

CASE REPORT

Endovascular “Intimal Flap Septostomy” for Safe Landing of a Stent Graft in an Anastomotic Pseudoaneurysm of Chronic Type B Aortic Dissection[☆]

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Objective/Background: The purpose of this report is to demonstrate a novel endovascular technique for gaining and producing the maximal landing zone for a thoracic stent graft in a patient with a chronic type B aortic dissection.

Methods: The patient was a 64 year old man with chronic type B aortic dissection. He had developed acute type B aortic dissection and undergone descending thoracic replacement (Zone 2–Th10) 12 years earlier. During follow-up, he developed an anastomotic false aneurysm distally. In the initial operation, the distal anastomosis was performed with fenestration of the dissecting membrane. Computed tomography showed a pseudoaneurysm of 54 mm that was positioned 9 cm proximal to the coeliac artery. The landing zone was < 20 mm in the fenestrated area. At surgery, the true and false lumens were each cannulated from the femoral artery, and a pull through form was made just above the fenestrated flap. After the wire exchange, a 4 mm cutting balloon was positioned on the bottom of the flap, and the flap was gently sawed about 3.5 cm.

Results: After stent graft placement no endoleak was observed. The patient was discharged without any complications.

Conclusion: This technique was effective in producing a sufficient landing zone for endovascular aortic repair in a patient with an anastomotic pseudoaneurysm of chronic type B aortic dissection.

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INTRODUCTION

Endovascular stent grafting for thoracic aortic aneurysm following chronic type B dissection is challenging. Endografting during thoracic endovascular aortic repair (TEVAR) with a dissected distal landing zone may be unreliable because of retrograde filling and pressurisation of the false lumen. A hybrid strategy represented by surgical fenestration following TEVAR has been reported to be effective,¹ although this technique still imposes invasiveness on patients and may not be suitable for those with comorbidities.

Endovascular longitudinal fenestration is a novel approach and was introduced for treatment of patients with chronic type B aortic dissection.^{2–4} Blunt wire was used in this setting for cutting the thick septum between the true and false lumens, although restive resistance force against the wire may cause errors in manipulation and distal

embolisation, and aortic injuries may occur as a potential hazard of this technique.

As a solution, an endovascular fenestration technique using a cutting balloon, named “intimal flap septostomy” (IFS), for TEVAR in a patient with anastomotic pseudoaneurysm of chronic type B aortic dissection, is presented.

CASE REPORT

The patient was a 64 year old man with a diagnosis of anastomotic false aneurysm in the descending thoracic aorta. He had a past medical history of acute type B aortic dissection with rupture and had undergone descending thoracic aortic replacement, from Zone 2 to Th 10, 12 years prior to the present admission. In the previous operation, the intima of the distal aorta was fenestrated, and the adventitia was directly anastomosed to the prosthetic graft.

Pre-operative computed tomography (CT) showed an anastomotic false aneurysm at the distal site (Fig. 1A). The maximum diameter including the aneurysm and native aorta was 54 mm, and the aneurysm was positioned 9 cm proximal to the origin of the coeliac artery. The distance between the aneurysm and the bottom of the fenestrated flap was 19 mm (Fig. 1B). However, 19 mm did not appear to be a sufficient distance for a good landing zone for TEVAR, because the form of the fenestrated flap was not

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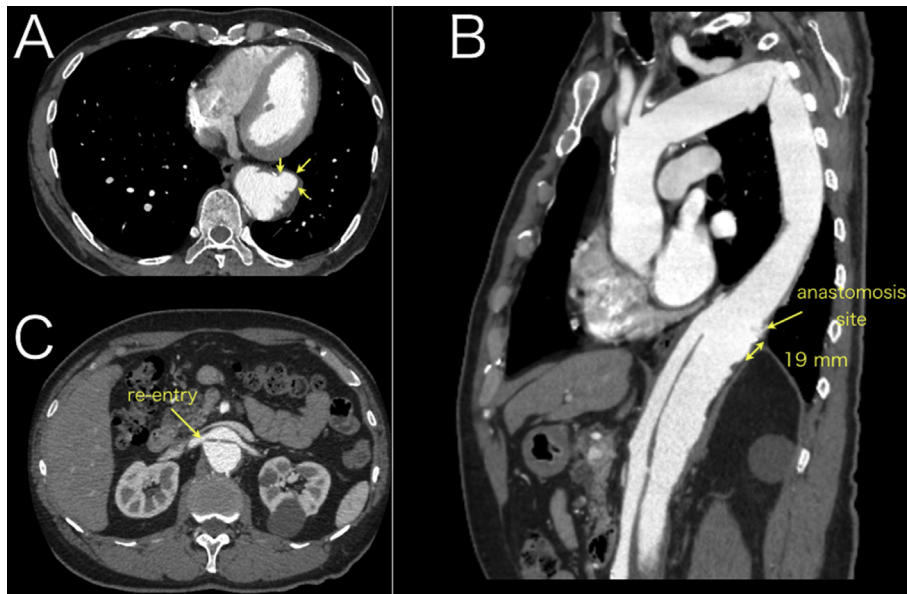


