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Buddy wire technique for successful transfemoral transcatheter aortic valve implantation through an extremely tortuous abdominal aorta: a basic technique in Asian patients?

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Abstract

Recent papers have reported better outcomes in transfemoral (TF) transcatheter aortic valve implantation (TAVI) than with transapical and direct aortic approaches. However, TF TAVI is challenging in a case with an extremely tortuous access route. Our case highlights the feasibility of TF TAVI in the presence of extreme tortuosity in the abdominal aorta if the "buddy wire technique" is appropriately utilised. Asian operators should become familiar with this technique, as the angle of the abdominal aorta may be more acute in Asians than in Caucasians.

Introduction

Recently, the Placement of Aortic Transcatheter Valves (PARTNER) 2 trial demonstrated that the rate of death or disabling stroke was similar between transcatheter aortic valve implantation (TAVI) and surgical aortic valve replacement (sAVR), even in intermediate-risk patients with severe aortic stenosis (AS)[1]. In this trial, transfemoral (TF) TAVI resulted in a lower rate of this endpoint than sAVR at two years. In addition, recent papers have reported better outcomes in TF TAVI than with the transapical and direct aortic approaches[2-4]. One of the potential anatomical issues encountered with TF TAVI is severe tortuosity of the access route. A "buddy wire technique" using stiff wires is a potential solution for this situation by straightening a tortuous access route; however, to the best of our knowledge, this has never been reported in Asian patients. Herein, we report a case with an extremely tortuous abdominal aorta which was successfully treated with TF TAVI using the buddy wire technique.

Case report

A frail, 89-year-old woman was diagnosed with symptomatic severe AS. Transthoracic echocardiography revealed severe degenerative AS with an area of 0.3 cm^2 and a mean aortic valve pressure gradient (AVPG) of 104 mmHg. Moderate aortic regurgitation was also detected, with a decreased left ventricular ejection fraction (40%). Multislice computed tomography showed an aortic annulus perimeter of 67.0 mm and an extremely tortuous abdominal aorta **(Figure 1A, Figure 1B)**. Minimum lumen diameters in the bilateral iliac to femoral arteries were at least 6.0 mm, but only 4.6 mm in the left subclavian artery. Furthermore, the ascending aorta was dilated (45 mm). In view of the high surgical risk based on the logistic European System

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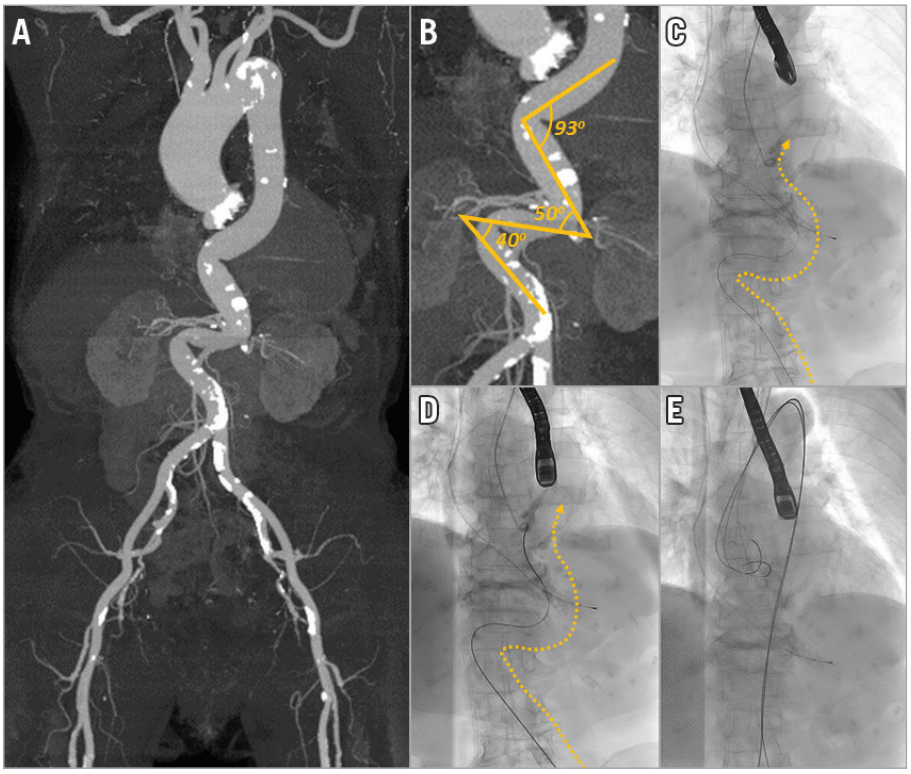

