

Transesophageal Echocardiography to Help Position and Deploy a Transcatheter Heart Valve

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TRANSCATHETER AORTIC VALVE IMPLANTATION (TAVI) IS A CLINICALLY ACCEPTED PRACTICE IN EUROPE for patients with high or prohibitive surgical risk and is undergoing clinical investigation in the U.S. and Canada. Some investigators have utilized transesophageal echocardiography (TEE) to select transcatheter heart valve (THV) size, monitor the procedure, and identify complications (1,2). The use of TEE to position and deploy the THV has been limited by the ability to image the THV within the calcium shadowing of the native aortic valve, and the ability to differentiate the THV from the balloon on which it is mounted. In this iPIX, we show the use of 2- and 3-dimensional TEE to aid in the positioning and deployment of THV. If the appropriate technique is used, TEE can be an important adjunct to fluoroscopy and, therefore, improve the safety and efficacy of the TAVI procedure.

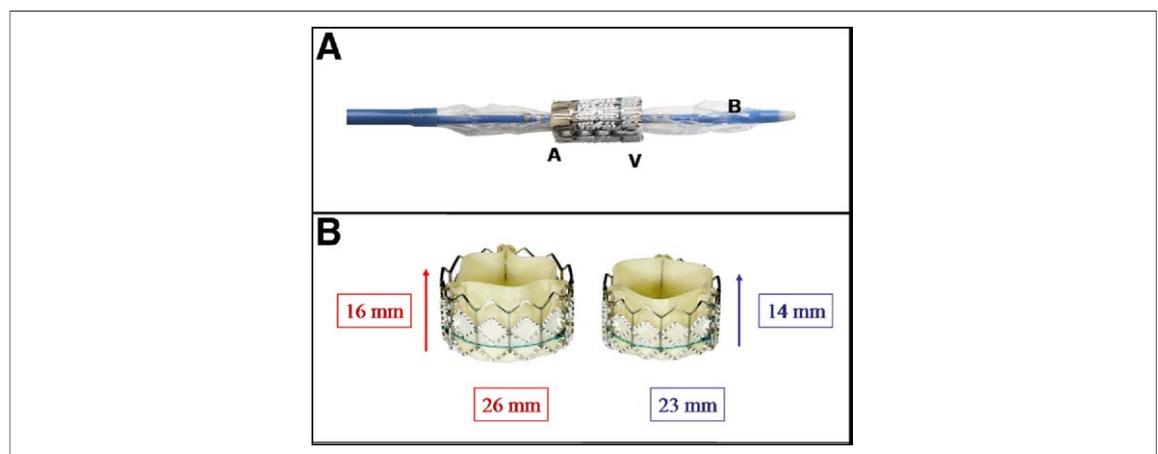


Figure 1. The 23- and 26-mm Edwards Sapien THVs

The Edwards Sapien (Irvine, California) transcatheter heart valve (THV) is a stent valve that can be crimped on a balloon catheter (A) and deployed to a 23- or 26-mm final diameter (B). In order to assist the placement of the THV by transesophageal echocardiography, the ventricular and aortic end of the stent frame must be differentiated from the balloon that it is mounted. A = aortic end; B = balloon catheter; V = ventricular end.

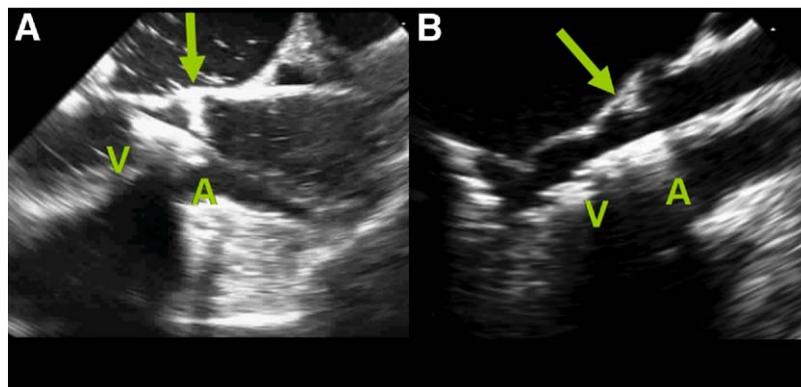


Figure 2. Coaxiality of THV Within Left Ventricular Outflow Tract

The first step for transesophageal echocardiography guidance after the echogenic ends of the THV are identified in the 110° to 140° longitudinal view is to determine the coaxial alignment of the THV within the left ventricular outflow tract. If the THV is not coaxial (A), then feedback is given to the operator who can then manipulate the delivery catheter (often with a counter-clockwise rotation of the delivery catheter) and guidewire to improve coaxial alignment (B) (arrow = aortic valve leaflet insertion). Abbreviations as in Figure 1.

