Trans-stent graft thrombectomy for the treatment of long stent graft thrombosis in the femoropopliteal artery

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ABSTRACT

At present, no consensus has been reached regarding the optimal management of stent graft thrombosis in the femoropopliteal artery. We present a case of long thrombosis of a Viabahn stent graft implanted in the superficial femoral artery that was successfully treated by thrombectomy using a trans-Viabahn approach at the mid-thigh segment. The advantages of this approach include that it preserves the common femoral artery and popliteal artery untouched without scarring, allowing for a future site of surgical anastomosis. This technique could be a reasonable approach when performing surgical thrombectomy for stent graft thrombosis in the femoropopliteal artery. (J Vasc Surg Cases Innov Tech 2022;8:102-6.)

Keywords: Femoropopliteal artery; Reintervention; Stent graft; Thrombectomy; Thrombosis

Stent graft (SG) thrombosis is the most common form of SG failure and is a concern after SG implantation. The development of slow flow due to edge stenosis or any significant inflow or outflow disease can result in thrombosis of the entire SG, potentially leading to acute limb ischemia.[1-4] In addition, a large thrombus burden inside the thrombosed SG carries a high risk of distal embolization.[5]

In the present report, we describe a case of long Viabahn SG (W. L. Gore & Associates, Flagstaff, Ariz) thrombosis in the superficial femoral artery (SFA) that was treated by thrombectomy using a trans-Viabahn approach. The patient provided written informed consent for the report of his case details and imaging studies. The institutional review board at The Jikei University School of Medicine approved the present case report (approval no. 33-274[10892]).

CASE REPORT

A 53-year-old man had been admitted to our hospital with a complaint of recurrent lifestyle-limiting claudication of the right leg (Rutherford class 2). He had a history of peripheral artery

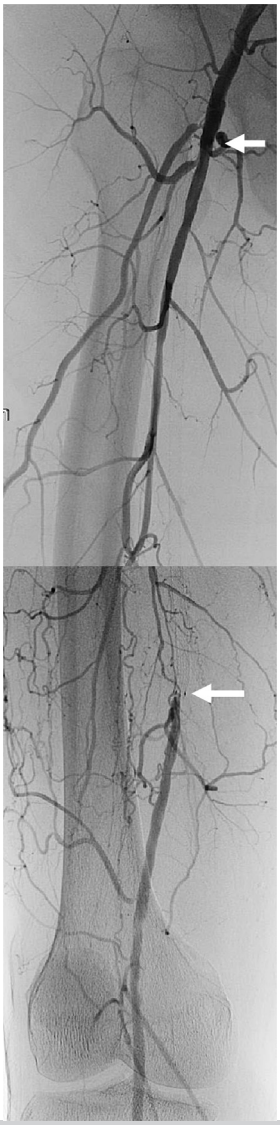

Fig 1. Initial angiogram showing occlusion of the previously implanted Viabahn stent graft (SG) extending from the ostium to the distal portion of the superficial femoral artery (SFA; *arrow*).

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Author conflict of interest: T.O. serves as a consultant to W. L. Gore & Associates. H.O., K.S., T.B., and H.T. have no conflicts of interest.

