Transjugular Approach in Valve-in-Valve Transcatheter Mitral Valve Replacement: Direct Route to the Valve
Tsuyoshi Kaneko, MD, JaBaris D. Swain, MD, Dan Loberman, MD, Frederick G. P. Welt, MD, Michael J. Davidson, MD, and Andrew C. Eisenhauer, MD
Division of Cardiac Surgery, Department of Surgery, Brigham and Women’s Hospital-Harvard Medical School; and Division of Cardiovascular Medicine, Brigham and Women’s Hospital-Harvard Medical School, Boston, Massachusetts

With the recent emergence of transcatheter valve replacement, high-risk cases of structural valve deterioration after mitral bioprosthesis can be treated with valve-in-valve transcatheter mitral valve replacement (TMVR). The transapical approach has become the principal access for TMVR, but we report an alternative direct access for TMVR—transjugular transseptal route—in an 81-year-old woman with a degenerated mitral bioprosthesis.


Valve-in-valve (VIV) transcatheter technique inserts transcatheter valve inside a deteriorated bioprosthetic valve. The risk of reoperation and these patient’s more advanced age has made this new technique appealing to patients with structural valve deterioration [1–6]. Various methods have been used to access the mitral valve such as transapical, transfemoral and transjugular approaches [3, 4, 6]. We report our VIV transcatheter mitral valve replacement (TMVR) using the transjugular approach.

An 81-year-old woman who had mitral valve replacement with a 29-mm Mosaic bioprosthesis (Medtronic, Minneapolis, MN), aortic valve replacement, and coronary artery bypass 8 years previously was admitted because of pulmonary edema associated with mitral stenosis from structural valve deterioration. Her initial operation was complicated by extensive mitral annular calcification and a prolonged and complex postoperative course that included atrioventricular block and implantation of a permanent pacemaker. Her comorbidities included hypertension, diabetes, dyslipidemia, chronic renal insufficiency (glomerular filtration rate <35 ml/min), and previous stroke. She was also morbidly obese with a body mass index of 39.7. Her calculated logistic EUROSCORE was 26.1%, and the Society of Thoracic Surgeons calculated risk of mortality was 19.2%. A transesophageal echocardiogram showed a left ventricular ejection fraction of 45% and demonstrated severe mitral stenosis with mean gradient of 12 mm Hg. Two of the leaflets were calcified and immobile.

Because of her medical comorbidities and body habitus, she was believed to be at unacceptable risk for reoperative surgical mitral valve replacement, and VIV-TMVR was planned after discussion with the interdisciplinary heart team. The usual transapical approach was considered dangerous because of her body habitus and poor left ventricular function. A transjugular transseptal approach was chosen to pass the delivery sheath into the mitral orifice to prevent hang-up or dislodgment of the valve from the delivery catheter.

After induction of general anesthesia in the hybrid operative suite, a transseptal puncture was made from the right common femoral vein, and a 6-French balloon flotation catheter was passed into the left atrium, through the left ventricle and into the aorta. A 0.035” 200-cm wire was passed through the balloon flotation catheter and snared out the left femoral artery using a 15-mm Microvena snare (ev3, Plymouth, MN). The balloon flotation catheter was removed, reinserted from femoral artery in a reverse direction, and passed to the right atrium; the balloon was inflated, thus ensuring the catheter tip position in the right atrium. The guidewire from the femoral artery was reversed, and the soft end was snared and exteriorized through the right internal jugular vein using the micro-vena snare. After a series of dilations, the Edwards 27-mm sheath (Edwards Lifescience, Irvine, CA) was advanced via the jugular vein through the right atrium across the septum and into the mitral valve (Fig 1).

Fig 1. Transjugular–transseptal approach. Sheath is going through the atrial septum and mitral valve, which allows better and accurate control of the valve.

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Address correspondence to Dr Eisenhauer, Division of Cardiovascular Medicine, Brigham and Women’s Hospital, 75 Francis St, Boston, MA 02215; e-mail: aeisenhauer@partners.org.
A 26-mm SAPIEN valve (Edwards Lifescience) was mounted and passed into position within the sheath. The valve was “unsheathed” into position and deployed under rapid ventricular pacing (Fig 2). The transesophageal echocardiogram showed no gradient and no significant paravalvular leak (Fig 3). There was a small residual atrial septal defect with left-to-right shunt on Doppler interrogation, but without oximetric shunt. The patient was extubated on the operative table, transferred from the cardiac intensive care unit on postoperative day 1, and discharged to home on postoperative day 5. Transthoracic echocardiography on postoperative day 4 showed a well-seated valve with no paravalvular leak or gradient across the valve.

Comment
Transcatheter VIV is gaining in interest as an important option for high-risk patients with structural valve deterioration after bioprosthetic valve replacement. Since the report of the first experience with the transcatheter VIV in the aortic position [1], the majority of VIV procedures have been reported in the aortic position, but a number of case series have demonstrated favorable results in the mitral position [2-6].

In addition, most VIV-TMVR has been performed through the transapical approach, which allows a shorter, direct, and coaxial route instead of the antegrade approach [2]. However, the transapical approach has several potential deficiencies. Retrograde insertion of the valve has the danger of capturing or disrupting the chordae while placing the valve. It also requires thoracotomy, which can be prohibitive in patients with pulmonary disease. Postoperative pain can be significant after thoracotomy, and there is risk of ventricular disruption in the context of apical manipulation. In the PARTNER trial quality-of-life assessment, the transapical approach demonstrated no benefit compared with a surgical approach, whereas the transfemoral approach had benefit [7]. In this case, we avoided the transapical approach because of her morbid obesity and impaired left ventricular function.

Additional alternative access routes have been the transatrial [3], or transfemoral-transseptal approaches [4]. The disadvantages of transatrial approach are that it requires thoracotomy and it is often difficult to obtain a coaxial delivery plane because of the angle of access. The transfemoral-transseptal approach has been described [4], but this approach requires a long sheath to shield the valve passed in an upward direction and to traverse the atrial septum to the mitral valve, which is left and downward direction. This approach could result in insertion of the valve without the ability to either deploy or remove it.

The transjugular-transseptal approach avoids thoracotomy and apical manipulation, and it is performed totally percutaneously. There has been one previous report using this technique [6]. Our technique differs from the previous report in that we did not use balloon dilation of the septum and we placed the sheath directly through the septum and through the mitral valve, allowing “unsheathing” of the valve for more accurate and secure positioning. Thus, this technique is feasible and safe, and it avoids the disadvantages of the transapical approach. We believe that this approach offers an...
important and clinically relevant alternative approach for management of mitral bioprosthetic structural valve deterioration in high-risk patients.

References