroscopy.[5]

Three-dimensional (3D) echocardiography offers better delineation of the mitral valve components,[6] and is increasingly being used for visualization and deployment of transcatheter devices.[7] Here we describe the case of a high-risk patient with severe stenosis of an older generation Mosaic bioprosthesis in the mitral position, who underwent MVIV under echocardiographic guidance alone, as the position of the annulus could not be ascertained by fluoroscopy.

Case

A 68-year-old woman with severe mitral stenosis presented with worsening dyspnea on minimal exertion, leg swelling and orthopnea over the past 6 months. She had undergone multiple procedures in the past; including a mitral valve commissurotomy and two mitral valve replacements. She last received a stented surgical Medtronic Mosaic valve (Figure 1). The Mosaic valve's stent and frame are radiolucent, with opaque markers only at the stent apices, precluding their use for fluoroscopic guidance and deployment of a transcatheter heart valve. A 3D transesophageal echocardiogram revealed a severely stenotic bioprosthetic mitral valve, with minimal movement of the valve leaflets (Figures 2A & 2B). The calculated valve area was 0.6 cm^2, and the mean transvalvular peak gradient 14 mmHg (Figure 3A). She was deemed high-risk for surgery and subsequently underwent transcatheter valve-in-valve implantation of an Edwards Sapien bioprosthetic valve, via the transapical approach under echocardiographic guidance alone (Figures 4A & B). The sur-

