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Case Report

# Success Begins with Failure: A Novel Approach in Transfemoral Transcatheter Aortic Valve Implantation

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## Abstract

Transcatheter aortic valve implantation (TAVI) has transitioned from an experimental procedure to an important alternative therapy for patient with symptomatic aortic stenosis and high surgical risk. We present an approach to deal with the issue of 'failure to cross' the aortic valve in TAVI from the transfemoral retrograde approach.

***Keywords:*** *Aortic Stenosis; Transcatheter Aortic Valve; Transseptal Puncture*

## Introduction

Consistent with the ageing population, degenerative aortic valve stenosis (AS) is increasing in prevalence and is one of the most common adult valve condition seen in the Western world [1]. It is well documented that conservative management carries a poor prognosis for patients with severe symptomatic aortic stenosis [2]. Surgical therapy of the calcified aortic valve provides durable and excellent results [3] but not all patients are suitable for open-heart surgery. Transcatheter Aortic Valve Implantation (TAVI) has become a feasible alternative to open surgical techniques in patients in whom open surgical treatment is contraindicated or those who have predictive high-risk for perioperative morbidity and mortality.

## Case Report

A 77-year old female with significant chronic obstructive pulmonary disease (COPD) with a predicted forced expiratory volume for 1 second (FEV1) of 33% was reviewed for severe AS. Additional past medical history included hypertension, pulmonary artery hypertension, bilateral pulmonary lobectomies for severe bronchiectasis, osteoporosis and gastro-esophageal reflux disease. Due to her poor FEV1 and other co-morbidities, she was considered a high-risk candidate for open surgical aortic valve replacement and therefore was referred for consideration of TAVI. The aortic valve area on transthoracic echocardiography (TTE) was calculated to be 0.54 $cm^2$ with significant valvular calcification. Transoesophageal echocardiogram (TOE) confirmed severely calcified aortic valve leaflets and root with a mean valvular gradient of 52 mmHg (Figure 1).

***Figure 1:*** *Baseline echocardiographic assessment of the native aortic valve. Severely calcified trileaflet aortic valve was demonstrated on the baseline transesophageal echocardiogram in the short axis mid-esophageal view.*

For the procedure, the patient was intubated and ventilated. A 7-French sheath was placed in her left femoral vein with insertion of a ventricular pacing wire. A 6-French sheath was inserted in her left femoral artery through which a pigtail catheter was placed in the ascending aorta. After right femoral arterial access was obtain, three Perclose® ProGlide™ (Abbott Vascular) arterial closure devices were deployed and the 22-French Edwards sheath was placed in her right femoral artery. Four experienced interventional cardiologists each attempted to cross the aortic valve in retrograde fashion using a variety of coronary catheters over a total duration of 50 minutes without success. A decision was made to proceed with a transseptal approach. A transseptal puncture using an 8 French Mullins transseptal sheath was undertaken with fluoroscopic and TEE guidance (Figure 2). An angle Terumo (0.035 X 260) wire and a balloon tipped catheter (Arrow) were advanced through the left atrium, left ventricle and stenotic aortic valve antegrade into the descending thoracic aorta. Subsequently a 25 mm snare wire (120 cm, ev3 Inc.) was introduced retrograde into the descending aorta through the femoral sheath to snare the 260cm exchange length wire (Terumo) (Figure 3). The exchange wire was extracted through the right femoral arterial sheath and a multipurpose catheter (Johnson and Johnson) was passed retrograde back across the aortic valve. The transseptal wire was then removed

an extra stiff J wire was introduced from the right femoral artery into the left ventricle. Following aortic balloon valvuloplasty a 23 mm Edwards Sapien XT valve was deployed using standard technique. TOE was used to confirm the position and noted a trivial paravalvular leak with preserved LV systolic function (Figure 4). The Edwards sheath was removed and hemostasis obtained using three Perclose® ProGlide™ (Abbott Vascular) and the patient was extubated and transferred to the coronary care unit in stable condition. Although the patient was diagnosed with an expressive dysphasia, she had an otherwise uncomplicated peri-procedural recovery and was discharged home on day 2-post procedure.

