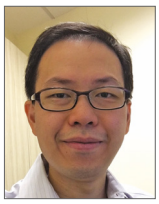
AsiaIntervention 2018;4:38-40

Hybrid technique to bail out an unsuccessful transfemoral TAVR attempt



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Abstract

The most common route to perform transcatheter aortic valve replacement (TAVR) is via the transfemoral access. The success of this technique hinges on the successful passage of guidewires across the stenosed aortic valve. Although this is possible in the majority of cases, this case illustrates an occasional anomaly. In this report, we describe a novel hybrid technique involving a transseptal access as well as the formation of a continuous arteriovenous loop to complete the procedure successfully. This technique also has an additional advantage as it maintains the feasibility of performing the procedure under local anaesthesia and conscious sedation.

Abbreviations

AV loop	arteriovenous loop
BAV	balloon aortic valvuloplasty
LA	left atrium
LV	left ventricle
PTFE	polytetrafluoroethylene
TAVR	transcatheter aortic valve replacement
TF	transfemoral
VSD	ventricular septal defect

Introduction

Transcatheter aortic valve replacement (TAVR) via the transfemoral (TF) access is a well-established technique to treat anatomically suitable intermediate to high surgical risk patients with severe aortic valve stenosis. Prior screening with computed tomography ensures a high degree of technical success. Occasionally, cases may be aborted due to failure of the retrograde approach when guidewires are unable to cross the calcified aortic valve leaflets. In such situations, the case is aborted and an alternative access (e.g., transapical) needs to be contemplated. This case report describes a novel technique which may enable such cases to be completed successfully.

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Discussion

A 64-year-old lady with a background of severe pulmonary arterial hypertension and lung disease was progressively dyspnoeic from severe aortic valve stenosis. Her resting oxygen saturation was 88% and she also had significant obstructive sleep apnoea. A TAVR was considered after discussion with the heart and respiratory team due to high surgical risks. She had a Sievers type 0 bicuspid aortic valve with mean gradient of 46 mmHg and an estimated aortic valve area of 0.8 cm^2. Computed tomography

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SUBMITTED ON 08/08/2017 - REVISION RECEIVED ON 1st 27/11/2017 / 2nd 08/12/2017 - ACCEPTED ON 11/12/2017

DOI: 10.4244/AIJ-D-17-00032

demonstrated a horizontal aorta with an annular perimeter of 80.4 mm.

We selected a 26 mm Evolut™ R valve (Medtronic, Minneapolis, MN, USA) for TAVR and performed the case under conscious sedation and local anaesthesia due to concern about worsening hypoxia. The procedure proceeded unremarkably initially with a Sentrant (Medtronic) 14 Fr sheath placed in the right femoral artery and a 6 and 5 Fr sheath placed in the left arterial and femoral artery, respectively. The latter two permitted the placement of a pigtail in the aortic root and a pacing wire in the right ventricle.

We then faced significant difficulty in the retrograde crossing of the aortic valve. Multiple attempts were performed with various catheters (6 Fr AL1, AL2, multipurpose, pigtail, Judkins right 3 and 4, Amplatz right) and both straight-tipped Terumo and polytetrafluoroethylene (PTFE) wires. Attempts using coronary wires were also futile.

We switched to a transseptal approach utilising another access on the right femoral vein. This was performed with a Fast-Cath™ SL0 sheath and BRK™ needle (Abbott, Abbott Park, IL, USA) **(Figure 1A)**. After the tip of the SL0 sheath was in the left atrium, an exchange length Terumo wire (Terumo Corp., Tokyo, Japan) was manoeuvred antegradely into the left atrium. Guided by this Terumo wire, a pigtail was positioned into the left atrium and, using this, we managed to direct the Terumo wire through the mitral valve into the left ventricle in an antegrade fashion and then further direct the Terumo wire to cross the aortic valve antegradely into the aorta (**Figure 1B-Figure 1D**). This Terumo wire was then snared using an Amplatz GooseNeck® Snare (Medtronic) placed through the 14 Fr Sentrant sheath and positioned at the level of the descending thoracic aorta. The Terumo wire was then externalised out of the Sentrant sheath to form a continuous arteriovenous loop **(Figure 1E)**. We decided not to use the continuous AV loop as a rail to deliver the EnVeo delivery system (Medtronic) due to significant tension on the inner curve of the aorta and the risk of a dissection. Instead, a 5 Fr 90 mm Flexor® Shuttle® Guiding Sheath (Cook Inc., Bloomington, IN, USA) was then tracked over the Terumo wire via the 14 Fr Sentrant arterial sheath to cross the aortic valve retrogradely supported by the AV loop **(Figure 1F)**. Once the shuttle sheath was in the left ventricle, the Terumo wire was removed and then a Confida™ wire (Medtronic) was placed through the shuttle sheath in the LV **(Figure 1G)**. The shuttle sheath was removed and exchanged for the EnVeo delivery system. The rest of the implant was unremarkable and the procedure was completed successfully **(Figure 1H)**.