Figure 1. Findings of pre-operative computed tomography. (A) Axial view. Yellow arrows show the false aneurysm at the distal anastomosis. Maximum diameter is 53 mm. (B) Sagittal view. The distance between the anastomosis and the bottom of the fenestrated flap is 19 mm. (C) Small re-entry near the origin of the right renal artery.

rectangular, but tapered and arcuate. The diameter of the prosthetic graft was 28 mm, whereas the diameter of the native aorta distal to the aneurysm was 38 mm. A small re-entry existed near the origin of the right renal artery (Fig. 1C). The coeliac artery and left renal artery originated mainly from the false lumen.

At surgery, cut downs were made on both femoral arteries. First, a 0.035 inch hydrophilic guidewire was inserted to the true lumen from the right femoral artery. The direction of the guide wire was verified by intravascular ultrasound (IVUS). After insertion of the 18 Fr sheath (Dryseal; W.L. Gore & Associates, Flagstaff, AZ, USA), a second 0.035 inch guide wire was inserted co-axially from the right femoral artery through the same 18 Fr sheath. The false lumen was cannulated through the re-entry around the right renal artery. IVUS showed that the second guidewire ran into the false lumen from the distal true lumen. The guidewire in the false lumen was snared by that of the true lumen using a trilobed snare catheter and the pull through form was made. After changing the guide wire to a 0.014 inch micro-guidewire, 4 mm in diameter \times 12 mm long, a Small Peripheral Cutting Balloon Monorail (Boston Scientific, Marlborough, MA, USA) was advanced to the fenestrated flap (Fig. 2A). Moving the guidewire and the balloon like a wire saw (Fig. 2B), the flap was gently incised distally about 3.5 cm. The cutting area was limited in the aorta just above the coeliac artery. The angiography after the IFS showed that the distance from the anastomosis site to the bottom of the fenestration was adequate for the TEVAR. A 32 mm \times 120 mm Zenith TX-2 (Cook Medical, Bloomington, IN, USA) was first inserted from the left femoral artery and deployed proximally in the prosthetic graft. Then, a 42 mm \times 135 mm long TX-2 was inserted. The distal portion was approximately 2 cm proximal to the

bottom of the flap so as to achieve full expansion of the stent graft. The bottom of the flap was verified by the balloon and the pull through wire position. After the balloon touch up, there was no endoleak observed (Video 1; see Supplementary Material)

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ejvsr.2017.09.002>.

The patient's post-operative course was uneventful. Post-operative CT demonstrated no endoleak in the false aneurysm, and the distal landing zone was secured for 3.5 cm. The distance between the anastomosis and the bottom of the fenestrated flap was 5.2 cm (Fig. 2C).

DISCUSSION

Intraluminal endovascular fenestration using a "wire scissor manoeuvre" was first described by Beregi *et al.* for malperfusion syndrome in acute aortic dissection.²⁻⁴ They used two rigid guidewires firmly anchored with an 8-Fr sheath to cut the flap. This manoeuvre was modified in other reports and recently used for chronic type B aortic dissection combined with TEVAR and endovascular aneurysm repair.^{3,4} In these cases, the dissection flap was bluntly cut by a rigid guidewire. In chronic type B dissection, the dissected membrane was thick and organised. Therefore, it is difficult to manipulate certain parts of the cutting area by this "blunt-cutting" technique. Strong friction force due to the blunt cutting may cause unexpected wire movement and lead to injuries in the distal aorta. To prevent this issue, a cutting balloon was used to incise the intimal flap sharply. This technique allows precise control of the cutting area by a "to and fro" movement with minimum strength.

