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CASE REPORT

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Stent graft implantation from distal radial access—A novel way to treat femoral access site complication during transcatheter aortic valve replacement: A case report

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Abstract

In this paper, a case of an 82-year-old man who was admitted to our department with sever symptomatic degenerative aortic valve stenosis is presented and discussed. After all screening procedures, a successful transfemoral transcatheter aortic valve replacement was performed, but the closure of the femoral access was unsuccessful due to suture-based device failure. We decided to perform a prolonged balloon dilatation and external compression at the bleeding site, but the bleeding did not stop; therefore, an iCover stent graft was implanted from distal radial artery access using slender technique. Following that, the bleeding was stopped, and the patient had an uneventful outcome.

KEYWORDS

distal radial artery access, femoral access complications, transcatheter aortic valve replacement

1 | INTRODUCTION

Vascular complications such as dissection, perforation, occlusion, closure device failure leading to bleeding, or stenosis during transcatheter aortic valve replacement (TAVR) remain the most common procedural complications. Distal radial artery (dRA) access, a new site for cardiovascular interventions, although not yet recommended by the guidelines, has been rapidly acknowledged and adopted by many centers due to its high rate of success and safety and less complications.[1,2] Using radial access as a secondary access site during TAVR has become more preferred due to its feasibility and significant decrease of vascular and bleeding complications. Stent grafts with long shafts and low profiles were not available previously; therefore, femoral access was needed to treat perforations during TAVR procedures.[3] Concerning ilio-femoral interventions where a stent graft is needed, transradial access is usually prevented by the distance between the vascular access and the target lesion, which extends over the length of the currently available devices. Thanks to technical improvements, resulting in specifically dedicated low-profile stent graft equipment with adequate shaft length availability, transradial access is now feasible for the treatment of iliofemoral lesions. We report the first case of iliofemoral stenting performed by dRA with a new specifically developed balloon-expandable stent graft with extended delivery system length. However, there is limited data regarding dRA as a secondary access site for TAVR or dRA resolving primary transfemoral vascular access site complications, although it may be greatly beneficial in terms of reducing vascular complications and patient-operator ergonomics.

Abbreviations: ACT, activated clotting time; CABG, coronary artery bypass graft; dRA, Distal radial access; LAD, left anterior descending artery; LCX, left circumflex artery; PCI, percutaneous coronary intervention; RAO, radial artery occlusion; RCA, right coronary artery; TAVR, transcatheter aortic valve replacement.

2 | CASE PRESENTATION

The case of an 82-year-old man is discussed who was presented at our department with severe symptomatic degenerative aortic valve stenosis and was admitted for an elective TAVR procedure. The patient's history was notable for smoking, hypertension, type two diabetes mellitus, decreased renal function, he underwent several percutaneous coronary interventions, and in 2015 coronary artery bypass graft operation (CABG) due to significant restenosis and three vessel disease. In 2023 he was rehospitalized due to severe angina and dyspnoe. Transthoracic echocardiography showed mildly reduced systolic left ventricular ejection fraction (EF: 41%), and significant aortic valve stenosis (mean gradient 56 mmHg, peak gradient 88 mmHg, calculated aortic valve area 0.4 cm^2). Recoronarography showed good graft patency, and the previously implanted left circumflex artery stent was acceptable too. Regarding the aortic valve stenosis, the Heart Team's decision was TAVR considering the patient's age, the previous open-heart surgery with patent grafts, and the current guidelines. After a preoperative CT scan (Figure 1), we decided to perform transfemoral TAVR.