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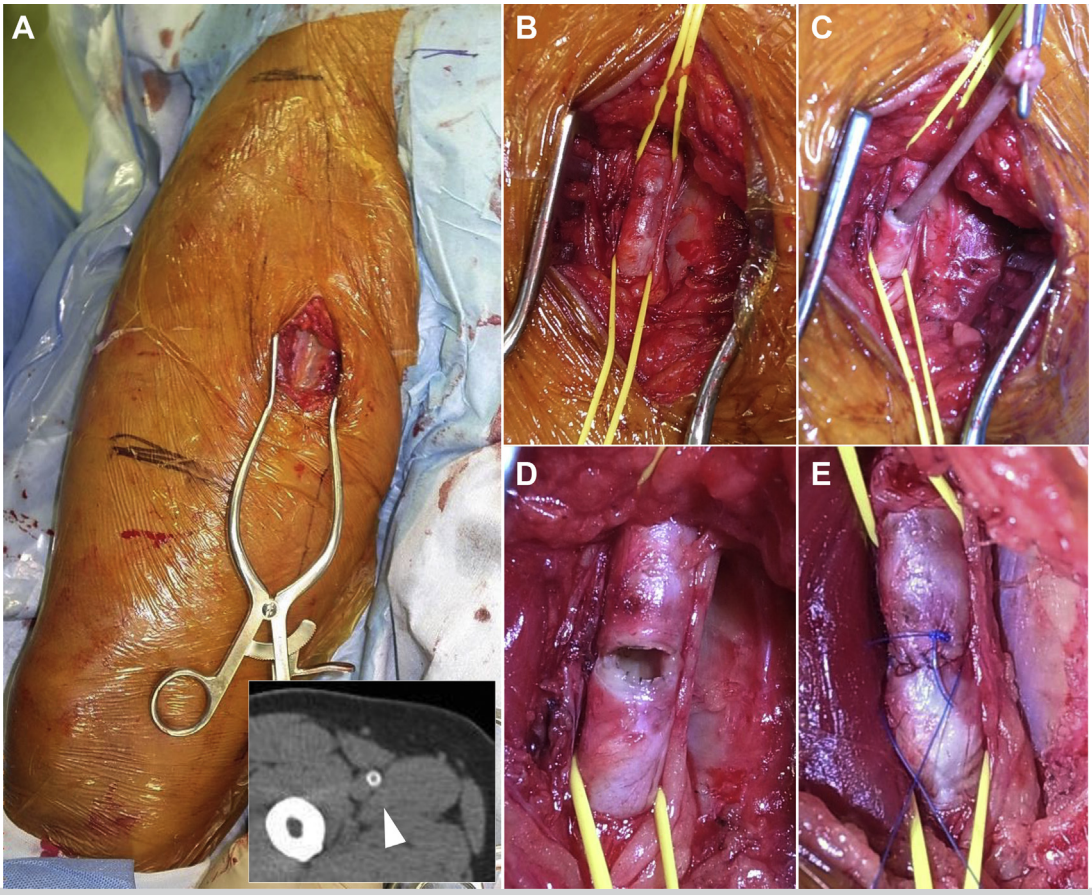

Fig 2. Intraoperative photographs. **A,** A 5-cm skin incision was made in the mid-thigh. **Inset,** Axial computed tomography image, showing that the superficial femoral artery (SFA) and Viabahn stent graft (SG) was located superficially at this site (*arrowhead*). **B,** The middle segment of the SFA was exposed. **C,** Thrombus inside the Viabahn SG was removed under direct vision and using a Fogarty balloon catheter. **D and E,** The cut Viabahn SG was closed with running 5-0 polypropylene suture.

