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IMAGES IN INTERVENTION

Multimodality Imaging of Bioprosthetic Percutaneous Balloon Valvuloplasty Followed by Valve-in-Valve Implantation for Mitral Stenosis Due to Commissural Leaflet Fusion

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A 77-year-old woman with a history of failed mitral valve (MV) repair with severe symptomatic mitral regurgitation underwent MV replacement with a 25-mm Carpentier-Edwards PERIMOUNT Magna bovine bioprosthesis (Edwards Lifesciences, Irvine, California) with resolution of symptoms.

After 6 months, she developed progressive dyspnea on exertion. A 2-dimensional (2D) and 3-dimensional (3D) transesophageal echocardiogram (TEE) demonstrated severe prosthetic MV stenosis due to commissural fusion (MV area by 3D TEE planimetry 0.6 cm^2) and no mitral regurgitation (**Figures 1A and 1B**; Online Video 1A).

Given the expected high morbidity and mortality of a third valve surgery, she underwent percutaneous balloon valvuloplasty (PBV) of her mitral bioprosthesis under fluoroscopic and TEE guidance, as catheter-based valve-in-valve (ViV) replacement was not yet available. After 2 inflations of a 26-mm Inoue balloon system (Toray, Tokyo, Japan) (**Figures 1C and 1D**, Online Videos 1C and 1D), the mean diastolic MV pressure gradient decreased from 16 to 6 mm Hg at a heart rate of 60 beats/min with wider commissural separation of prosthetic leaflets. MV area increased from 0.6 to 1.5 cm^2 with no mitral regurgitation (**Figures 1E and 1F**, Online Video 1E).

Two years later, she redeveloped severe exertional dyspnea. 2D and 3D TEE demonstrated recurrent bioprosthetic mitral stenosis with commissural fusion (**Figures 2A and 2B**, Online Video 2AB). She then underwent a successful ViV procedure using a 26-mm Sapien XT transcatheter valve (Edwards Lifesciences) via transapical approach (**Figures 2C to 2F**, Online Videos 2C, 2D, and 2EF) with resolution of symptoms.

Although PBV is the treatment of choice for native MV stenosis due to commissural fusion, reports of valvuloplasty for bioprosthetic MV stenosis are rare and there is equipoise toward its efficacy and safety (1-3). Ours appears to be the first reported case performed using both 3D TEE guidance and fluoroscopy. This case demonstrates the utility of PBV for prosthetic stenosis due to leaflet fusion, perhaps as an option for temporary palliation of symptoms in patients with a high surgical risk or those awaiting a more definitive treatment such as transcatheter ViV implantation (4).

