

## Asia's First Transapical Transcatheter Mitral Valve-in-Ring Implantation

### Dear Editor,

More elderly patients are returning for cardiac reoperations as a result of improved healthcare and longevity in Singapore. We report a mitral valve re-intervention using a novel minimally invasive approach via the apex of the left ventricle.

### Case Report

A frail 75-year-old lady with severe mitral regurgitation and pulmonary hypertension (124 mmHg pulmonary artery systolic pressure) presented with heart failure 9-years post-coronary bypass and mitral annuloplasty performed for functional mitral regurgitation. Her left ventricular ejection fraction was 45%. She has hypertension, hyperlipidaemia and had recovered from a stroke over 20 years ago. She was homebound due to her symptoms, her mammary artery

and vein grafts were patent, and she was deemed high risk for conventional surgical reoperation (13.1% EuroSCORE II surgical mortality risk) by 2 surgeons.

Cardiac-gated contrast-enhanced computed tomography (CT) was used to: a) assess the area and perimeter within the complete 26 mm physio mitral annuloplasty prosthetic ring, and b) to simulate the implantation of a 23 mm SAPIEN-XT valve (Figs. 1A-B). The area within the mitral ring was measured to be 328 mm<sup>2</sup>. The area of a fully deployed 23 mm SAPIEN-XT is 415 mm<sup>2</sup>, thereby satisfactorily oversizing (26%) for this patient's prosthetic mitral ring. The simulation predicted negligible left ventricular outflow tract (LVOT) obstruction, and the patient was offered the transcatheter approach having obtained informed consent.

The transapical mitral valve-in-ring (TAMViR) implantation of the balloon-expandable SAPIEN-XT

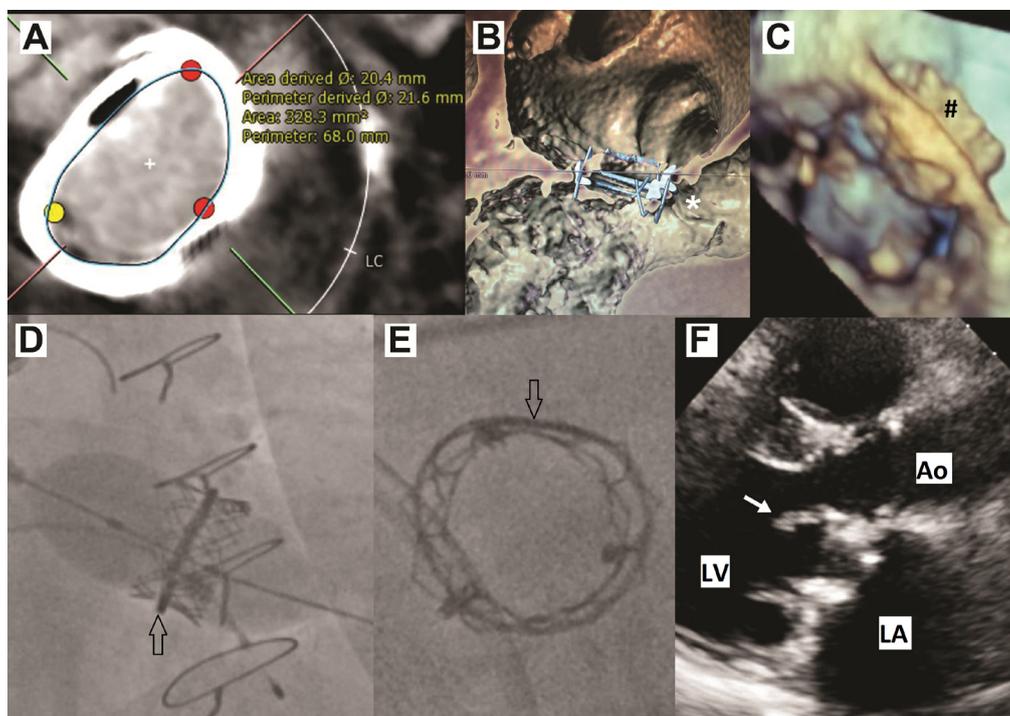


Fig. 1. Computed tomography (CT) sizing in A: "+" denotes dimensions measured within the metallic mitral annuloplasty ring. B shows CT-simulation of 23 mm SAPIEN-XT implantation ("\*" denotes the aortic valve). C shows 3D echocardiographic, with "#" denoting implanted 23 mm SAPIEN-XT. Fluoroscopic images (D-E): open arrow identifies the physio ring of the SAPIEN-XT within the mitral prosthetic ring. The widely patent left ventricular outflow tract during systole is seen on echocardiography. In F: arrow points to the mobile tip of the anterior mitral leaflet. Ao: Aorta; LV: Left ventricle; LA: Left atrium.

transcatheter bioprosthesis was performed via a left anterior mini-thoracotomy in a hybrid operating room. The radio-opaque mitral ring marks the target landing zone for the transcatheter valve without the need for ionic contrast agent. The SAPIEN-XT valve was implanted approximately 40% atrial to the mitral prosthetic ring, to ensure adequate sealing from major intervalvular leak. More importantly “waisting” and ventricular flaring of the circular SAPIEN-XT (Figs. 1C-E) is evident, in order to resist the systolic migration of transcatheter valve. The native anterior mitral leaflet (arrow) extends beyond the ventricular aspect of the SAPIEN valve frame (Fig. 1F), but did not cause LVOT obstruction post-implantation.

The procedure was uneventful and she was discharged home 4-days post-intervention. She remains well in New York Heart Association functional class I with 10 mmHg mean transmitral gradient 18-months post-implant. There is mild intervalvular regurgitation (between the SAPIEN frame and prosthetic mitral ring), but Figure 1E shows a nearly circular deployed SAPIEN-XT prosthesis.

## Discussion

The TAMViR procedure is similar to the previously described transapical transcatheter mitral valve-in-valve implantation technique.<sup>1-4</sup> It is performed through a small left submammary incision on the beating heart. It remains the most direct route to the mitral valve compared to the transeptal approach, with excellent coaxiality achieved (ability to align the transcatheter valve with the target mitral annular ring).<sup>5</sup> The short distance of the mitral valve to the cardiac apex also permits experienced operators to “adjust” the transcatheter valve position during deployment.

Patients with mitral ring annuloplasty and preserved native anterior mitral leaflet however may succumb to acute LVOT obstruction due to: a) long anterior mitral leaflet, b) narrow aorto-mitral annular planes, and/or c) restricted native LVOT. The SAPIEN-XT valve frame splints the basal segment of the native anterior mitral valve leaflet toward the LVOT, whilst its leaflet tip remains mobile (Fig. 1F). The trans-esophageal echocardiographic image (Fig. 1F) corresponds with the CT-simulated image of an implanted 23 mm SAPIEN-XT valve (Fig. 1B).

This case reports Asia’s first successful TAMViR using the Edwards SAPIEN-XT balloon expandable valve. This novel minimal access approach may benefit high risk patients with failed mitral valve repair, if deemed of prohibitive risk for conventional reoperation.

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