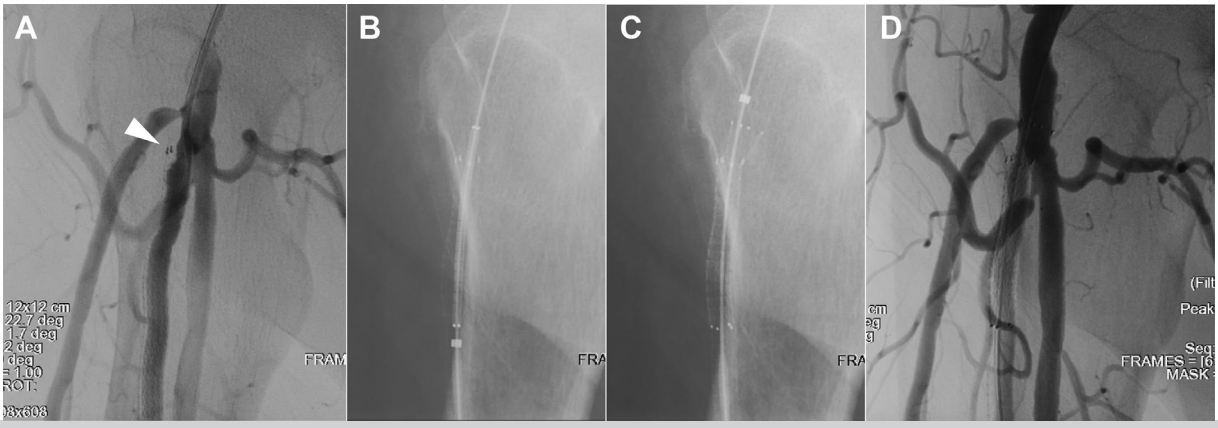

Fig 3. A, Follow-up angiogram at the proximal edge of the previously placed Viabahn stent graft (SG) showing mild stenosis at the proximal edge of the Viabahn SG (*white arrowhead*). **B and C,** Placement of an Innova stent (7 × 40 mm) to cover the proximal edge stenosis via a contralateral femoral approach. **D,** Completion angiogram showing a satisfactory outcome.

disease with previous endovascular treatment 10 months before the present event. The prior endovascular treatment of his lower extremity had included placement of a Viabahn SG (5 × 250 mm; W. L. Gore & Associates) in the right SFA for long occlusive disease. The ankle brachial index on his right leg was 0.65 compared with 0.89 at his last visit. Duplex ultrasound

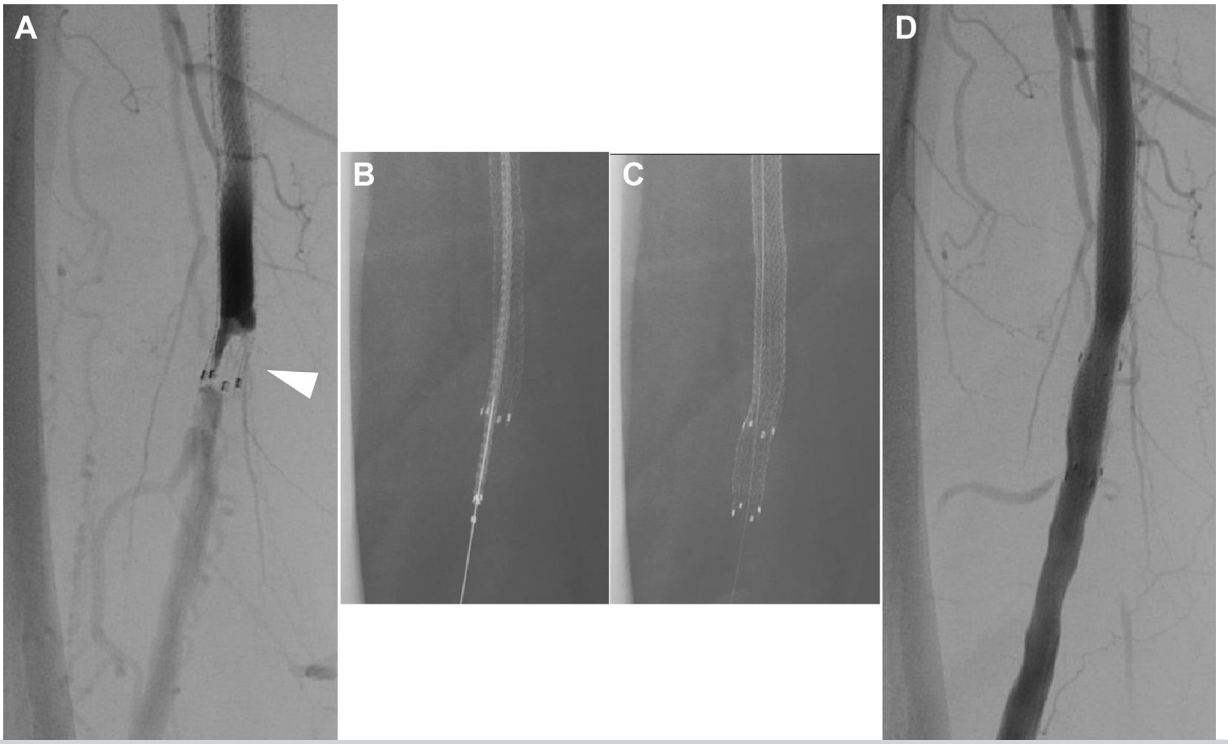

Fig 4. A, Follow-up angiogram at the distal edge of the previously placed Viabahn stent graft (SG) showing severe stenosis and residual thrombus at the edge of the Viabahn SG (*white arrowhead*). **B and C,** A Viabahn SG (6 × 250 mm) was placed to cover the distal edge stenosis. **D,** Completion angiogram demonstrating no residual stenosis in the superficial femoral artery (SFA).

imaging showed the entire length of the right SFA Viabahn SG was occluded. He was scheduled for revascularization of the occluded right SFA Viabahn SG in an elective setting.

