

Management of a large ruptured popliteal artery aneurysm involving combined deployment of a covered stent graft and evacuation of popliteal fossa hematoma

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ABSTRACT

Popliteal artery aneurysms (PAAs) are the most common of all peripheral aneurysms. However, ruptured PAA is rare, accounting for approximately 2% of PAA presentations. A literature review found only 11 published cases of ruptured PAAs treated with endovascular repair. In this case, a large (6.9 cm in diameter) ruptured PAA was successfully treated with endovascular repair using the GORE VIABAHN (W. L. Gore & Associates, Flagstaff, Ariz) stent graft and had simultaneous evacuation of popliteal fossa hematoma through a medial distal thigh incision. This facilitated more rapid recovery of mobility, reduced pain, and reduced hospital stay and may represent a useful hybrid surgical approach for this rare condition. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:27-30.)

Keywords: Popliteal; Artery; Aneurysm; Rupture; Stent

Popliteal artery aneurysms (PAAs) are the most common of all peripheral aneurysms.¹ However, ruptured PAA is rare, accounting for approximately 2% of PAA presentations.² The majority of PAA presentations are either asymptomatic or related to symptoms of embolism or thrombosis with subsequent acute limb ischemia.³ Repair options for PAAs include open repair (including bypass or interposition grafting using autogenous or synthetic conduit) and endovascular repair in anatomically suitable patients with a covered, self-expanding stent.⁴

There are no guidelines with respect to optimal management of a ruptured PAA.⁵ Two relatively recent cohort studies investigating outcomes of endovascular repair for all types of PAAs found that endovascular treatment was not inferior to surgical repair.^{4,6} In these two cohort studies, there was only one case of ruptured PAA managed with placement of a covered stent.⁴ A systematic review and meta-analysis of endovascular popliteal aneurysm repair in all settings (asymptomatic, thrombosed, ruptured) using the GORE VIABAHN (W. L. Gore & Associates, Flagstaff, Ariz) stent graft (a polytetrafluoroethylene [PTFE] stent graft) found no difference in primary patency between surgical repair and endovascular repair for these aneurysms.⁶ Interestingly, endovascular stenting of popliteal artery

pseudoaneurysms in patients after orthopedic surgery is quoted to be as high as 88% in a French review.⁷ Although the antegrade approach is most commonly used, there are reports of combined antegrade and retrograde popliteal artery recanalizations in the setting of chronic occlusions⁸ and one case report of a retrograde popliteal approach for a femoral pseudoaneurysm.⁹ A literature review found only 11 published cases of ruptured PAAs treated with endovascular repair,⁵ 9 of which were for nonmycotic ruptured PAAs, as was the case in our patient. Complication rates were significant, with at least three patient deaths shortly after the endovascular repair (27%) and two cases with wound complications (18%).⁵ Length of in-hospital stay, duration of immobility, and intraoperative evacuation of hematoma were not recorded or reported in these published cases. There are only three published case reports of PTFE stent graft infections in the lower extremity.¹⁰⁻¹²

This institution managed a case of a large (6.9 cm in diameter) nonmycotic ruptured PAA, which was successfully treated with endovascular repair using the GORE VIABAHN stent graft and evacuation of popliteal fossa hematoma through a medial distal thigh incision. None of the previously published 11 cases of ruptured PAAs were treated with the combined technique of endovascular intervention and hematoma evacuation. This novel hybrid approach resulted in a rapid recovery for this immunosuppressed patient.

CASE REPORT

A 68-year-old man presented to the emergency department of a regional hospital with a 4-day history of intermittent posterior right knee pain that became severe and constant that afternoon. He was unable to mobilize, and the pain and swelling progressed during the several hours it took for transfer of the patient to this tertiary institution. His background history was significant for seronegative polyarthropathy necessitating prednisone and methotrexate treatment. The patient reported a

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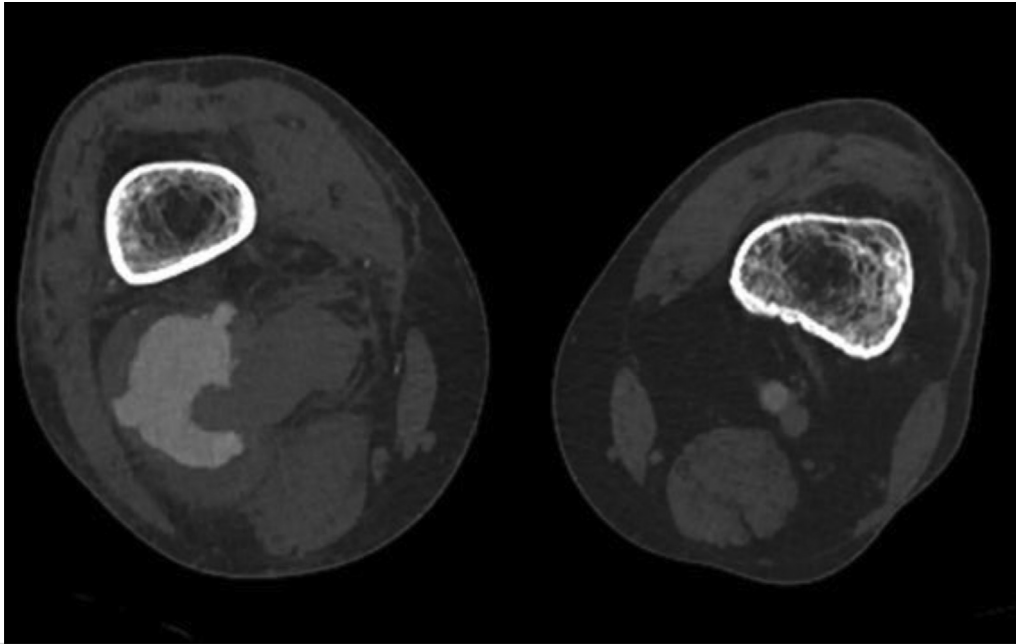