There are a few limitations in the present technique. First, there should be no thrombus in the torn area and the

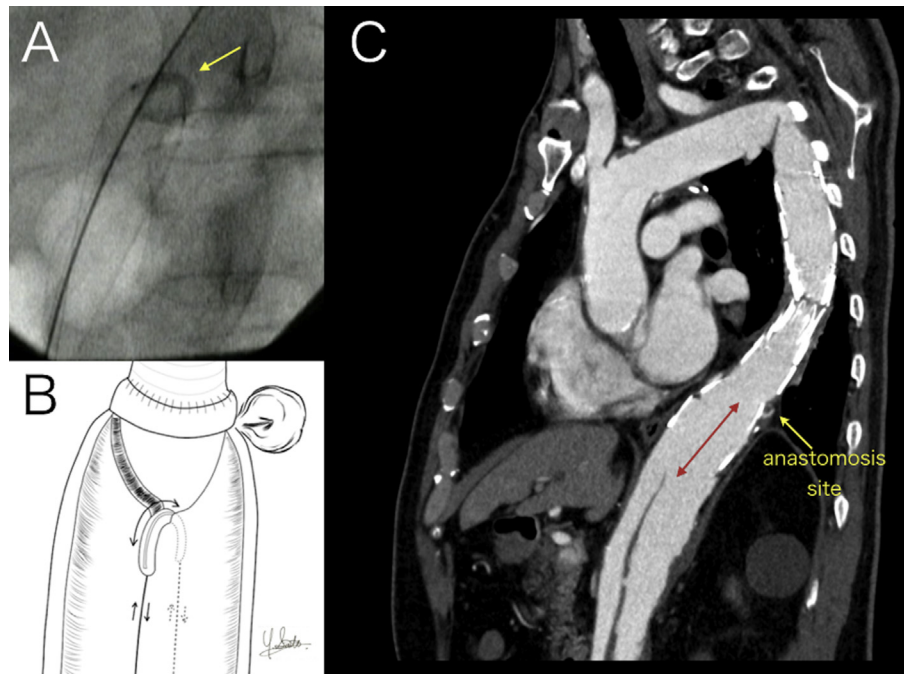


Figure 2. (A) Intra-operative findings of “intimal flap septostomy”. Yellow arrow shows inflated cutting balloon over the intimal flap. (B) Schema of the present technique. (C) Post-operative computed tomography shows a sufficient distal landing zone for the thoracic stent graft. The distance between the anastomosis and the bottom of the fenestrated flap is increased to 52 mm (compared with Fig. 1B).

projected new landing zone. In cases with thrombus in the aortic lumen (mostly in the false lumen), this technique is contraindicated because endovascular manipulation may cause visceral and lower limb embolism. Post-procedural angiography and IVUS should be performed to secure visceral and lower limb blood flow, even in cases without thrombus. Second, this technique is an adjunctive procedure for creating a landing zone in patients with chronic type B aortic dissection. Another flap penetrating device is needed for a “pull through” wire from the true to false lumens. The present case could only be managed by this technique because the patient already had a fenestrated area. In cases with no pre-fenestrated area, an approximately 5–7 cm incision on the flap is recommended to achieve full expansion of the stent graft for a safe landing zone, since this technique does not remove flap structure. When deploying the stent graft after IFS, the pull through wire for the fenestration should be gently pulled distally to confirm the bottom of the fenestrated area. This helps avoid deployment failure into the true lumen. Keeping 1.5–2 cm from the IFS wire might be sufficient for achieving full expansion of the stent graft. Long-term imaging follow-up is necessary for surveillance of the endoleak in the treated aortic segment.

In conclusion, IFS was effective for gaining a sufficient landing zone for TEVAR in a patient with an anastomotic false aneurysm of chronic type B dissection. This technique

may make TEVAR possible in more patients with chronic type B dissection aneurysms when combined with other endovascular fenestration techniques.

CONFLICT OF INTEREST

None.

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