The TAVR was performed under conscious sedation and local analgesia. The right inguinal region and the left arm was shaved, sterilized, and draped. After local analgesia, the left dRA was punctured by ultrasound guidance, and a 6 F radial sheath (Radiofocus, Terumo) was inserted into the radial artery. Following that, a 5 F pigtail (Terumo) catheter was placed to the non-coronary cusp. Subsequently, also with ultrasound guidance, the right common femoral artery was punctured, and one ProGlide (Abbot Vascular) was placed as a preclosure. Na-Heparin was given until reaching 100 IU/kg. Routine activated clotting time was measured during the intervention. From femoral access a 0.035 soft tip guidewire was placed into the left ventricle through an AL1 catheter (Cordis Miami Lake). A simultaneous pressure-gradient measurement was done showing a 110 mmHg peak-to-peak gradient (Figure 2). Because of the severe aortic valve calcification showed by the CT scan, a predilatation was performed trough a 14 F femoral sheat with a 22 × 40 mm VACS III balloon (Osypka AG) under rapid pacing through a Confida wire (Medtronic Co.). After that, an Evolut R 34 mm bioprosthesis (Medtronic Co.) was implanted in the cusp overlap view. The transvalvular gradient was 6 mmHg and neither angiography nor transthoracic echocardiography showed any significant regurgitation. (Figure 2). After TAVR, the closure with a Proglide and an 8 F Angioseal (Terumo) was unsuccessful, and severe bleeding was observed through the puncture site. (Figure 3) Despite the reversal of Na-Heparin with protamine and manual compression the bleeding did not stop; therefore, a balloon assisted external compression was planned. Using the dRA, a sheathless 6.5 F JR 4 guiding catheter (Asahi) was advanced on a long Steelcore wire (0.018, 300 mm Abbot) in the distal right common femoral artery. Next using the above-mentioned guide catheter and wire we delivered a 7 × 40 × 130 mm Passeo-18 balloon (Biotronic, Germany), and balloon angioplasty was performed. Despite ballooning we observed still some bleeding, therefore we exchanged for a 300 mm long 0.035 Supra Core guidewire (Abbot), then a 7 × 57 × 140 mm OTW iCover (iVascular) stent graft was implanted under road map imaging. Postdilatation was performed with an