Operative procedure. The operation was performed with the patient under general anesthesia. A 5F sheath was placed into the left common femoral artery (CFA) in a retrograde manner. The initial angiogram confirmed a thrombotic occlusion of the entire length of the Viabahn SG, extending from the ostium to the distal portion of the right SFA (Fig 1).

The decision was made to proceed with trans-Viabahn thrombectomy. Thus, surgical thrombectomy was performed from the ipsilateral mid-SFA where the Viabahn had previously been implanted. This site was chosen because the SFA and Viabahn SG were located superficially and close to the skin. A 5-cm longitudinal incision was made at the mid-thigh, and the midsegment of the right SFA was exposed after dissecting the sartorius muscle and the long adductor muscle (Fig 2). A transverse arteriotomy was performed, and the anterior wall of the previously placed Viabahn was also cut transversely. A 4F Fogarty catheter (Edwards Lifesciences, Irvine, Calif) was inserted distally from this site, and, under fluoroscopic guidance, thrombectomy along the occluded distal SFA was performed. A moderate amount of thrombus was obtained, with back-bleeding from the distal SFA. Next, the SFA and Viabahn SG was controlled with an atraumatic vascular clamp in the manner usually used for arteries. Similarly, thrombectomy along the occluded proximal SFA was performed with a moderate amount of thrombus collected. The cut Viabahn SG was closed with running 5-0 polypropylene, after which antegrade flow of the right SFA was restored.

Angiography performed from the left CFA showed removal of a large amount of thrombus. However, residual thrombus in the Viabahn SG and mild stenosis at the proximal edge (Fig 3) and severe stenosis at the distal edge of the Viabahn SG (Fig 4) were seen, both of which were thought to be culprit lesions. The left femoral sheath was, therefore, upgraded to a 6F guiding sheath, which was advanced over the top and into the right CFA. Balloon angioplasty of both edges of the Viabahn SG was performed, followed by placement of an Innova stent (7 × 40 mm; Boston Scientific, Marlborough, Mass) in the proximal edge and a Viabahn SG (6 × 250 mm; W. L. Gore & Associates) to cover the distal edge stenosis and the subtotal length of the previously deployed Viabahn SG. The final angiogram demonstrated no filling defects or residual stenosis in the SFA (Fig 5).

Postoperative course. The postoperative course was uneventful. At a follow-up of 33 months, the right SFA had remained patent, although balloon angioplasty was required and performed for mild in-stent restenosis at the proximal edge of the Viabahn 16 months after thrombectomy.