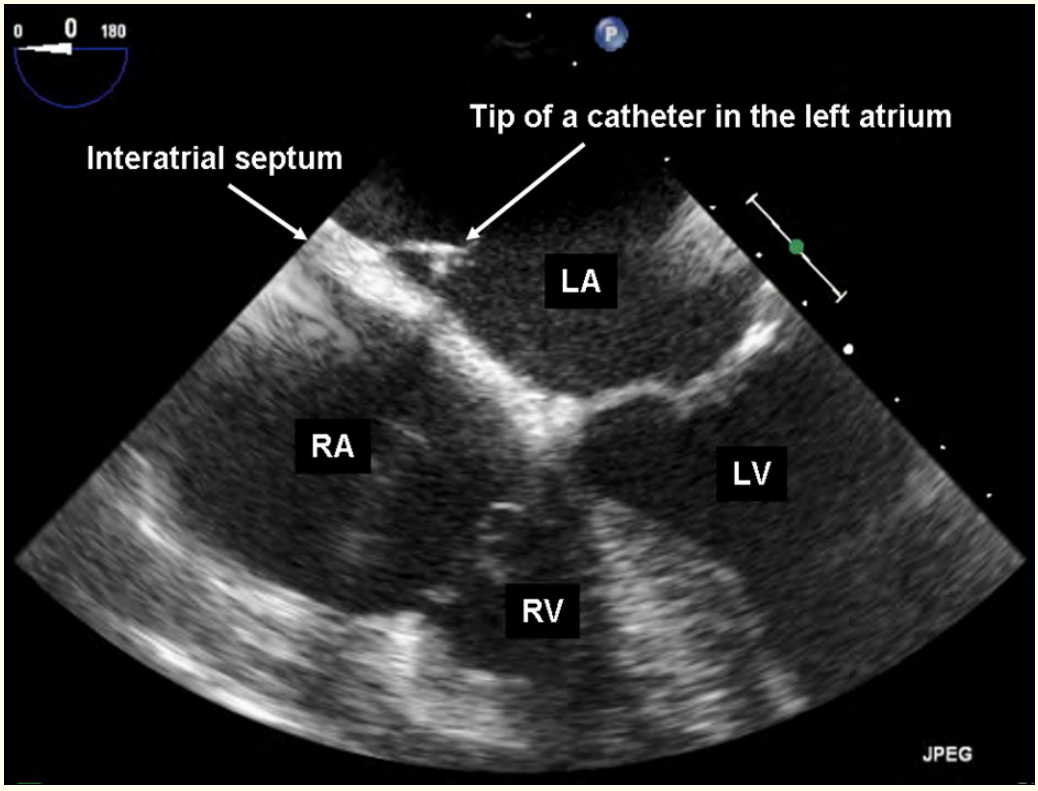


***Figure 2:*** *Echocardiography guided transseptal puncture. The catheter crossing the interatrial septum with its tip in the left atrium is demonstrated on the transesophageal echocardiogram in the mid-esophageal view at 0 degrees.*