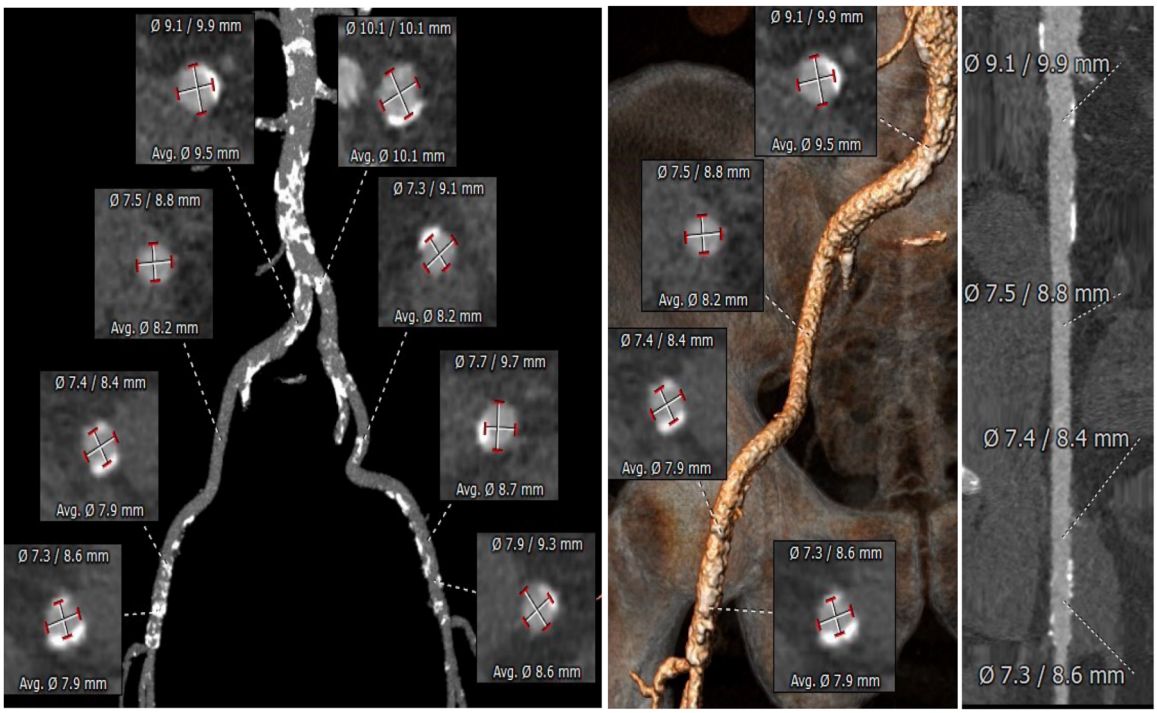

FIGURE 1 Results of the TAVR CT scan showing the descendent aorta and the detailed measurements of the right ilio-femoral artery. TAVR, transcatheter aortic valve replacement. [Color figure can be viewed at wileyonlinelibrary.com]

