Transcaval transcatheter aortic valve replacement through abdominal aortic aneurysm in a patient with no option for other vascular access

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Introduction

Transcaval access is a viable option for patients needing transcatheter aortic valve replacement (TAVR) when no other vascular access is appropriate for delivering the heart valve. We hereby present a successful procedure of transcaval TAVR (TcTAVR) through an abdominal aortic aneurysm (AAA).

Case Report

An 83-year-old male patient was transferred for cardiovascular assessment after presenting with peripheral edema and progressive dyspnea. Through cardiologic auscultation, a grade III/VI systolic ejection murmur in the right second intercostal area was noted. Our patient had a history of coronary artery bypass graft surgeries, having undergone the surgery twice: first surgery was conducted 17 years ago and second 10 years ago. He was diagnosed with lower extremity arterial disease and had an AAA in the infrarenal region with a diameter of 32 mm.

The electrocardiogram showed sinus rhythm and incomplete right bundle branch block, whereas blood test results were unremarkable. The transthoracic echocardiogram revealed left ventricular ejection fraction to be 40% with global hypokinesis, 72 mm Hg systolic maximum, and 51 mm Hg mean pressure gradient on the aortic valve.

A three-dimensional computed tomography (CT) angiography showed that both common iliac arteries were totally occluded and highly calcified, and 70% stenosis was observed in the left subclavian artery. The diameters of both subclavian and axillary arteries were 4.5–4.6 mm and not suitable for TAVR. The two common carotid arteries were also extensively calcified and not suitable for vascular access. TcTAVR was decided to be the appropriate procedure by the Heart Team.

Bilateral percutaneous femoral venous access and arterial access from left brachial artery were obtained. An internal mammary catheter (7 French, Launcher, Medtronic, Dublin, Ireland) was placed in the inferior vena cava, and a goose neck snare (25 mm) at the predetermined crossing site was placed in the aorta. We planned to go through the infrarenal aorta above the AAA and tried to cross with Astato XS 20 0.014 inch (Asahi, Tokyo, Japan) chronic total occlusion guidewire with the support of Finecross microcatheter (150 cm, Terumo, Japan) and Navicross (135 cm, Terumo, Japan) support catheters accompanied by electrocautery (50 watt, cutting mode) attached to the back end of the guidewire (Fig. 1). Unfortunately, we could not reach the infrarenal aorta owing to the presence of porcelain aorta. We were able to cross into the AAA with the amputated tip of Conquest Pro 12 (Asahi, Tokyo, Japan) CTO guidewire, and the guidewire was captured by the goose neck snare, thereby creating the caval-aortic connection (Video 1). We then dilated the calcified wall of the AAA with coronary noncompliant balloons of 2.5 and 3.0 mm diameters (Solarice, Medtronic, Minneapolis, USA). Finecross microcatheter and Navicross catheters were advanced to the descending aorta. Finally, a 0.035 inch extra support Lunderquist wire (Cook, USA) was advanced to the ascending aorta through Navicross support catheter, and an 18 French 60 cm braided sheath (Cook, Bloomington, USA) was

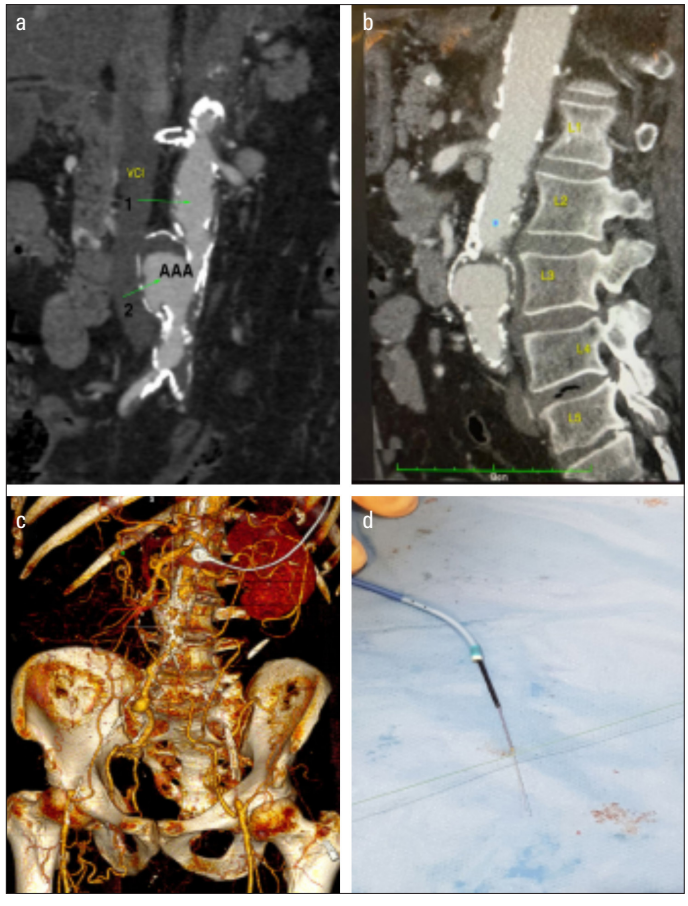

Figure 1. a. Possible puncture locations (1 or 2) for transcaval crossing; b. determination of puncture points according to lumbar vertebrae in sagittal tomographic view; c. three-dimensional reconstruction of occluded iliac arteries before the procedure; and d. internal mammary guiding catheter, Navicross support catheter, Finecross microcatheter, and amputated Conquest pro 12 coronary guidewire placed as mother-and-child technique.

