Transapical Approach for TAVR: Keep It in the Quiver

J. James Edelman, MBBS (Hons), PhD, Hiroto Kitahara, MD, and Vinod H. Thourani, MD

Pasala et al describe the case of a 92-year-old with aortic stenosis and challenging access options for transcatheter aortic valve replacement (TAVR).[1] A right anterior thoracotomy was performed in the second intercostal space to expose the aorta, which was used for TAVR access. The procedure was complicated by rupture of the deployment balloon and fracture of the distal part of the delivery sheath catheter; these could not be retrieved retrogradely through the primary access despite upsizing of the sheath to 26F. The patient was established on cardiopulmonary bypass (CPB) and the apex cannulated via a small left thoracotomy. A wire was snared from the apex allowing retrieval of the distal part of the delivery system with balloon. The team at Hackensack Medical Center is to be congratulated for getting the patient out of hospital alive after this complication. This case highlights a number of important TAVR issues.

Procedure and access planning with a thorough preoperative evaluation utilizing a multidetector computed tomography (MDCT) imaging of the heart, aorta, and its major branches in the neck, pelvis, and lower limbs are essential. Good planning and understanding of access alternatives become especially relevant if there is an unforeseen complication. Our preference for alternative access if the iliofemoral arterial system is unavailable now is the right femoral vein using the transcaval technique. If that is unavailable secondary to severe calcification of the infrarenal aorta, then carotid or subclavian (whichever is the largest caliber and least diseased) is our access of choice. Transaortic or transapical (depending on the degree of aortic calcification, positioning of the heart and pulmonary function) access is now our last choice for TAVR implantation.

Transcaval access requires expertise in the preoperative planning, then specifically in the execution of the inferior vena cava to abdominal aorta crossing and device closure with the patent ductus arteriosus closure device. Overall, this procedure is associated with very good results with no mortality in a series of 100 high-risk TAVR patients and a low rate of aortocaval fistula.[2,3] Carotid access is safe, with a low combined rate of stroke and TIA (1.6%)[4]; the artery is often larger and less friable than the subclavian/axillary. The subclavian/axillary artery access is well tolerated but has been associated with a higher rate of stroke than transapical or transaortic approach in a propensity-matched cohort of the STS/ACC Transcatheter Valve Therapies (TVT) Registry.[5] Interestingly, transapical access had similar mortality to the transaortic approach for all except the highest risk cohorts, where the mortality for transapical access was lower.[6] The major downsides for both the transaortic and transapical remain the need for violation of the intrathoracic cavity, which requires chest tubes and either an upper median sternotomy or left mini-thoracotomy.

Balloon rupture during aortic valvuloplasty is not uncommon and is associated with a risk of vascular injury during balloon retrieval, even with a large access sheath in TAVR.[7,8] In the current study, the authors were unable to retrieve the balloon and distal tip of the delivery system through a large sheath. Once the patient was on CPB, an alternative would have been removing the whole system (sheath, catheter, and balloon) during a very brief period of low flow or circulatory arrest. This approach, however, would risk aortic injury as the balloon expands during retrograde

J. James Edelman MBBS (Hons), PhD.

Central Message

Thorough preoperative planning and a multidisciplinary team are the best way to prevent and manage complications during TAVR.

Department of Cardiac Surgery, MedStar Heart and Vascular Institute, Georgetown University School of Medicine, Washington, District of Columbia

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Address reprint requests to Vinod H. Thourani, MD, Department of Cardiac Surgery, MedStar Health/Georgetown University, 110 Irving Street, Suite 6D15G, Washington, DC 20010. E-mail: vinod.h.thourani@medstar.net
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withdrawal; the authors' approach through the apex with antegrade withdrawal (which "flattens" the balloon to a minimal profile) is more elegant. The use of a short period of CPB is well tolerated even in the very elderly, allows easier control of the friable LV apex, but requires full heparinization.[9,10]

Involvement of a multidisciplinary heart team in TAVR planning and the procedure is the standard of care and in no case is this more important than a high-risk patient with challenging vascular access. An MDCT imaging specialist is essential for procedure planning. Surgeons should be actively involved in all TAVR procedures and be trained in percutaneous access, wire skills, surgical approaches for alternative access, and surgical management of the left ventricular apex. Active surgical involvement in the "routine" lower risk case improves collaboration with the interventional cardiologist when a hybrid solution, such as in the case presented, is required.

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