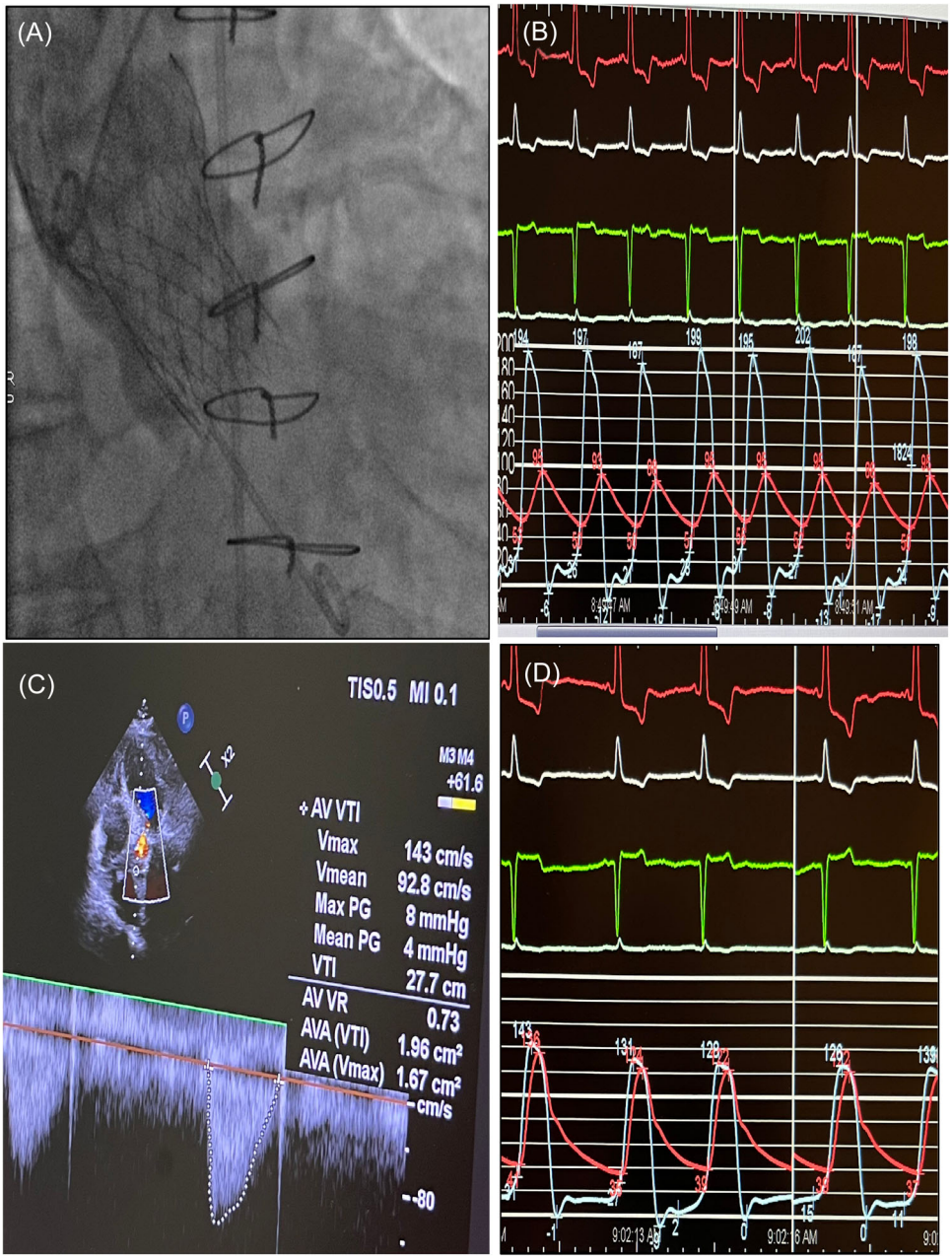

FIGURE 2 Transfemoral TAVR. (A) Evolut R 34 mm bioprosthesis with no significant paravalvular regurgitation. (B) Pressure gradient measurements before TAVR. (C) Transthoracic echocardiography with no significant paravalvular regurgitation. (D) Pressure gradient measurements after TAVR. TAVR, transcatheter aortic valve replacement. [Color figure can be viewed at wileyonlinelibrary.com]

8 × 40 × 135 mm Armada 35 balloon (Abbot). After these procedures, the bleeding stopped, and the control angiography showed trace extravasation. (Figure 3) The patient was transported to the coronary intensive care unit-according to our hospitals postoperative care protocol where he spent 2 days without any further complication. There was no need for blood transfusion, and no conduction disturbances occurred. The postprocedural echocardiography showed the same reduced systolic left ventricular ejection fraction (EF: 40%), good bioprosthesis function (mean gradient 4 mmHg, peak gradient 8 mmHg, calculated aortic valve area 1.9 cm^2) with a trace paravalvular leak. As for the antithrombotic management, we decided to continue the dual antiplatelet treatment because of the implanted stent graft. After 5 days of observation, he was discharged from the hospital.

3 | DISCUSSION

The primary access sites for TAVR are the femoral, axillo- brachial, subclavian, carotid, transapical and transcaval, and conventional secondary access sites are the radial, ulnar, brachial, and femoral arteries. The access site selection is based on imaging and on the

