CASE REPORT

A rare and potentially fatal cause of popliteal fossa swelling

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Accepted 24 June 2014

SUMMARY

Popliteal vein aneurysms (PVAs) represent a rare form of venous aneurysm and necessitate prompt diagnosis and management due to their well-established role as a source of pulmonary emboli. Surgical repair is usually curative; we present the case of a 47-year-old woman with a recurrent PVA presenting as a soft popliteal fossa mass with associated sensory deficit affecting the right foot, 4 years after initial operative repair. Venous duplex imaging demonstrated a saccular aneurysm originating from the posterior wall of the right popliteal vein. In light of the long-term risk of potentially life-threatening pulmonary embolism, surgical repair was undertaken by tangential aneurysmectomy and long saphenous vein patch venoplasty. This case emphasises the importance of including PVA in the differential diagnosis of popliteal fossa swellings as well as the need for long-term follow-up to detect late recurrence with subsequent avoidance of the otherwise significant potential morbidity and mortality.

BACKGROUND

This case serves to highlight popliteal vein aneurysms (PVAs) as a rare but important differential diagnosis to consider when evaluating a patient with a popliteal fossa swelling. We describe the essential investigations, review the key anatomy of the popliteal fossa and detail the operative management of this pathology. We also emphasise the serious consequences if this condition is missed or medically treated.

CASE PRESENTATION

A 47-year-old woman was referred to our clinic for evaluation of a recurrent right-sided popliteal swelling. Four years previously she had presented to a different institution with a swelling behind the right knee. She had subsequently undergone exploratory surgery under an orthopaedic team for a presumed tibial nerve schwannoma. This had been diagnosed on the basis of MRI. Intra-operatively this was discovered to represent a thrombosed PVA. The aneurysm sac was opened and plicated, with no postoperative complications. Four years later she experienced sensory disturbance over the dorsum of her right foot and found that the popliteal swelling had recurred, prompting presentation to our department. On examination there was an obvious popliteal swelling; clinical examination could not discern the exact nature of this swelling and therefore a duplex ultrasound scan was requested.

INVESTIGATIONS

Venous duplex imaging revealed a saccular aneurysm arising from the posterior wall of the right popliteal vein, measuring 4.3 cm in length with an anteroposterior diameter of 2.9 cm (figure 1). There was no intra-aneurysmal thrombus. Elective repair of this aneurysm was scheduled in light of the well documented risk of pulmonary embolism with this pathological anatomy.¹

TREATMENT

With the patient prone, via the previous longitudinal S-shaped incision in the posterior popliteal fossa, the incision was continued down to the fascia. Below this there was marked scarring which required sharp dissection. The recurrent popliteal venous aneurysm was clearly seen protruding from the posterior aspect of the popliteal vein (figure 2). The posterior tibial and peroneal nerves and their branches were separated from the vein and surrounding scar tissue. The popliteal artery was helpful as a guide to the orientation of the path of the deep vein. Inferiorly, the saphenopopliteal junction was identified and the junction disconnected, and then the distal popliteal deep vein controlled. Moving superiorly, the proximal popliteal vein and all the branches of the deep venous system draining into the venous aneurysm were controlled with vascular slings. With systemic heparinisation, the aneurysm was opened and the internal wall assessed. There was a transition zone of normal vein to thinner aneurysmal vein wall. At this site the redundant aneurysmal tissue was completely

Figure 1 Posteroanterior longitudinal section ultrasound image. Saccular popliteal vein aneurysm (2.9×4.3 cm) arising from the posterior wall of the right popliteal vein.

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To cite: Kelay A, Constantinou J, Hamilton H. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-201971

Figure 2 Intraoperative image of popliteal vein aneurysm. MG, medial head of gastrocnemius; LG, lateral head of gastrocnemius; PVA, popliteal vein aneurysm; TN, tibial nerve.

excised, and the defect closed with a long saphenous vein patch, so as not to reduce the diameter of the popliteal vein (figure 3). The saphenous vein was readily available from this prone position via a separate longitudinal incision at the posterior medial knee level.

OUTCOME AND FOLLOW-UP

The patient has subsequently been reviewed in the outpatient setting; the initial sensory deficit has resolved, suggesting that there was an element of nerve-related compression. The popliteal vein 6 months after the surgery was patent with a normal calibre.

DISCUSSION

Recurrent PVA has been previously described twice in the literature. Gasparis *et al*² reported a case of a 28-year-old woman who presented 4 years after repair of a left-sided saccular aneurysm with tangential aneurysmectomy and lateral venorrhaphy. Elective repair was undertaken with repeat aneurysmectomy and end-to-end anastomosis. Falls and Eslami described a recurrent PVA in a 40 year-old man developing gradually over the 2-year period following tangential aneurysmectomy of a saccular aneurysm superior to the tibial plateau.³ In light of previous pulmonary embolism, repair was performed with resection and placement of an interposition spiral vein graft using the ipsilateral long saphenous vein. Follow-up at 6 and 12 months, respectively, confirmed venous patency.