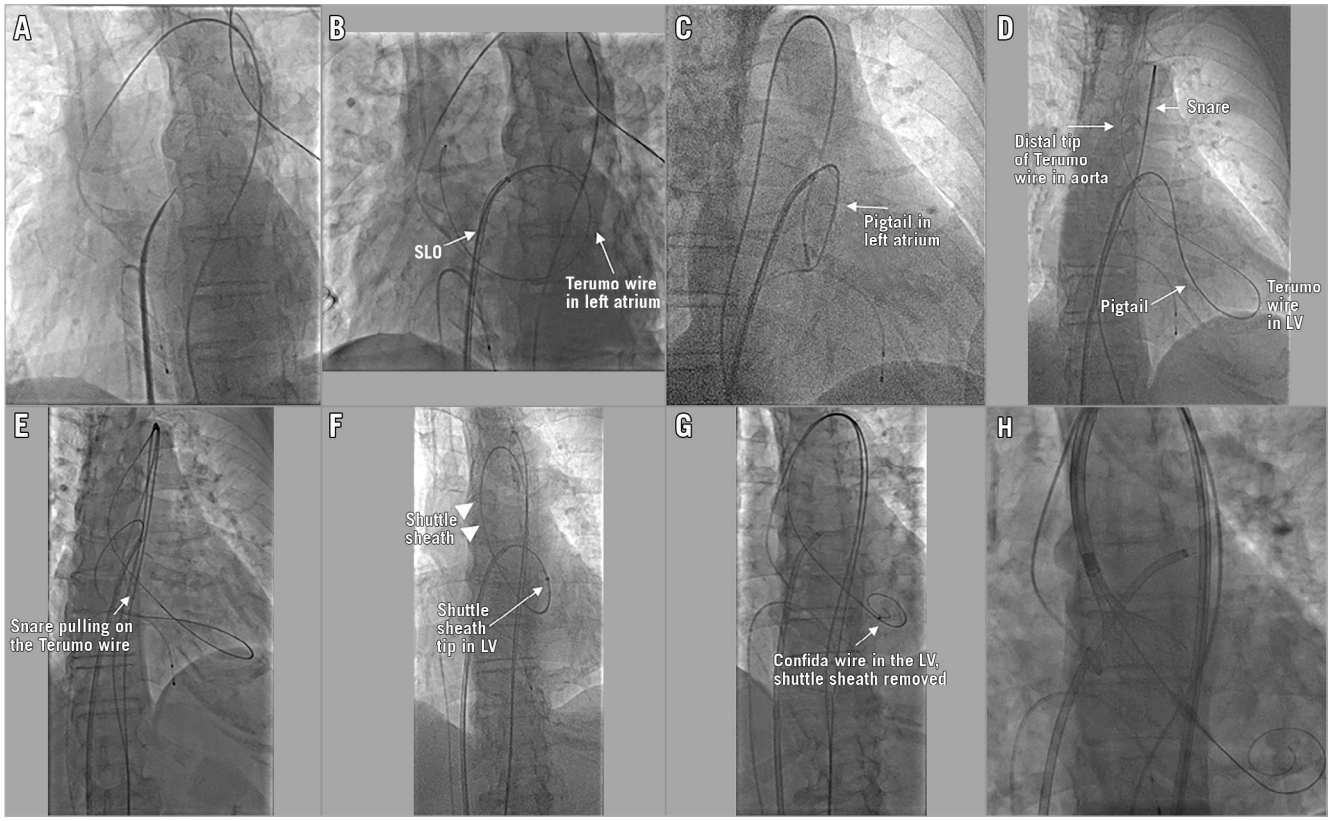

Figure 1. *Procedural steps for the hybrid technique. A) Transseptal puncture. B) SLO sheath placed in the LA with the exchange length Terumo wire looping within the LA. C) Using a pigtail to manoeuvre the wire into the ventricle antegradely. D) Manoeuvring the Terumo wire into the aorta. E) Snaring the Terumo wire and forming a continuous AV loop. Externalising the wire out of the femoral artery. F) Using the AV loop to deliver a Shuttle sheath (via arterial sheath in femoral artery) across the aortic valve retrogradely. G) Placing the Confida wire via the shuttle sheath into the LV. H) Implanting the 26 mm Evolut R valve.*

Crossing the aortic valve using the retrograde approach is a pivotal step in transfemoral TAVR. There have been very few data on failure rates; however, they are likely to be rare (<1%) but may be a cause of an aborted TAVR procedure[1]. In this case, the difficulty occurred due to the bicuspid and calcified morphology of the aortic valve **(Figure 2)**. Balloon aortic valvuloplasty (BAV) registries also do not mention this complication as only the outcomes of patients with successful BAV are reported. The alternative for a failed TF procedure could be a transapical approach. A full antegrade approach is also possible and was historically the first published approach for TAVR[2]. These are, however, more invasive and technically demanding.

A transseptal technique and forming a continuous AV loop are both well-established techniques (e.g., for VSD closure or paravalvular leak closures) and may be utilised in rare situations such as these. We would caution against using the AV loop as a rail for the larger and more rigid TAVR devices as there would invariably be tension placed on the inner curve of the aorta and passage of a large device may increase the risk of aortic dissection.

Figure 2. *Anatomy of the aortic valve (type 0) may have contributed to the difficulty in crossing.*

Conclusions

A novel hybrid transseptal with retrograde crossing technique can be considered during difficult retrograde entry of the aortic valve and will improve the rates of technical success during transfemoral TAVR.

Impact on daily practice

This technique enables operators to have an alternative technique to cross the aortic valve in TAVR situations where retrograde crossing is not possible.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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