*LA: Left Atrium; RA: Right Atrium; LV: Left Ventricle; RV: Right Ventricle*

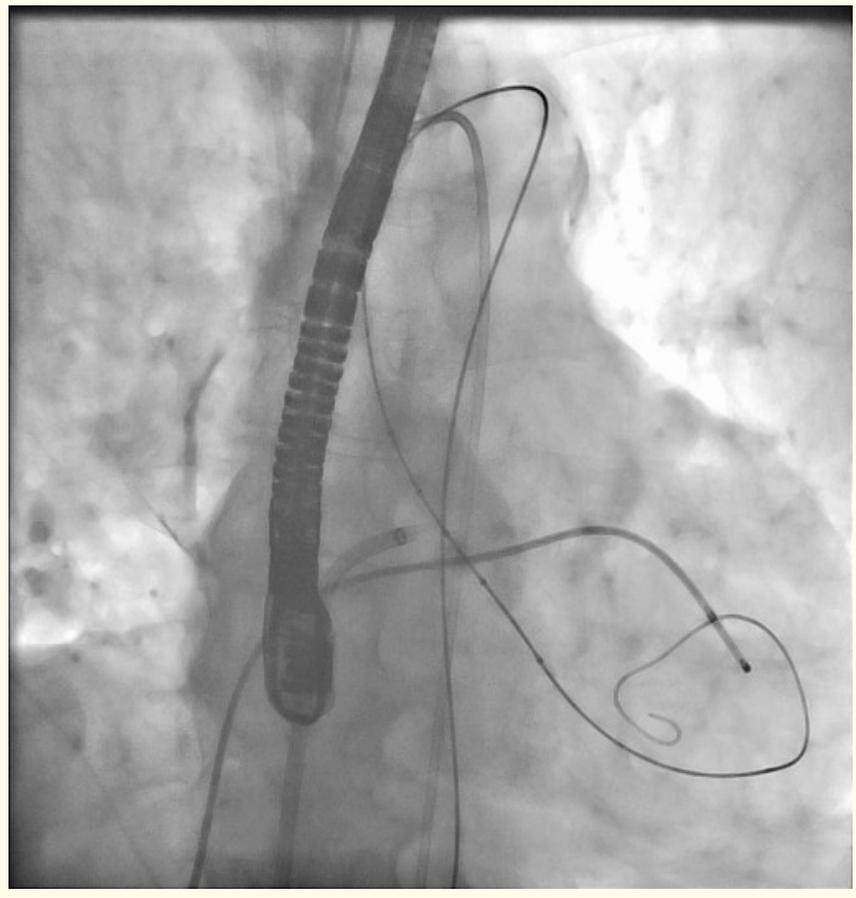

***Figure 3:*** *Snare Wire.*

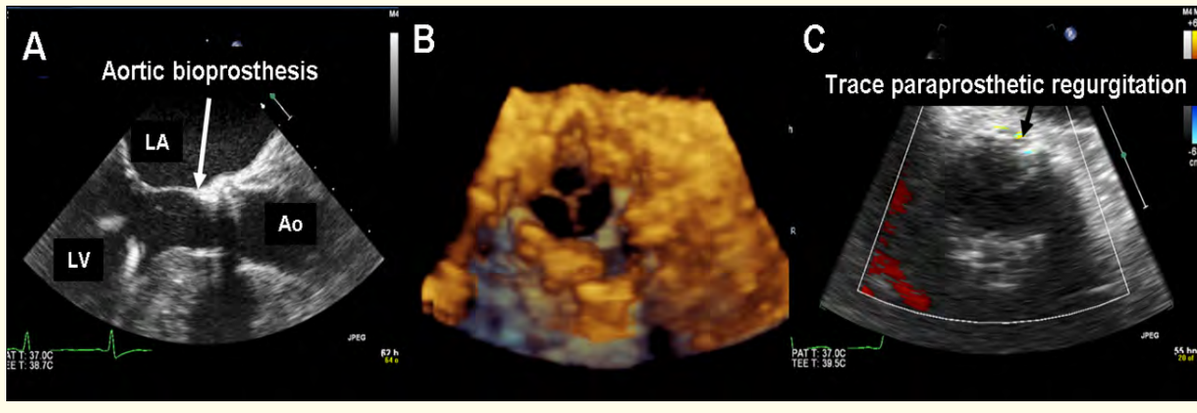


***Figure 4:*** *Intra-procedural echocardiographic assessment of the bioprosthetic valve position and function. Immediately following the valve deployment, transesophageal echocardiogram demonstrated optimal valve position (A), normally functioning leaflets demonstrated on 3D images from the short axis view (B) and a trivial paraprosthetic leak on color Doppler (C).*

*LA: Left Atrium; LV: Left Ventricle; Ao: Aorta*

## Discussion

With the international expansion of TAVI programs and the increased utilization of this technique to treat elderly patients with symptomatic severe aortic stenosis there are bound to be cases in which the aortic valve cannot be crossed in the typical retrograde fashion (although rare). The above-described method allowed the procedure to be completed successfully; avoiding the need to switch to an alternative approach (i.e. transapical or subclavian) or abandon the procedure altogether. This is important since a significant portion of the risk of this procedure is related to obtaining vascular access with the TAVI sheath. The described technique was employed in the era of aortic balloon valvuloplasty and found to be technically and haemodynamically satisfactory compared with the retrograde approach [4-6]. Ideally local TAVI teams have access to onsite expertise to conduct such an approach to allow successful transfemoral TAVI after an initial 'failure to cross'.

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