Primary PVAs represent a rare subset of venous aneurysms, with an estimated prevalence for asymptomatic PVAs of 0.1–

0.2% among patients undergoing venous duplex imaging for various chronic venous symptoms.^{4 5} They may occur at any age; PVAs have been reported in patients from 10 to 86 years old.¹ A female preponderance has been noted in three previous series,^{1 6 7} with a median age at presentation of 51 and 49 years, in men and women, respectively.¹

Their aetiology is unclear; congenital weakness, trauma and inflammation have been postulated to be responsible. It is thought that larger and/or saccular aneurysms pose a higher risk for thromboembolic complications, though pulmonary emboli have also occurred secondary to fusiform aneurysms. Small PVAs have also been documented to act as a source of emboli, precluding the stratification of thromboembolic risk by aneurysm size.

Symptomatic PVAs typically present either acutely with pulmonary embolism, or with a more chronic history of localised symptoms relating to a popliteal mass or venous insufficiency. The potentially life-threatening complication of pulmonary embolism occurred in 43% of patients from a 105 case series.¹ The presence of an intra-aneurysmal thrombus is a clear risk factor for thromboembolism; 69% of patients with a confirmed thrombus presented with pulmonary embolism, as compared with 23% of those where no thrombus had been identified.⁸

Surgical repair is the treatment of choice for symptomatic PVA as medical therapy with anticoagulation has been shown to be ineffective in the prevention of thromboembolism. Nasr *et al*⁸ reviewed 23 cases managed in this way; 10 patients developed pulmonary embolism and one developed an iliofemoral venous thrombosis, reflecting a 43% failure rate for anticoagulation alone. The optimum management for asymptomatic PVAs also appears to be surgery given the otherwise continued risk of pulmonary embolism and death, as well as the high success rate and low morbidity associated with the operation.

Duplex ultrasonography is the imaging modality most commonly employed for the diagnosis of PVA, providing information relating to the aneurysm location, size, presence of thrombus and venous patency. This may be supplemented with CT or MRI to further define the anatomy prior to operative intervention.

A variety of surgical techniques have been used to repair PVAs, guided by the anatomy of the aneurysm. Proximal control of the vein prior to mobilisation is essential to prevent intraoperative pulmonary embolism. Saccular aneurysms are most commonly treated with tangential aneurysmectomy and lateral venorrhaphy via a posterior approach with the patient in a prone position. A medial approach with the patient supine has proved helpful in situations where the aneurysm is located proximally within the popliteal fossa.⁸ A patch venoplasty may be necessary to achieve adequate closure depending on the diameter of the popliteal vein. Alternatively, the aneurysm may be resected followed by end-to-end anastomosis or interposition vein grafting.

Venous aneurysms have previously been treated with endovascular stent grafts, however, not in small vessels located in close proximity to a joint. The patient was young and the risk of stent thrombosis and/or fracture would be unacceptably high.

Postoperative complications include transient common peroneal nerve palsy and haematoma formation.⁷ More significantly, thrombosis of the surgical repair and recurrent venous dilation can also occur. Sessa *et al*⁷ described 12–20 mm dilation of fusiform and saccular configuration at or above the level of surgical repair following tangential aneurysmectomy and aneurysm resection with end-to-end anastomosis.⁷ No operative mortality has been reported, with the absence of early or late episodes of pulmonary embolism following surgical repair or recurrent venous thrombosis.

Figure 3 Intraoperative image of repaired popliteal vein aneurysm. MG, medial head of gastrocnemius; LG, lateral head of gastrocnemius; VP, long saphenous vein patch.; TN, tibial nerve.

Postoperative management is primarily the achievement of anticoagulation, typically with heparin in the immediate post-operative phase and subsequent conversion to warfarin. The duration of anticoagulation is usually 3–6 months. External limb compression, for example, with graduated compression stockings has been implemented to augment venous return and protect against thrombosis.¹

This case highlights the importance of including PVA in the differential diagnosis of popliteal swellings, as misdiagnosis can expose the patient to the risk of deep vein thrombosis and subsequent pulmonary embolism. The development of recurrent

PVA 2–4 years following surgical repair supports the institution of longer-term follow-up for this patient population, particularly in light of the unpredictable thromboembolic risk presented by PVA.

Contributors JC was one of the operating surgeons for this case and contributed to the 'treatment' and 'discussion' sections. HH was the lead operating surgeon for this case and contributed to the 'treatment' and 'discussion' section. AK contributed to the 'introduction', 'case presentation', 'investigations', 'discussion' and 'learning points' section of the case report.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Learning points

- ▶ Consider popliteal vein aneurysms in the differential diagnosis of popliteal fossa swellings/masses—though rare they can be responsible for significant morbidity and even mortality secondary to acute pulmonary embolism.
- ▶ Duplex imaging is quick and readily available to confirm the presence and precise anatomy of a suspected venous aneurysm.
- ▶ Surgical repair is essential as anticoagulation alone has a 43% failure rate in preventing venous thromboembolism.
- ▶ Long-term follow-up is required to monitor for aneurysm recurrence, as popliteal vein aneurysms have been documented to recur up to 4 years postsurgery.

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