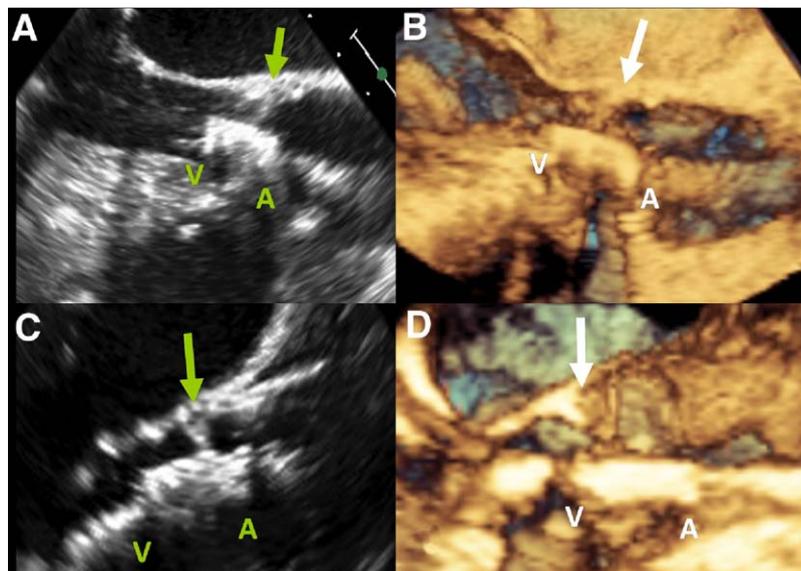


Figure 3. THV Not Aligned With Aortic Valve Leaflet Tips

The next step is to align the aortic end of the THV with the tips of the native aortic valve leaflets (arrow). Use of 2- and 3-dimensional transesophageal echocardiography depict that the 23-mm (A,B) and 26-mm (C,D) THV are almost one-half a stent length too aortic in relation to the tip of the aortic leaflets. In D, the THV is so aortic that the ventricular end is aligned with the aortic leaflets. Abbreviations as in Figure 1.

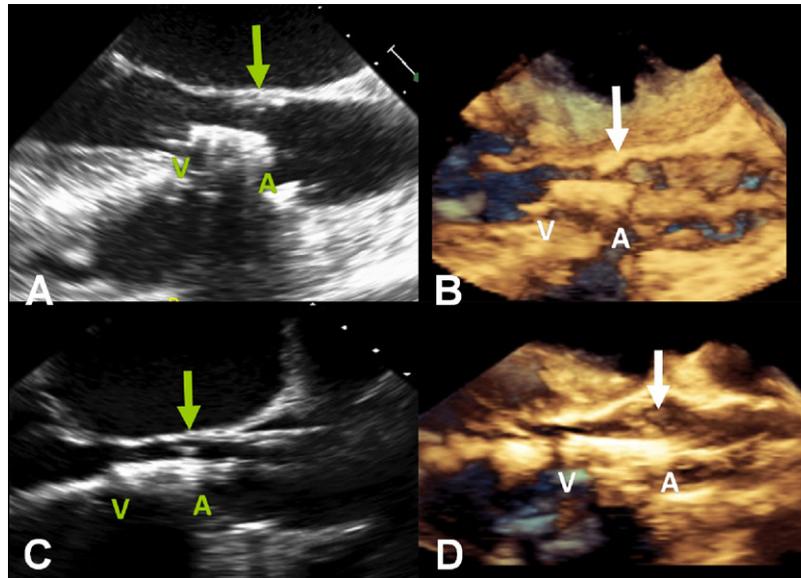


Figure 4. THV Perfectly Aligned With Aortic Valve Leaflet Tips

After giving the operator feedback, adjustments were made to move the THV more ventricular while maintaining coaxiality for a perfect pre-deployment position. As depicted by the 2- and 3-dimensional transesophageal echocardiography images, the 23-mm (A,B) and 26-mm (C,D) THV are ready for deployment during rapid ventricular pacing (arrow = aortic leaflet tips). Abbreviations as in Figure 1.

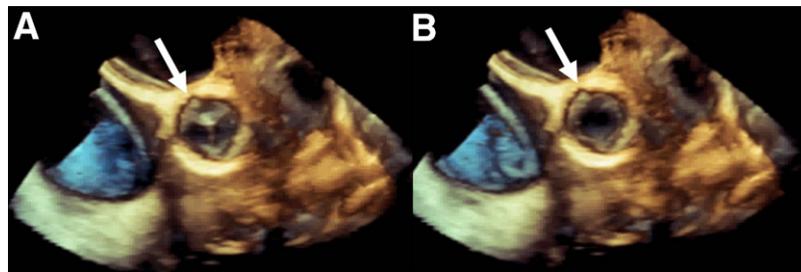


Figure 5. Short-Axis View of Successfully Deployed THV

After deployment, the 3-dimensional transesophageal echocardiography short-axis view of the THV shows a successful outcome with normal valve function (A = diastole, B = systole). We believe that the close collaboration between the operator and echocardiographer is paramount for a successful transcatheter aortic valve implantation program. Abbreviation as in Figure 1.

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