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Balloon-Assisted Perclose Suture Delivery for Large-Bore Vascular Access Closure After Transcatheter Aortic Valve Replacement

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Introduction

Vascular complications remain an important cause of morbidity after transcatheter aortic valve replacement (TAVR).[1] In contemporary TAVR, up to 4% of patients experience a significant vascular injury, of which vessel closure complications remain a major contributor. Preclosure of the primary femoral access site using the Perclose ProGlide™ (Abbott Vascular, CA) system, in which 2 suture-mediated closure devices are deployed at the arteriotomy site, remains the most common approach to vascular closure. This approach requires the use of additional closure devices in up to 40% of patients and endovascular intervention in up to 5%.[2] Several mechanisms of Perclose failure have been reported, with malfunction of the sutures being the most common mechanism, accounting for 25% of cases.[3] In this article, we describe a method for optimization of suture-mediated closure with the Perclose ProGlide™ system, using balloon counterpressure to facilitate and confirm delivery of the suture knot to the vessel.

Case Description

A 64-year-old man with a history of end-stage renal failure on hemodialysis, human immunodeficiency virus, paroxysmal atrial fibrillation, and chronic lymphedema was admitted to the hospital with rapidly progressive dyspnea on exertion. Transthoracic echocardiography demonstrated severe calcific aortic stenosis with a peak velocity of 4.3 m/s, mean gradient of 44 mmHg, and aortic valve area of 0.9 cm^2. Left ventricular function was moderately decreased with an ejection fraction of 35-40%. There was no other significant valvular disease. Coronary angiography revealed nonobstructive disease. Gated cardiac CT demonstrated an aortic valve annular diameter of 561 mm^2 and perimeter of 85.8 mm, with adequate coronary heights for TAVR. His peripheral access was deep but suitable for transfemoral access utilizing the right side for the large-bore access site (Figure 1a; Supplemental Video 1), with minimum luminal diameters of 9.4 mm in the right common femoral artery (CFA), 8.2 mm in the right external iliac artery, and 14.5 mm in the right common iliac artery. After discussion by the heart valve team, the decision was made to proceed with TAVR with transfemoral access.

Procedure Details

Ultrasound-guided vascular access was first obtained on the contralateral (left) side, with a 6Fr sheath placed in the left CFA and an 8Fr sheath in the left femoral vein. A temporary pacing wire was placed in the apex of the right ventricle. From the left femoral arterial access, a 5Fr internal mammary artery catheter was used to cross over the iliac bifurcation and a Grand Slam wire (Asahi Intecc USA, Tustin, CA) was directed to the right superficial femoral artery. Ultrasound-guided puncture of the right CFA was performed at the level of the mid-femoral head (Figure 1b; Supplemental Video 1). Following an angiogram via a 5Fr sheath to confirm suitability of the puncture (Figure 1c; Supplemental Video 1), the vessel was preclosed using 2 Perclose devices, orientated at 10 and 2 o'clock. A SAPIEN 3 Ultra 29-mm valve was deployed under rapid pacing with an excellent result.

Abbreviations: CFA, common femoral artery; TAVR, transcatheter aortic valve replacement.

