Total Viabahn endoprosthesis collapse

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We present a case of Viabahn (W. L. Gore & Associates, Flagstaff, Ariz) collapse during popliteal artery aneurysm treatment. An elderly man with severe comorbidities presented with a 34-mm popliteal artery aneurysm. Proximal and distal landing sites of 11 and 9 mm, respectively, demonstrated by preoperative computed tomography angiography were confirmed by intraoperative angiography. After Viabahn deployment, angiography revealed a filling defect in the distal popliteal graft with poor flow. Balloon dilatation failed. A femoropopliteal bypass with aneurysm ligation was performed. Transection of the distal popliteal vessel demonstrated complete infolding. Our choice of grafts represented 15% to 18% proximal and distal oversizing. Focal areas of relative vessel narrowing may lead to incomplete graft unfolding and graft failure. (J Vasc Surg 2008;47:454-6.)

Popliteal artery aneurysm (PAA) is the most prevalent peripheral aneurysm.1 The natural history of asymptomatic PAA demonstrates a 1-year complication rate of 24% increasing to 68% at 5 years.2 Lower extremity ischemia due to acute thrombosis or distal embolization of aneurysm thrombus is the most frequently reported complication, with limb loss a common end result.

Results of elective open repair of asymptomatic PAA have been shown to be superior to those of symptomatic aneurysms for graft patency, postoperative complications, and limb salvage.3,4 Therefore, elective repair is generally recommended for those aneurysms >20 mm or those with mural thrombus, or both.4

Open surgical repair still remains the standard approach to PAA. However, interest in a less invasive approach has grown since the first description of an endovascular PAA repair using a homemade device by Marin et al in 1994.6 Adequate preoperative planning and sizing is paramount to any endovascular aneurysm repair. We present a case of a failed endovascular PAA repair secondary to infolding of the Viabahn stent graft (W. L. Gore & Associates, Flagstaff, Ariz).

CASE REPORT

A 76-year-old man presented with multiple asymptomatic peripheral aneurysms, including bilateral PAA. He was stratified as a high-risk surgical candidate because of his significant medical history, which included hypertension, coronary artery disease, thrombocytopenia, and therapy with high-dose prednisone and Cellcept (Roche, Tinley, NJ) for autoimmune disease. His surgical history included uneventful endovascular repair of bilateral common iliac artery aneurysms and an abdominal aortic aneurysm.

Duplex ultrasonography revealed bilateral superficial femoral and popliteal artery aneurysms. Secondary to his multiple medical problems, an endovascular approach with a Viabahn stent graft was planned. Preoperative computed tomography angiogram (CTA) with reconstruction was used for stent graft sizing (Fig 1). Although smaller, the left aneurysm (34 mm diameter) contained a higher thrombus burden and was scheduled for repair, followed by a delayed right-sided repair. The aneurysmal arterial segment extended from the proximal superficial femoral artery to the distal popliteal artery with proximal and distal luminal landing zones on preoperative CTA of 11 mm and 9 mm, respectively.

Intraoperative angiography confirmed preoperative diameters using a calibrated Magic Torque (Boston Scientific, Natick, Mass) wire, and five Viabahn stent grafts were deployed distally to proximally as follows: two 11-mm × 10-cm grafts distally, followed by three 13-mm × 10-cm grafts proximally, with a minimum of 2-cm overlap between stent grafts. In the 11- and 13-mm-diameter devices, 10 cm is the longest available stent graft. Longer stent

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Fig 1. The preoperative computed tomography angiography used for planning and sizing is shown. A, The proximal landing zone in the superficial femoral artery measured 11 mm in diameter. B, The maximum diameter of the popliteal aneurysm was 24 mm with intraluminal thrombus. C, D, The diameter of the distal popliteal landing zone measured 9 mm.
grafts are available for small diameter grafts. There was never a “double overlap” of stent grafts.

Device junctions were ballooned appropriately, and postdeployment angiography with the knee bent revealed no flow in the distal graft (Fig 2). Multiple attempts at repeat balloon dilatation with up to a 14-mm noncompliant balloon were made without improvement. The procedure was converted to an open femoropopliteal bypass using ringed 6-mm polytetrafluoroethylene with aneurysm ligation. The bypass was performed with a prosthetic device to minimize operative time and dissection in this critically ill patient. Transection of the distal popliteal vessel revealed infolding with incomplete expansion of the Viabahn graft (Fig 3). A postoperative CTA confirmed a patent postoperative femoropopliteal bypass with in situ multisegment stent graft infolding throughout the length of the leg (Fig 4).

DISCUSSION

Since its introduction in 1994, endovascular repair of PAA has been shown to be technically feasible. The largest prospective series by Tielliu et al in 2005 showed a primary and secondary patency of 80% and 90% at 1 year and 77% and 87% at 2 years. These patients were treated with an older generation Hemobahn design (W. L. Gore), and they too experienced stent graft infolding. Although the patency rates are promising, long-term outcomes remain unknown.

The recommend sizing of the Gore Viabahn device includes 5% to 20% oversizing relative to the native vessel. Our measurements based on both the CTA and intraoperative arteriogram showed the native vessel to be 11 mm and 9 mm at the proximal and distal landing zones, respectively. We chose 13- and 11-mm grafts, representing a respective oversize of 15% and 18%, which is near the upper end of the percentage of oversizing recommended in the instructions for use (IFU). However, the IFU do state that a 10-mm graft should be used for a 9-mm lumen. We used an 11-mm stent graft, which in this case was clearly too large.

Furthermore, use of the Viabahn stent graft to treat PAA is off-label. We based our sizing on the recommendations in the IFU, which is for the tracheobronchial tree and not for aneurysmal vessels. An indication is not available for PAA because there are inadequate data on the safety and efficacy of any sizing guidelines for this use. The off-label nature must not be subverted by the assumption that sizing guidelines for the tracheobronchial tree are appropriate for a different indication.

Fig 2. A, Intraoperative angiography after stent graft deployment revealed complete cessation of flow when the knee was bent at 90°. B, A filling defect consistent with graft infolding was noted when the leg was straight.

Fig 3. The distal popliteal artery was transected when performing the femoral below knee popliteal bypass. A Viabahn (W. L. Gore & Associates, Flagstaff, Ariz) stent is observed, completely infolded (arrow). The gross pathology suggests inappropriate oversizing in this segment.
and 13 mm) deploy by unfolding. These larger grafts are packaged by being flattened and rolled onto the delivery shaft. We believe that our grafts did not have enough room to completely unroll. In addition, postdeployment angioplasty would not allow the graft to fully deploy once infolding occurred. We therefore advise caution when sizing these larger, rolled, Viabahn endografts. We suggest a maximum of 5% to 10% oversizing when these larger Viabahn grafts are used for the treatment of aneurysmal disease.

Furthermore, angioplasty of stenotic lesions in the attachment zones before stent graft deployment and angioplasty after placement of each device may help prevent endoprosthesis collapse.

CONCLUSION

Although endovascular repair of popliteal artery aneurysms is a feasible alternative to open repair in select patients, meticulous sizing of the target vessel is critical to successful deployment. Care must be taken when utilizing the larger Viabahn devices, and careful attention to these areas before device deployment may improve technical success.

REFERENCES