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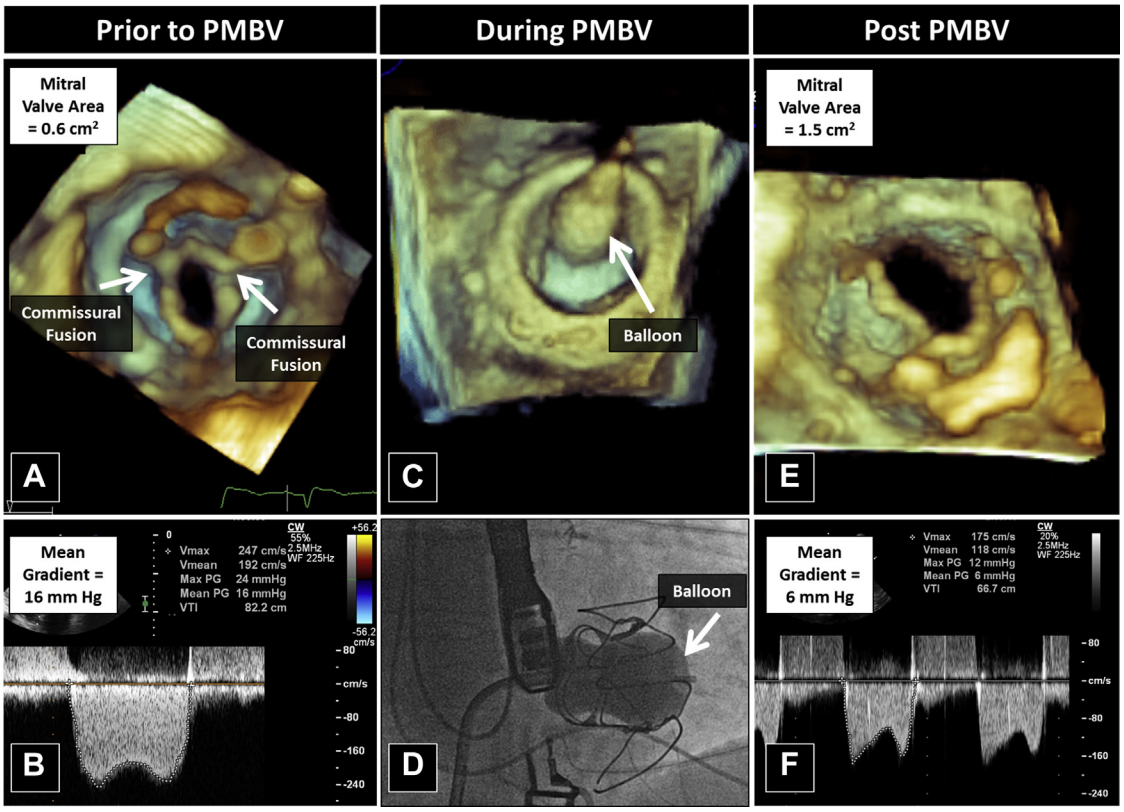
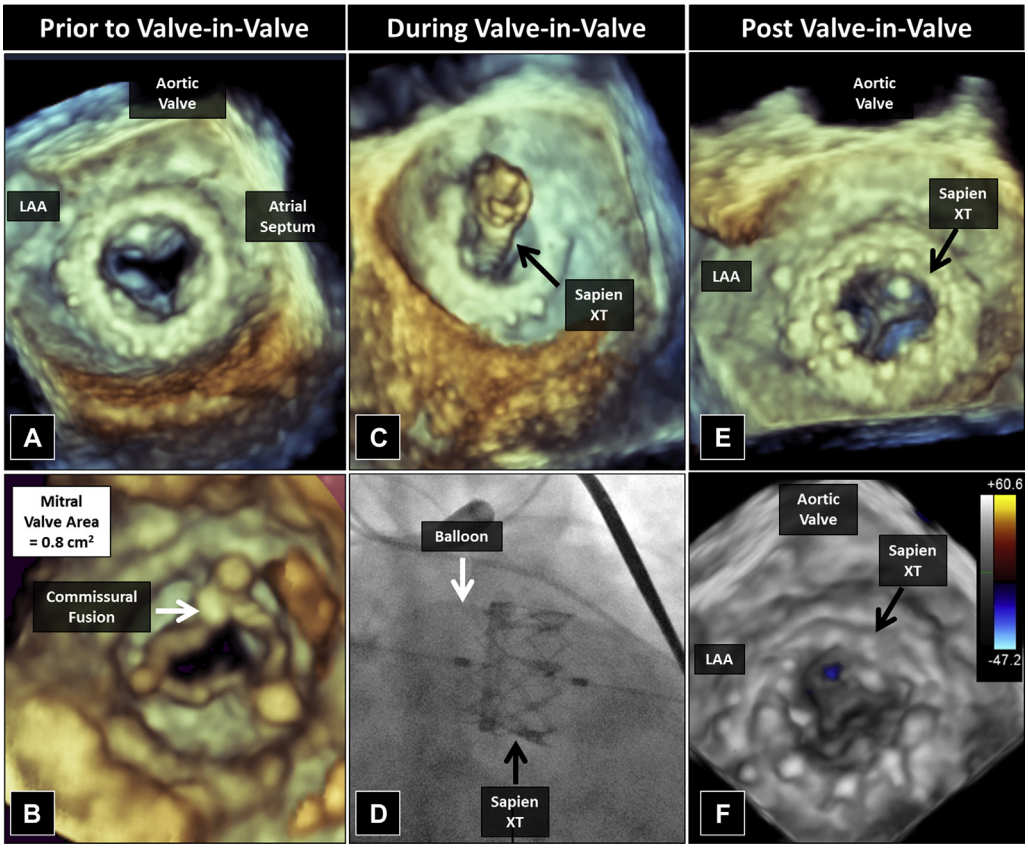
FIGURE 1 Percutaneous Balloon Valvuloplasty of a Stenosed Mitral Bioprosthesis



At baseline, 3-dimensional (3D) transesophageal echocardiogram (TEE) of mitral bioprosthesis from the left ventricular perspective demonstrates commissural leaflet fusion leading to prosthetic stenosis (**A,** Online Video 1A), with an elevated transmitral Doppler gradient **(B)**. The stenosis was initially treated with percutaneous balloon valvuloplasty using a 26-mm Inoue balloon system as visualized by 3D TEE (**C**, Online Video 1C) and cine fluoroscopy (**D**, Online Video 1D). Post-valvuloplasty, 3D TEE of mitral bioprosthesis from the left ventricular perspective demonstrates an increase in mitral valve area from 0.6 to 1.5 cm^2 (**E**, Online Video 1E) and a marked improvement in mitral valve gradient from 16 to 6 mm Hg **(F)**. PMBV = percutaneous mitral balloon valvuloplasty.

FIGURE 2 **Valve-in-Valve Procedure to Treat Mitral Bioprosthetic Restenosis**



Two years post-valvuloplasty, 3D TEE demonstrates restenosis of the mitral bioprosthesis from the **(A)** left atrial and **(B)** left ventricular perspective with a valve area of 0.7 cm^2 (Online Video 2AB). Restenosis was treated with valve-in-valve procedure using a 26-mm Sapien XT prosthesis. Deployment is seen on 3D TEE from the left atrial perspective (**C**, Online Video 2C) and cine fluoroscopy (**D**, Online Video 2D). Fully deployed Sapien XT is seen from the left atrial perspective on 3D TEE **(E)** and demonstrates no mitral regurgitation on color Doppler (**F**, Online Video 2EF). LAA = left atrial appendage.

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KEY WORDS 3D transesophageal echocardiography, mitral valve, percutaneous balloon valvuloplasty, prosthetic valve stenosis, valve-in-valve

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