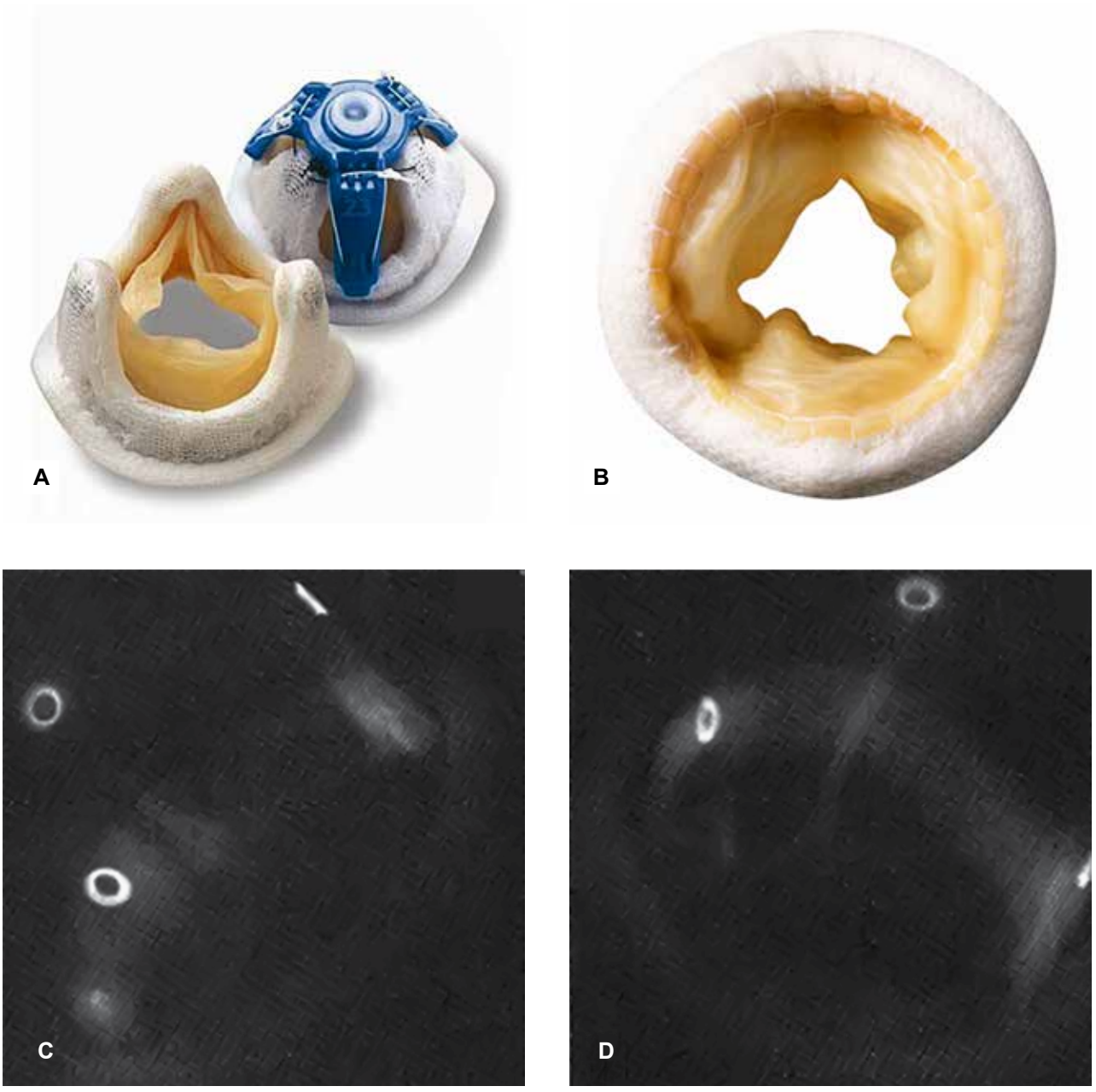

Figure 1. Mosaic bioprosthetic valve visualized under fluoroscopy. A, B: Medtronic Mosaic bioprosthetic valve photographs. C: posterior-anterior radiograph. D: lateral radiograph depicting radiopaque rings marking the tips of the stent. Note the absence of a radio-opaque ring.

geon's view of the bioprosthesis by transesophageal 3D echocardiogram showed mobile leaflets (Figures 2C & 2D) and a significantly decreased mean peak gradient of 2 mmHg (Figure 3B). The patient did well, with no complications, and was discharged on postoperative day 5. This case illustrates the critical role of echocardiography in successful guidance for the delivery of current transcatheter technology, especially in cases where fluoroscopic imaging is inadequate.

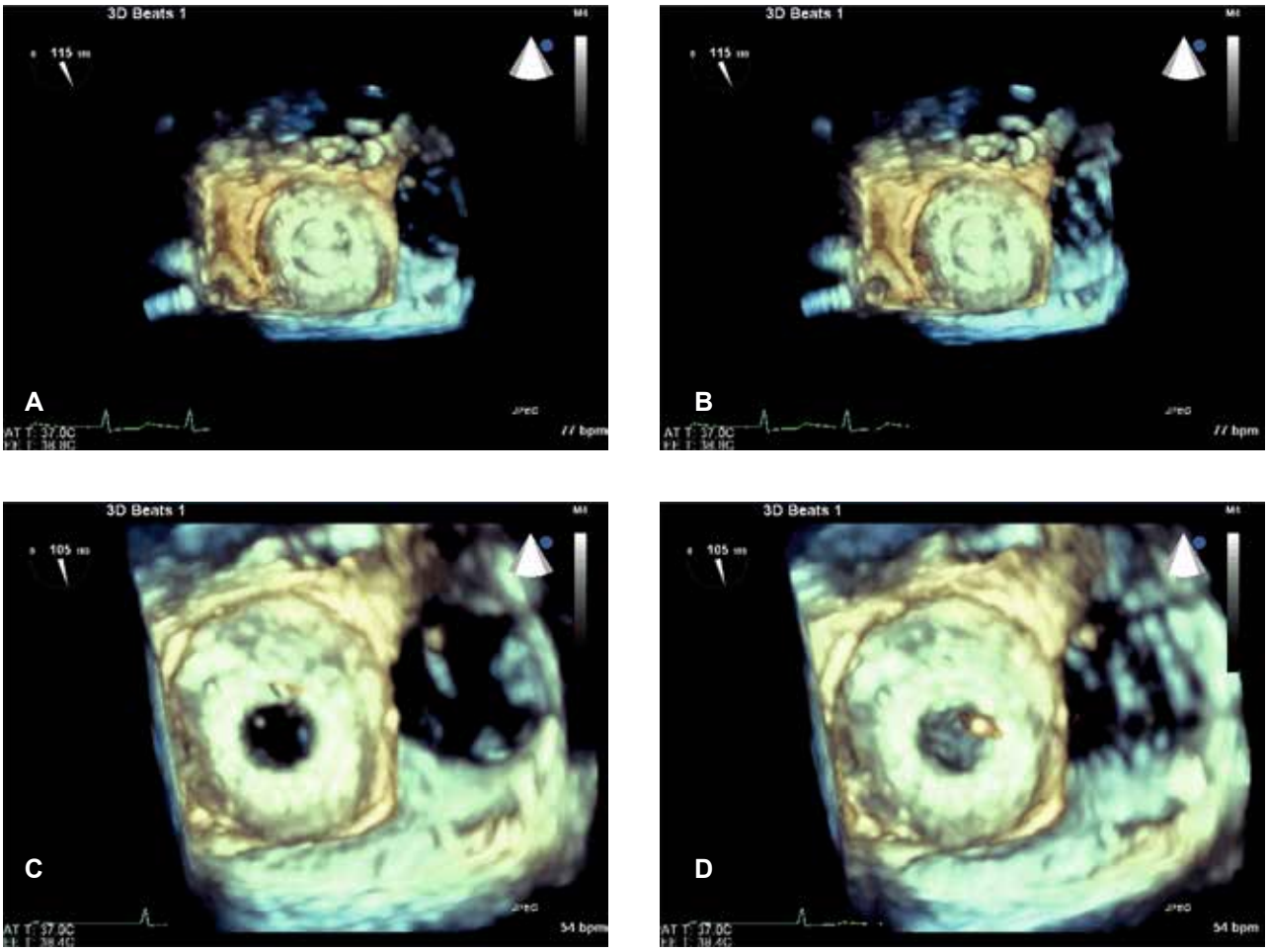

Figure 2. Transesophageal surgical view of the mitral bioprosthetic valve. 3D transesophageal surgical view "*en face*", showing the severely stenotic mitral bioprosthetic in panels A, during diastole, and B, during systole. Note the severe stenosis and minimal movement of leaflets. Panels C and D show the same view following transcatheter valve implantation. Note the improved mobility of the leaflets.