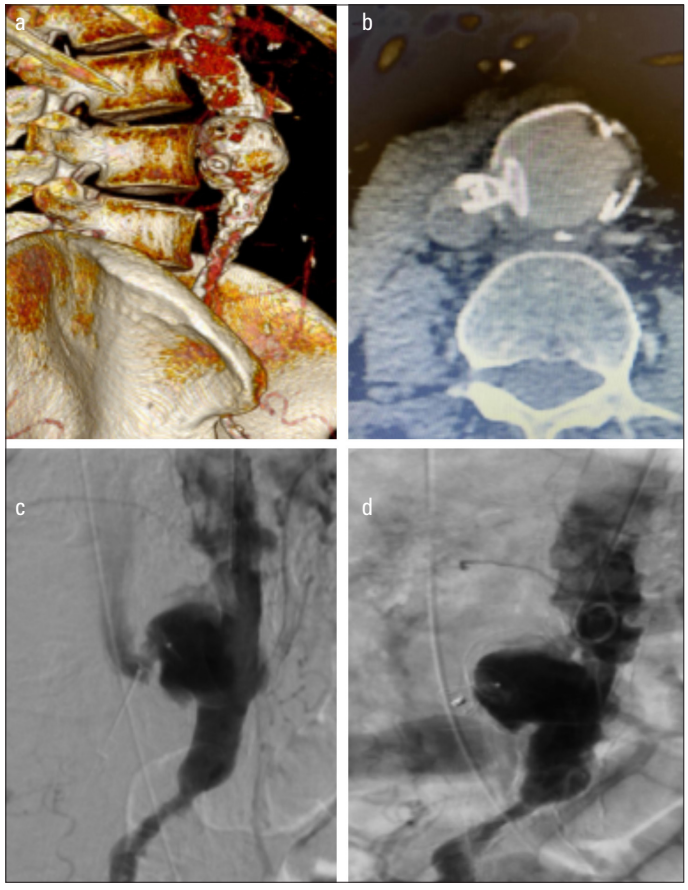

Figure 2. a. Three-dimensional reconstruction of Amplatzer Duct Occluder (i.e., ADO-1) device implanted into aneurysm wall; b. position of the occluder device in transverse tomographic view; c. aortocaval shunt before the release of occluder device from its delivery cable; and d. immediate closure of aortocaval fistula after release of the occluder device.

advanced to the descending aorta (Video 2). Implantation of 29 mm Evolute-R self-expandable TAVR valve (Medtronic, Minneapolis, USA) was accomplished as usual without pre or post balloon dilatations (Video 3).

The caval-aortic tract was closed using a nitinol occluder device [10/8 mm Amplatzer Duct Occluder (i.e., ADO 1); Abbott, Chicago, USA] with a deflectable 8.5 French Agilis sheath (Abbott, Chicago, USA) (Fig. 2 and Videos 4 and 5). No residual shunt or retroperitoneal bleeding was observed during the abdominal aortography (Fig. 2). CT angiography of the abdomen was performed on post-procedure day 2 and demonstrated no residual aortocaval shunt and no retroperitoneal bleeding. The patient was discharged and given aspirin (100 mg/day) and clopidogrel (75 mg/day).

Discussion

TAVR has been shown to be a viable and accepted approach for the treatment of inoperable and high-risk patients with severe symptomatic aortic stenosis. Recent reports have shown excellent results in patients with intermediate and low risk (1). To avoid a transthoracic procedure, optional transcarotid and TcTAVR approaches are also used in patients unsuitable for transfemoral delivery (2).

In summary, TcTAVR is a safe and effective option for high-risk patients with limited vascular access options (1-3). In the literature, there is another case report in which TcTAVR was performed through an AAA (4). To the best of our knowledge, our case is the second such case in the literature.

Conclusion

Our case demonstrates that crossing through an AAA for TcTAVR for endovascular treatment of critical aortic stenosis is a safe procedure in patients with no other vascular access options.

Informed consent: Written informed consent was obtained from the patient and his family for publication of this case report and accompanying images.

Video 1. Guidewire captured by goose neck snare

Video 2. Delivery of 18 French cook sheath through AAA
AAA - abdominal aortic aneurysm

Video 3. Implantation of evolute-R valve

Video 4. Release of Amplatzer Duct Occluder (i.e., ADO 1) device

Video 5. Control abdominal aortography without any shunt or bleeding

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