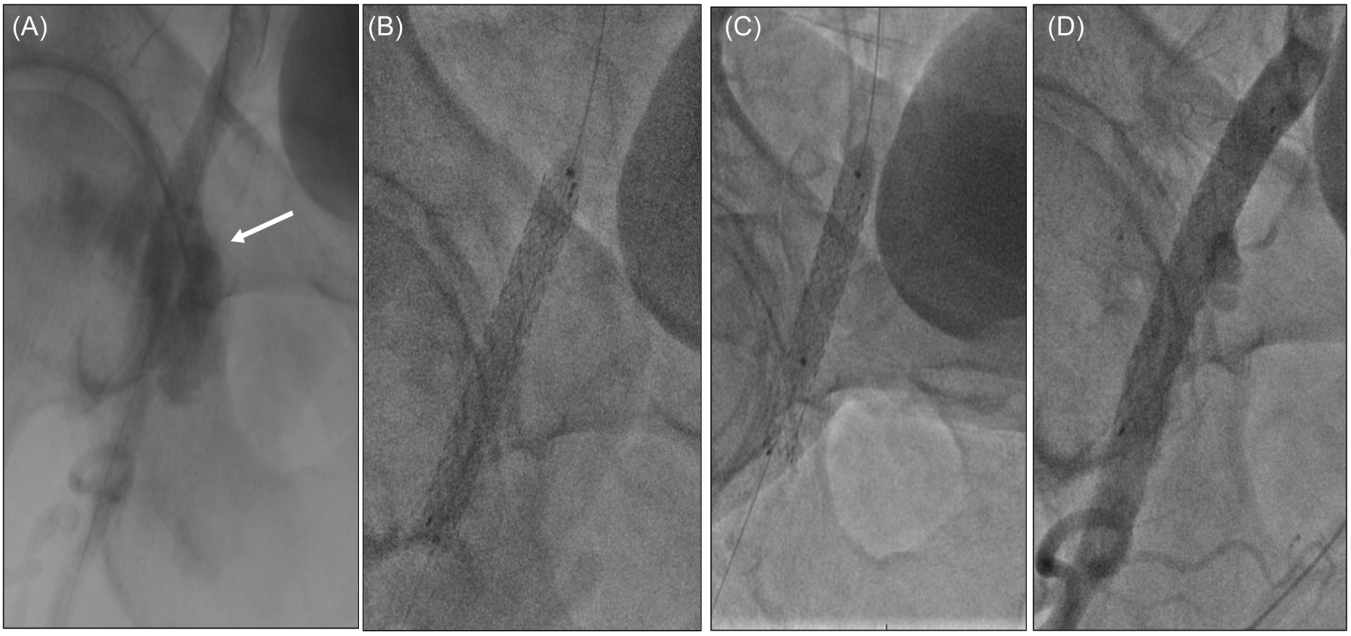

FIGURE 3 Right common femoral artery at the puncture site. (A) Bleeding after failed closure white arrow. (B) Stenting with the iCover stent graft. (C) Postdilatation. (D) Final result.