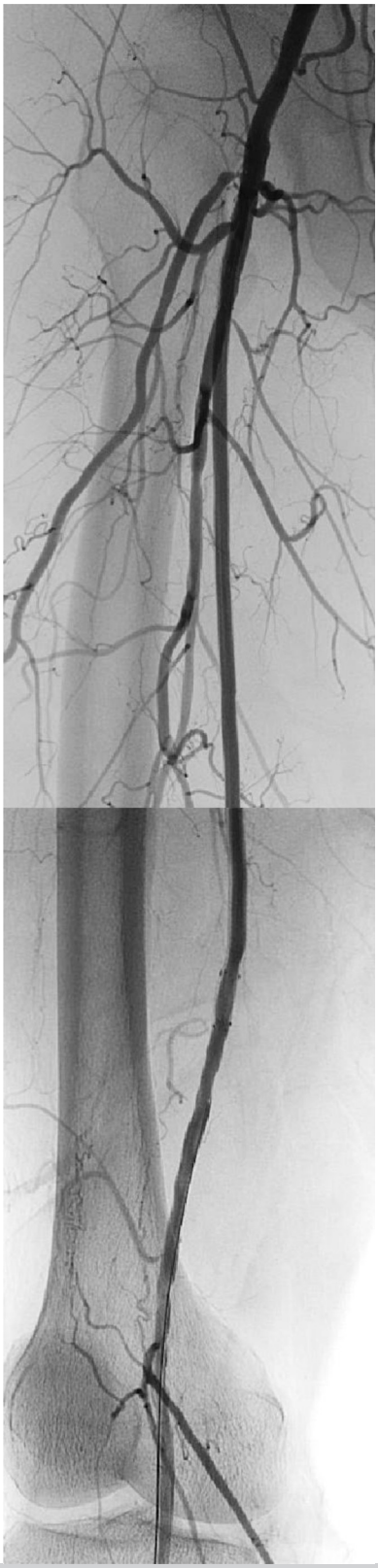

Fig 5. Final angiogram showing excellent restoration of flow for the superficial femoral artery (SFA) without any filling defects or residual stenosis.

DISCUSSION

We performed surgical thrombectomy using a trans-Viabahn approach for the treatment of a long Viabahn SG thrombosis in the SFA, resulting in excellent restoration of the SFA flow and a favorable postoperative course. In this technique, the mid-segment of the previously deployed SFA Viabahn SG was exposed and cut open. Next, we performed surgical thrombectomy proximally and distally, with no need for exposure of the CFA or the popliteal artery (PA). After suturing the cut Viabahn, additional endovascular procedures such as balloon angioplasty and/or stenting for edge stenosis and relining the thrombosed Viabahn with an additional Viabahn SG can be performed via a contralateral femoral approach.

Several treatment options are available for revascularization of SG thrombosis in the femoropopliteal (FP) artery, although no consensus has been reached regarding the optimal treatment method. In general, the revascularization strategy will consist of procedures for the thrombosed SG such as surgical thrombectomy, mechanical thrombectomy, and thrombolysis, and optional angioplasty or stenting for the culprit edge stenosis. Bypass conversion should be the last resort to treat SG thrombosis. Below-the-knee FP bypass or distal bypass will often be the option, especially in cases of a more severe clinical setting of thrombosis. Although endovascular intervention should be considered, mechanical thrombectomy devices are not available in Japan, and conventional catheter-directed thrombolysis alone has some disadvantages, including the time required to restore blood flow, the requirement for follow-up angiography, and the risk of bleeding complications. In addition, some patients have contraindications to thrombolysis. Therefore, without the option of mechanical thrombectomy, surgical thrombectomy is a viable option at present in Japan.

The outcomes after revascularization of SG thrombosis have generally been unsatisfactory. Golchehr et al[6] reported that the patency at 6 months after revascularization for SG thrombosis was 56%. Furthermore, in a recent retrospective multicenter study, Ichihashi et al[7] reported that about one half of the patients had experienced recurrent thrombosis within 1 year.

The trans-Viabahn approach has several advantages. Surgical thrombectomy is usually performed by exposure of either the CFA or PA. However, using the trans-Viabahn approach, it is possible to maintain the CFA and PA as a virgin field, preventing scarring and preserving these for future surgical anastomosis if a bypass is required. Furthermore, we can use this approach multiple times in the case of recurrent thrombosis, because the mid-SFA can be exposed nearby from a previous cut-down site. Also, this approach can be performed with the patient under local anesthesia for patients at

high risk for general anesthesia. Finally, the trans-Viabahn approach allows one to remove the thrombus using a Fogarty catheter equally effectively both proximally and distally.

For treatment of the remnant, culprit edge stenosis in the previously placed SG, using the trans-Viabahn technique, one can perform additional endovascular procedures via the contralateral femoral artery remote from the lesion and/or the surgical incision, thereby making the additional procedure more comfortable and easier. For cases in which stenosis at the site of arteriotomy has occurred, it can be treated simultaneously by stenting.

CONCLUSIONS

We believe that thrombectomy via a trans-Viabahn approach is advantageous because it enables easy exposure of the mid-SFA and leaves the CFA and PA untouched to serve as a future site for bypass anastomosis. We also believe this technique could be a reasonable approach when performing surgical thrombectomy of Viabahn SG thrombosis in the FP artery.

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