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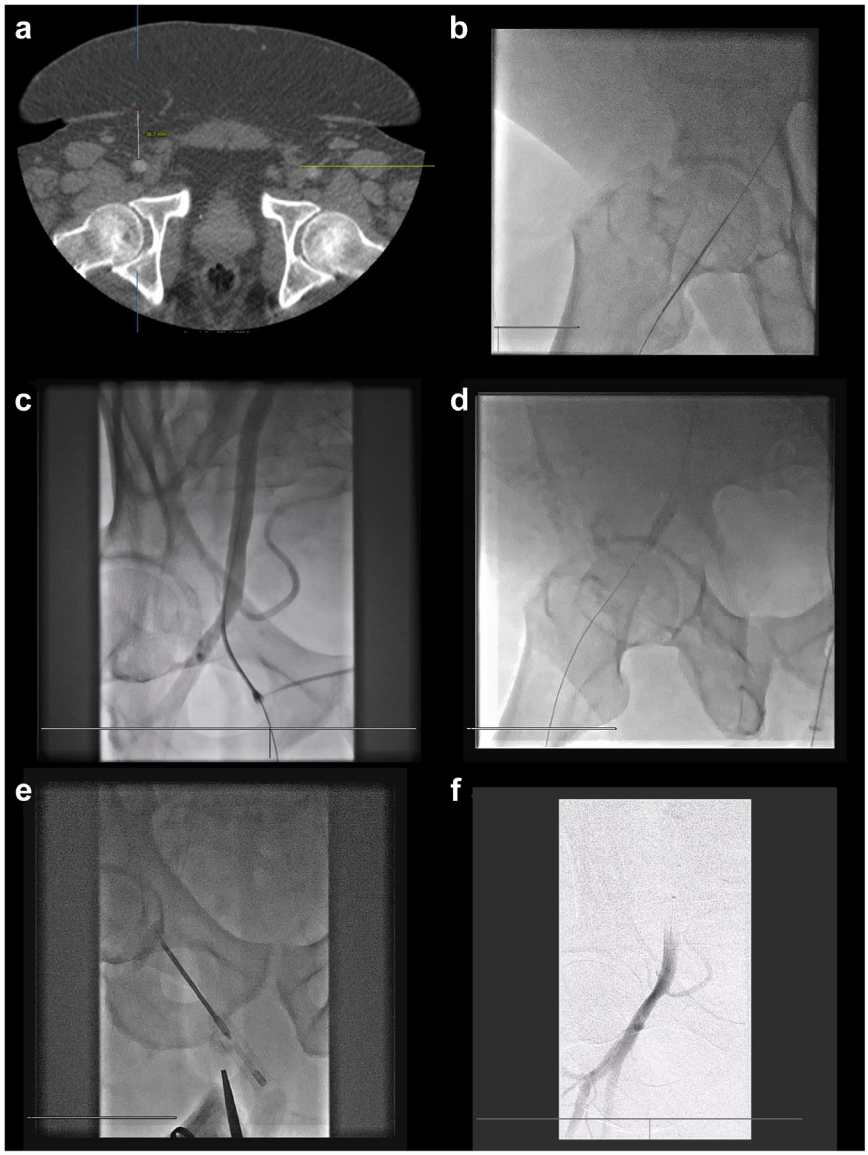

Figure 1. Procedural steps for balloon-assisted perclose suture delivery.

To facilitate and confirm delivery of the Perclose suture through the subcutaneous tissues, we performed balloon-assisted Perclose suture delivery, where a balloon in the CFA (sized in a 1:1 manner) provided counterpressure to ensure delivery of the knot down to the vessel wall. First, a 10 × 20-mm Armada 35 PTA Catheter balloon (Abbott Vascular) was loaded onto the Grand Slam wire. The Edwards E-sheath was withdrawn to the right common iliac artery over a 135-cm J-wire, to allow the Armada balloon to cross over the iliac bifurcation. The E-sheath was then fully withdrawn, and both Perclose sutures were delivered to the arteriotomy site using the Perclose Knot Pusher. To reduce bleeding during this stage, the Armada balloon was delivered to the right external iliac artery and inflated to 2 atm to reduce bleeding (Figure 1d; Supplemental Video 1). Next, the Armada balloon was deflated and advanced into the right CFA at the level of the arteriotomy site and inflated to 2 atm. The Perclose Knot Pusher was again advanced over the Perclose suture to ensure the Perclose knot was at the level of the vessel wall, which was confirmed fluoroscopically (Figure 1e; Supplemental Video 1). The Perclose suture was then locked against the balloon. Digital subtraction angiogram was performed with contrast injection through the Armada balloon to assess the closure result (Figure 1f; Supplemental Video 1). The contralateral access was subsequently closed with another Perclose device.

Balloon-assisted Perclose suture delivery facilitates successful vascular closure following large-bore access. Use of a balloon in the CFA provides counterpressure to assist delivery of the sliding suture knot and a fluoroscopic marker to confirm that the suture has been delivered to the vessel wall.

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Disclosure statement

The authors report no conflict of interest.

Supplementary Material

Supplemental data for this article can be accessed on the publisher's website.

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