

Open Posterior Approach to Popliteal Aneurysm Repair Prevents Sac Enlargement from Endoleak and Is Better than Endograft Repair and Ligation and Bypass

NOTES

Wesley S. Moore, MD, Los Angeles, CA; Bryce Beseth, MD

Objective of Repair

Prevention of Thromboembolism Leading to Limb Loss
The most common complication associated with popliteal artery aneurysm is the risk of thrombosis or thromboembolism leading to distal occlusion with limb-threatening ischemia. In spite of modern approaches for thrombectomy and/or thrombolysis, once thromboembolism occurs there is a significant risk of severe ischemia leading to amputation.

Prevention of Aneurysm Rupture

Popliteal artery aneurysm rupture is a relatively rare occurrence, but can happen. Once this occurs, it is an acute surgical emergency, and in spite of timely and emergent surgical repair, will result in significant morbidity and risk of limb loss.

Prevention of Mass Effect

As popliteal artery aneurysms enlarge, there is a mass effect with compression of the popliteal vein and nerves.

History

Ligation

This approach is of historical interest only. Prior to the availability of direct repair, ligation was used to prevent enlargement as well as thrombotic propagation.

Direct Repair with Interposition Grafting

Once prosthetic graft materials became readily available, the possibility of aneurysm resection with interposition grafting was realized. The early experience with this technique, while brief, was quite satisfactory.

Ligation and Vein Bypass

As a consequence of the early experience with bypass grafting for infrainguinal arterial occlusive disease, vein bypass was recognized as providing superior patency to prosthetic bypass. Thus, with no evidence whatsoever, this observation was translated to popliteal artery aneurysm as well. It was thus presumed that patients with popliteal artery aneurysm would be better served with an autogenous saphenous vein bypass. Since the harvest of the saphenous vein was made easier with the patient in a supine position, the technique of proximal and distal ligation of the popliteal artery aneurysm in combination with femoral-to-popliteal bypass using reversed autogenous saphenous vein was introduced.

Endovascular Repair

With the advent of the endovascular surgical era, the possibility of placing an endovascular graft to bridge the popliteal artery aneurysm became both attractive and feasible. This was initially performed with bench-fabricated devices utilizing grafts compressed into a delivery sheath and secured with balloon expandable stents at the proximal and distal extent. More recently, commercially available prosthetic devices have been tried, and there is now a limited literature concerning their long-term results.

Reintroduction of the Posterior Approach with Prosthetic Interposition Grafting

Several centers, including our own, have continued to use the posterior approach for repair of popliteal artery aneurysm with reconstruction using prosthetic interposition grafting. This report will examine our own institutional experience and compare it with other options.

The UCLA Experience

My personal approach to popliteal artery aneurysm repair, since completion of my residency training, has been the posterior approach with open aneurysm repair and interposition grafting. The operation can be performed under either regional or general anesthesia. A vertical incision is made across the popliteal fossa. The fascia is opened. The short saphenous vein and sural nerve are identified and protected. The popliteal vein and nerves are identified and carefully mobilized. The dissection is carried proximally until the junction between normal artery and aneurysm are identified. Occasionally, it is necessary to divide the fascial area of the adductor muscle (the adductor hiatus) to gain control of the distal superficial femoral artery as a better point for a proximal anastomosis. The distal portion of the aneurysm is then exposed and dissection carried down to the point where the normal distal popliteal artery, proximal to the take-off of the anterior tibial artery, is identified and circumferentially mobilized. The patient is then systemically heparinized with 5,000 units of heparin. The artery is clamped proximally and distally. The popliteal aneurysm is then opened, and the thrombus is evacuated. Suture ligation of geniculate vessels that are actively backbleeding can be simply carried out much in the same way as one controls lumbar arteries in an abdominal aortic aneurysm. Once the field is hemostatic, preparation is made for interposition grafting. It is often possible to divide the artery proximally and distally, and with increased mobilization the distance between the proximal and distal extent of normal artery can be shortened. Rarely, a primary anastomosis between proximal popliteal artery and distal popliteal artery can be carried out. More commonly, an interposition graft is required, but the length of the graft is usually quite short. Most commonly, I will use an 8.0 mm knitted Dacron graft, but have also used a 6.0-mm thin-walled PTFE with satisfactory results. End-to-end anastomoses are constructed with running 5-0 prolene sutures in a continuous fashion. Blood flow is restored, and attention is turned to closure. The subcutaneous tissues are approximated with an absorbable suture, and the skin can either be closed with staples or a subcuticular absorbable suture. We currently place an Op-Site dressing over the wound for ease of observation and to provide a waterproof environment.

From December 1981 through June 2003, 42 popliteal artery aneurysms in 35 patients were repaired using the posterior approach with interposition prosthetic grafting. All of these repairs were elective. The mean aneurysm diameter was 2.9 cm with a range of 1.9 to 6.2 cm in diameter. Indication for smaller aneurysm repair was the presence of thrombus as documented by duplex ultrasonography. There were no postoperative deaths or thromboses. The mean hospital stay was 3.2 days, and the median stay was 2 days. Following discharge, patients are encouraged to ambulate, and the presence of a waterproof dressing allows them to resume their normal bathing activity.

The mean follow-up of this group of patients was 31 months. The 1-year follow-up data includes primary patency of 97%, a secondary patency of 100%, and a limb-salvage rate of 100%. At the end of 5 years, the primary patency rate was 95%; the secondary patency rate was 100%, and limb-salvage rate was 100%.

Comparative Results

Comparative results are presented in Table 1.

Table 1. Comparative Results

Parameter	Ligation and Endo-Posterior Vein vascularRepair	Direct BypassRepair(UCLA)		
Primary patency	47-74%	95%	38-56%	
Type II endoleak	0%		19-38%	?
Limb salvage	96%		100%	100%

Conclusions

A direct posterior approach to popliteal artery aneurysm with a short interposition prosthetic graft is clearly superior to ligation and vein bypass as well as endovascular repair. A direct posterior approach is associated with a shorter operating time, shorter period of hospitalization, superior primary patency, elimination of aneurysm mass or type II endoleak, and a better primary limb-salvage rate.

References

1. Ebaugh JL, Morasch MD, Matsumura JS, et al. Fate of excluded popliteal artery aneurysms. *J Vasc Surg* 2003;37:954-9.
2. Gerasimidis T, Sfyroeras G, Papazoglou K, et al. Endovascular treatment of popliteal artery aneurysms. *Eur J Vasc Endovasc Surg* 2003; 26:506-11.
3. Mehta M, Shanteen B, Darling RC, et al. Outcome of popliteal artery aneurysms after exclusion and bypass: significance of residual patent branches mimicking type II endoleaks. *J Vasc Surg* 2004;40:886-90.
4. Tielliu IF, Verhoeven EL, Prins TR, et al. Treatment of popliteal artery aneurysms with the Hemobahn stent-graft. *J Endovasc Ther* 2002;10:111-6.