Transcatheter Balloon Expandable Aortic Valve Implantation through an Aortofemoral Bypass Graft

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Abstract

An 84-year-old woman was diagnosed with symptomatic severe aortic stenosis. She had previously undergone aortobifemoral bypass grafting (Y graft) for bilateral iliac stenosis. In view of a high surgical risk, a decision for transcatheter aortic valve implantation (TAVI) was made. An incision was made on the right limb of the Y graft and subsequently a 16 Fr e-sheath was smoothly advanced through the graft. A 23 mm balloon expandable valve was then advanced with no resistance and successfully deployed. This case highlights the feasibility of TAVI through the graft, but requires a thorough preprocedural assessment of the access route using multiple imaging modalities.

Key words: transcatheter aortic valve implantation, aortic stenosis, aortobifemoral bypass grafting

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Introduction

Transcatheter aortic valve implantation (TAVI) is a recognized alternative to conventional surgical valve replacement in patients with severe aortic stenosis (AS) who are either inoperable or have a high surgical risk (1, 2). We have recently employed TAVI and its use is becoming more widespread in clinical practice (3, 4). Cases are often challenging due to various comorbidities and anatomical difficulties. We herein report a case of transfemoral TAVI that was successfully performed through an aortofemoral bypass graft.

Case Report

An 84-year-old woman with sick sinus syndrome, coronary artery disease, chronic kidney disease and previous cerebral infarction was diagnosed with symptomatic severe AS (NYHA class IV). She had previously (17 years prior) undergone aortobifemoral bypass grafting (Y graft; 14 mm in the body and 7 mm in the limb, respectively) for bilateral iliac stenosis. In addition, she had received renal grafting for right renal artery stenosis. The distal part of the right limb of the Y graft had been regrafted for a focal stenosis 8 years after the index procedure. An attempt for surgical aortic valve replacement was made 7 years previously, which had failed due to an extremely small aortic valve. According to the surgical records, they had difficulty inserting a 17 mm valve sizer. Subsequently, the patient underwent several percutaneous balloon aortic valvuloplasties. Because TAVI was now available in Japan, she was referred for aortic valve intervention.

Transthoracic echocardiography (TTE) revealed a severely calcified aortic valve with an area of 0.54 cm² and a mean aortic valve pressure gradient (AVPG) of 48 mmHg. The left ventricular ejection fraction was preserved (63%). A multislice computed tomography (CT) scan showed an aortic annulus diameter of 18.1×24.2 mm and an area of 347 mm². The CT scan also revealed an adequate diameter within the 17-year-old Y graft for carrying out TAVI using a 16 Fr e-sheath (outer diameter: 6.7 mm) (5) and this was also confirmed on aortography and intravascular ultrasound (Fig. 1A-E, Ea-c). Intravascular ultrasound demonstrated that the inner diameters through the right limb of Y graft measured over 7 mm in size. The CT scan also demonstrated a porcelain aorta (Fig. 1F). The operative mortality risks according to the logistic EuroSCORE and STS scores were 74.6% and 11.9%, respectively. In view of the high

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Figure 1. A: CT with 3D reconstruction showing a patent aortobifemoral bypass graft, which was partially replaced at the distal part of the right limb (the Y graft is depicted in orange color and an additional graft is shown in red dotted color). B: CT showing the patent right limb of the Y graft that was partially replaced with a second graft (shown in red dotted color). C: CT showing the patent left limb of the Y graft. D: The currently available Hemashield Gold™ knitted microvel® double velour vascular graft (Boston Scientific, Natick, USA; the diameters were 12mm in the body and 6mm in the limb). E: Preprocedural aortography confirming a patent Y graft with no obvious bends, stenoses or mobile thrombi. a: IVUS image at the body of the Y graft (inner diameter: >10mm). b: IVUS image at the right limb of the Y graft (inner diameter: >7mm). c: IVUS image at the additional graft (inner diameter: >8mm). F: CT showing a porcelain aorta. CT: computed tomography, IVUS: intravascular ultrasound

surgical risk and previous history of failed open heart surgery, a decision for TAVI was made after discussion at a heart multidisciplinary team meeting. We undertook the transfemoral approach as per the patient’s previous medical records which showed the surgeons had difficulty in inserting even a 17 mm valve sizer; thus we prepared the smallest available 20 mm Sapien XT (Edwards Lifesciences, Irvine, USA) valve, which is not yet on the market, using the transapical approach. The procedure was performed via the right transfemoral approach under general anesthesia. An incision was made on the right limb of the Y graft and subsequently a 16 Fr e-sheath was smoothly advanced through the aortofemoral bypass graft (Fig. 2A-C). A 23 mm Sapien XT valve was then advanced with no resistance and deployed (Fig. 2D) following predilatation with a 20 mm balloon under rapid pacing. The incision site was then successfully sutured (Fig. 2E). Transesophageal echocardiography and aortography showed a well-seated prosthesis with an acceptable AVPG and mild paravalvular leak. The patient was discharged in a good condition at postoperative 17 days. The valve function remained good on TTE at discharge (mean AVPG: 9.1 mmHg with a mild paravalvular leak).
To the best of our knowledge, there are only 2 reported cases of transfemoral TAVI through an artificial graft (6, 7). This operation has not been previously reported in the Japanese population. Our case highlights the feasibility of TAVI through the graft, but requires a thorough preprocedural assessment of the access route using multiple imaging modalities. Potential complications of transfemoral TAVI through an artificial graft are: 1) difficulty in advancing the e-sheath due to graft stenoses or bends and 2) distal embolization of a thrombus or neointimal hyperplasia within the graft. We performed CT, aortography and intravascular ultrasound preoperatively to assess these issues thoroughly. These imaging modalities confirmed the absence of stenoses, bends, thrombus or thick neointimal hyperplasia within the graft. Intravascular ultrasound demonstrated that the inner diameters through the right limb of Y graft measured over 7 mm, which was larger than the outer diameter of the 16 Fr e-sheath (6.7 mm). In our case, a 16 Fr e-sheath and a subsequent 23 mm Sapien XT system were quite smoothly delivered through the graft with no resistance. There was no evidence of distal embolization into the lower extremities postprocedure. With the future availability of the new-generation Edwards Sapien 3 system with a smaller sheath (14 Fr) in Japan, we will be able to successfully treat more of these cases with relatively ease and maneuverability (8).

The authors state that they have no Conflict of Interest (COI).

References