Fig 1. Computed tomography (CT) angiogram showing ruptured right popliteal artery.

strong family history of aneurysms, including his father, who had treatment of bilateral popliteal aneurysms and an abdominal aortic aneurysm. On examination, he was noted to have significant popliteal fossa swelling that was both tender and pulsatile. Femoral, dorsalis pedis, and posterior tibial pulses were of normal character and caliber. Lower limb sensation and motor function were intact and normal. On examination of the abdominal aorta and contralateral leg, there were no other detectable aneurysms or any other abnormal clinical findings. Computed tomography (CT) angiography (Fig 1) revealed a 6.9-cm right PAA that had ruptured at the medial aspect of the aneurysm sac, with a large hematoma forming in the popliteal fossa. CT angiography confirmed no other aneurysmal disease. The popliteal artery below the aneurysm was patent but appeared flattened focally before showing normal opacification of the three-tibial vessel runoff below. The aneurysm was thought to be most likely degenerative in origin and less likely to be mycotic, given the patient's strong family history of aneurysmal disease. The possibility of a mycotic aneurysm was also thought to be less likely because there were no features of sepsis or infection in the patient's presentation.

The patient was taken to the operating room immediately, where he underwent surgical repair. An endovascular stent graft approach was deemed most suitable for this patient because of the emergency presentation, the history of immunosuppression, and the very large and hostile anatomy of the ruptured PAA, with surgical bypass and interposition grafting less appropriate options. A longitudinal groin incision to expose the common femoral artery allowed accurate antegrade placement of a 9F sheath into the origin of the superficial femoral artery. The patient received systemic heparinization and a Bern catheter was introduced, followed by a Glidewire (Terumo Interventional Systems, Somerset, NJ) that crossed the aneurysm into the healthy

distal popliteal artery. The catheter was advanced over the wire, and then the Glidewire was exchanged for a 0.018-inch guidewire. An 8-mm-diameter by 10-cm-long GORE VIABAHN endoprosthesis was placed over the guidewire and successfully deployed. Angiography (Fig 2) showed successful exclusion of the bleeding aneurysm with preserved distal runoff. The sheath was removed and the arteriotomy repaired with 6/0 Prolene suture. The patient underwent reversal of systemic heparinization with administration of intravenous protamine. The large hematoma occupying the entire above-knee popliteal fossa was evacuated through a 10-cm-long longitudinal distal medial thigh incision over semimembranosus. Both incisions were closed in layers with absorbable Vicryl and Monocryl sutures. Ongoing bleeding was minimal, and so no surgical drains were used.

The patient was cared for in a vascular surgery ward and mobilized with physiotherapy assistance on postoperative day 1. Pain was controlled and the patient was discharged home on postoperative day 5, at which time he was tolerating a normal diet and mobilizing independently without the use of a walking aid. The patient was treated with dual antiplatelet therapy (aspirin and clopidogrel) postoperatively. Duplex ultrasound scan and CT angiography (Fig 3) have subsequently shown the stent graft to be patent with no evidence of extravasation or in-stent restenosis.

The patient has provided written consent for publication of the case details and medical images.

DISCUSSION

Ruptured PAAs are rare, and only a few cases of management with endovascular covered stents have been reported in the published literature. None have described the technique of simultaneous hematoma evacuation. In a patient with immunosuppression, any



Fig 2. Angiography showing deployed stent and no extravasation of contrast material.

surgical incision (even to evacuate hematoma) carries with it an increased risk of infection. It resulted in marked reduction in postoperative swelling that allowed more rapid recovery of function and discharge home. Alternative techniques of repair, such as an interposition vein graft or surgical bypass (also with vein), carry a low risk of infection. However, case reports of infected PTFE stent grafts are very few,¹⁰⁻¹² and so in this emergency setting, the endovascular approach was deemed most appropriate, with less infection risk than with surgical bypass or interposition grafting (even with autologous vein conduit). Given that the previously published cases do not describe length of stay or mobility outcomes, it is



Fig 3. Postoperative computed tomography (CT) angiography reconstructed image showing covered stent and no evidence of extravasation of contrast material.

difficult to compare the efficacy of this treatment. A review of the literature shows promise for patency rates for endovascular stenting in the setting of ruptured PAA, but this is based on 11 published cases only. It is uncertain whether long-term patency rates for endovascular stenting in the ruptured nonmycotic PAA setting will be equivalent to 5-year patency rates in the elective setting, which are quoted as high as 77%.¹³

CONCLUSIONS

This institution successfully managed a case of ruptured PAA using a combined endovascular stent graft approach and surgical evacuation of hematoma, which allowed a more rapid return of independent function and mobility in an immunosuppressed patient. This may have reduced the patient's hospital stay and prevented further complications. The technique should be considered in patients who are anatomically and physiologically appropriate, given the results described here.

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