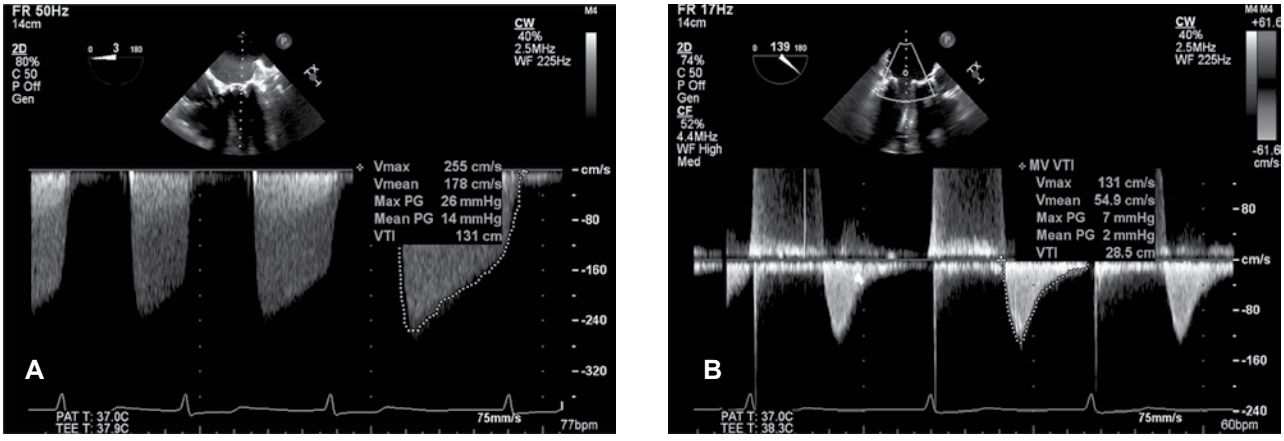

Figure 3. Continuous wave Doppler during transesophageal echocardiography. Peak gradient (PG) and mean gradient (MG) before (Panel A) and after (Panel B) transcatheter mitral valve-in-valve procedure.

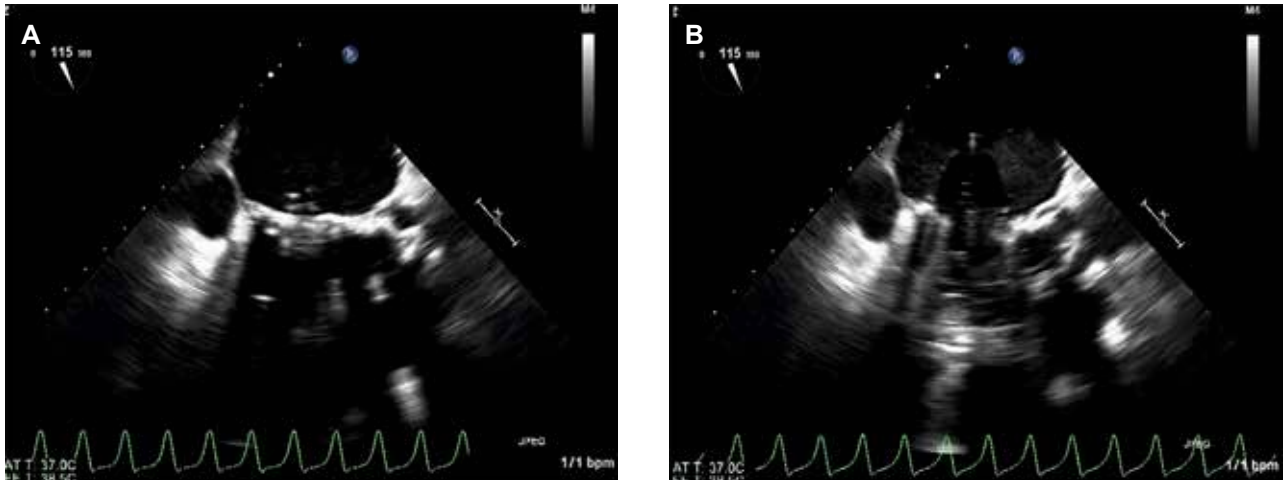

Figure 4. Deployment of the Edwards Sapien valve in the mitral position under echocardiographic guidance.

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