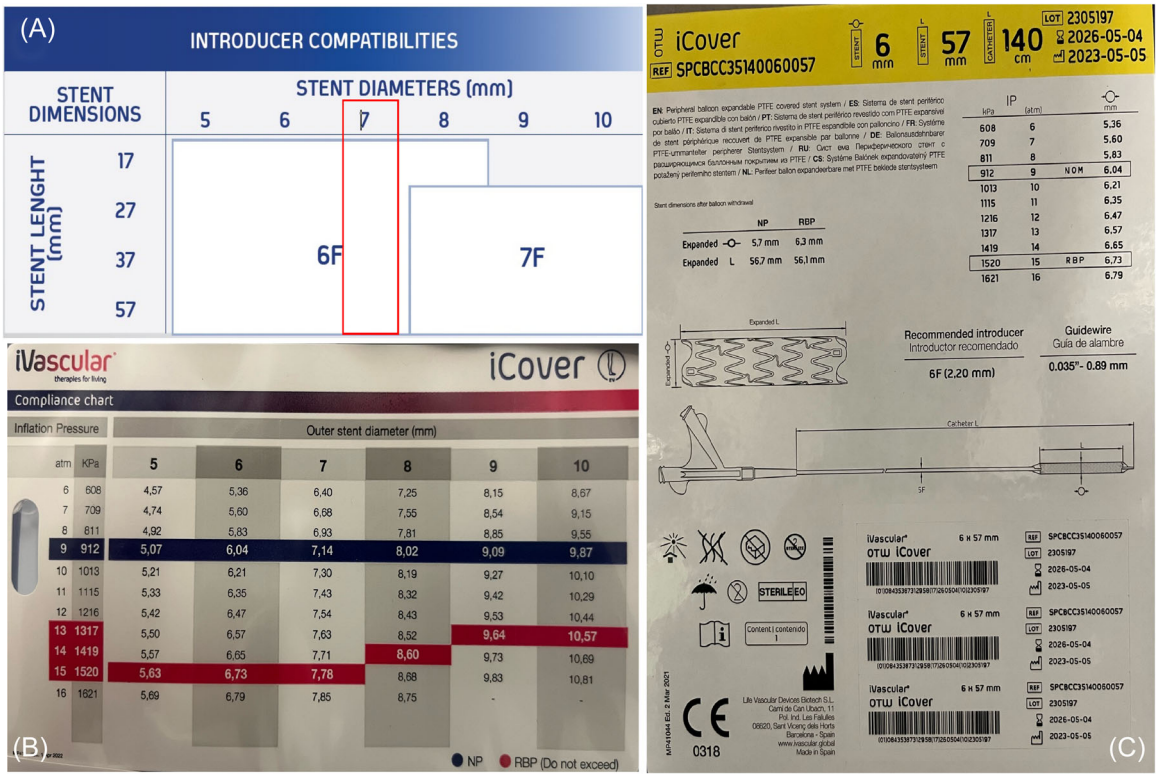

FIGURE 4 iCover stent graft specifications. (A) Introducer compatibilities, in the red box the one which could be used for bail-out stenting without changing the introducer sheat. (B) Compliance chart. (C) Device specifications. [Color figure can be viewed at wileyonlinelibrary.com]

operator's preference. Preoperative evaluation of the vascular access site (vessel size, tortuosity, and extent of calcification) is crucial to minimize the risk of complications. In the current literature, the rate of major vascular complications or bleeding are reported to be as high as 3.5–9.3% in transfemoral TAVR cases. In recent years, a clear association of their occurrence with an increased 30-day mortality can also be demonstrated in patients outside of the high-risk category.[3,4] The high prevalence of peripheral arterial disease in

conjunction with potent anticoagulation and antiplatelet regimens during the procedure further increases the risk of these complications. Vascular complications after TAVR can be treated percutaneously with a high rate of technical success, and clinical outcomes are comparable to patients without vascular complications.[5] A percutaneous treatment strategy, including the implantation of covered stent grafts for secondary vessel closure in case of incomplete arteriotomy closure, vessel perforation, rupture, or dissection is effective to rapidly stop severe bleeding. However, the use of covered stent grafts for treatment of vascular complications remains controversial, because of stent fracture, and for the possibility of stent dislodgement. Although the patency of such stent grafts is quite good also in a long-term follow up especially when they are implanted in the above the knee position.[6] Apart from the long shaft length (140 mm) and good crossing profile there are some other advantages of this novel iCover stent system like enhanced visibility due to the radiopaque markers, the wide post-expansion capacity (e.g., the 5–8 mm stengrafts have a post expansion capacity till 9–10 mm), and high flexibility thanks to open cell design and alternated links which makes it usages more applicable in tortuous vessels as well.

During transfemoral TAVR, using the contralateral femoral artery as a secondary access site carries all the above-mentioned complications. However, the use of dRA during TAVR can help to avoid the puncture of both femoral arteries. Mostly observational studies show the same efficacy as conventional radial access with some net benefits such as low radial artery occlusion (RAO) rate, shorter hemostasis, and better intraprocedural ergonomics.[2,5] The main limitations of the radial and dRA accesses to treat TAVR access site complications are the shaft length and the size of the sheath. Device related stenosis and occlusion can be treated with balloon angioplasty and stent implantation[7,8] but perforations or severe bleedings need cover stent implantations. Previously, these stent grafts were not available in small profile and long shaft length; therefore, the radial artery access was not applicable for stent graft implantation and crossover, or a lower superficial access was necessary. Stent grafts with 140 cm long shafts and 6 F sheath compatibility can solve this problem. Even with the low profile and long shaft length these devices also have some limitations when it comes to large femoral diameters like 8 mm or above in these occasions operators need to change for a 7 F sheat but can still do the procedure from dRA. (Figure 4). We use a long hydrophilic sheathless guiding (6.5 F Asahi Sheathless PV) to deliver the stent graft.

CONCLUSION

In this transfemoral TAVR case, we showed a solution for one of the common complications, namely the failure of access site closure using the dRA as a safe and effective access site to complete a femoral artery angioplasty.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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