Figure 1. *Extremely tortuous abdominal aorta. A) & B) Computed tomography showing extremely tortuous abdominal aorta. C) Radifocus guidewire M with a 4 Fr Judkins right 4.0 catheter from the left femoral artery (dotted arrow). D) Lunderquist wire through the 4 Fr Judkins right 4.0 catheter from the left femoral artery (dotted arrow). E) Buddy wire technique with two Lunderquist wires from the bilateral femoral arteries.*

for Cardiac Operative Risk Evaluation (EuroSCORE) and Society of Thoracic Surgeons (STS) scores of 51.6% and 12.2%, respectively, a decision was made to perform TAVI. The procedure was performed via the right transfemoral approach, because of dissection risk in the dilated ascending aorta with a direct aortic approach and too small a lumen diameter for a trans-subclavian approach. First, a 300 cm Radifocus® guidewire M (Terumo Corp., Tokyo, Japan) was advanced from the left femoral artery towards the sinus of Valsalva with a 4 Fr Judkins right 4.0 catheter **(Figure 1C)**. This was replaced with a 260 cm Lunderquist® wire (Cook Medical, Bloomington, IN, USA) **(Figure 1D)**. However, a single Lunderquist wire was not adequate to straighten the tortuous abdominal aorta. Only after this manoeuvre was repeated from the right side using the buddy wire technique was the tortuosity completely straightened **(Figure 1E)**. Next, an 18 Fr 40 cm Check-Flo® sheath (Cook Medical) was smoothly advanced from the right femoral artery until the tip of the sheath was proximal to the bends in the aorta **(Figure 2A)**. After placing the sheath, a 26 mm CoreValve® (Medtronic, Minneapolis, MN, USA) was successfully advanced and deployed following predilatation with an 18 mm balloon **(Figure 2B, Figure 2C)**. There were no vascular complications **(Figure 2D)**. Transthoracic echocardiography at one week showed a well-seated prosthesis with an acceptable AVPG (9 mmHg) and a trivial paravalvular leak.

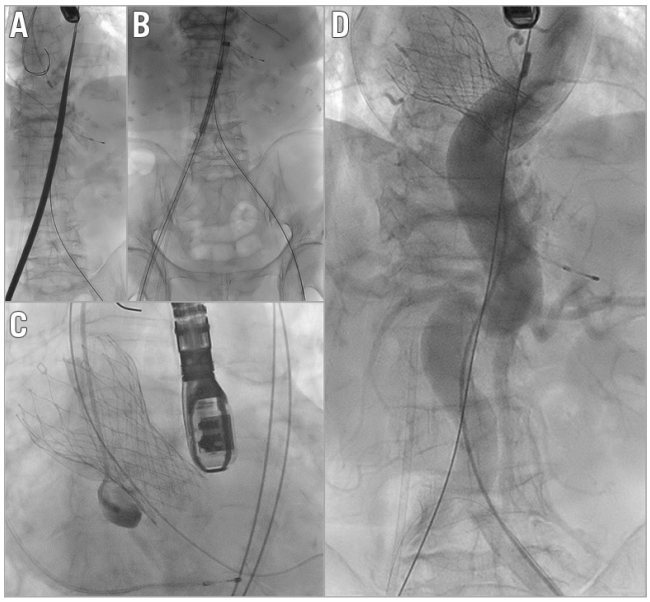

Figure 2. *Successful CoreValve implantation with the buddy wire technique. A) Smooth advancement of an 18 Fr 40 cm Check-Flo sheath on the right-side Lunderquist wire. B) Smooth delivery of a 26 mm CoreValve. C) Successful implantation of a 26 mm CoreValve. D) Post-procedural aortography showing no evidence of aortic injuries.*

Discussion

Asian operators should become familiar with this technique, as the angle of the abdominal aorta may be more acute in Asians than in Caucasians[5]. Since the flexural modulus of the Lunderquist wire has been reported to be the largest among commercially available wires (158.4 gigapascals)[6], it should be chosen to straighten aortic and/or iliac bends. We recommend using a long sheath for such cases because once the tip of the sheath has been advanced and placed proximal to the aortic and/or iliac bends it should be easy to deliver a TAVI system. By using these manoeuvres and straightening the access route through the aortic and iliac arteries, it is possible that even devices with relatively inflexible delivery systems can be used. A potential complication of this technique may be injury to the access route if a shortcut is used for placement of these extremely stiff wires. Therefore, post-procedural assessments with aortography and/or echo may be required.

Conclusions

Our case highlights the feasibility of TF TAVI in the presence of extreme tortuosity in the abdominal aorta if the buddy wire technique is utilised appropriately.

Impact on daily practice

TF TAVI is feasible even in the presence of extreme tortuosity in the abdominal aorta if the buddy wire technique is appropriately utilised.

Conflict of interest statement

The authors have no conflicts of interest to declare.

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