

Treatment of popliteal venous aneurysms by femoral vein ligation

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ABSTRACT

Popliteal venous aneurysms are highly associated with local venous thrombosis and pulmonary embolism. We propose a simple and new surgical therapy for popliteal venous aneurysm by ligation of the femoral vein. We describe the case of a woman with recurrent pulmonary embolism. Venous ultrasound examination showed a venous aneurysm of the right popliteal fossa. We proposed a ligature-section of the femoral vein just below the confluence of the great saphenous vein. After >6 years of follow-up, the patient is asymptomatic, with a completely normal life and only a small amount of edema of the right leg. (*J Vasc Surg Cases and Innovative Techniques* 2019;5:228-31.)

Keywords: Popliteal venous aneurysm; Surgery; Deep vein thrombosis

Popliteal venous aneurysms (PVAs) are an uncommon clinical entity. There are no criteria to definitively label a venous dilation as an aneurysm. McDevitt et al¹ defined PVA as a persistent isolated dilation of twice the normal popliteal vein diameter (generally between 5 and 7 mm). For Maldonado-Fernandez et al,² a venous fusiform dilation becomes an aneurysm when the diameter is at least three times that of the normal vein (>20 mm). Two types of aneurysms are reported: saccular and fusiform PVA.

Venous aneurysms are located mostly in the popliteal vein. Venous Doppler ultrasound is sufficient to make the diagnosis, and complementary imaging (computed tomography angiography, magnetic resonance angiography) simply allows confirmation and specifies its anatomy.

PVAs are highly associated with a risk of local venous thrombosis and of recurrent pulmonary embolism (PE) that may result in the patient's death despite adequate anticoagulation.² They are usually discovered by ultrasound on exploration for heaviness, tiredness, swelling, or mechanical pain of the knee region and by duplex ultrasound in case of suspicion of deep venous thrombosis (DVT) or in looking for DVT when a diagnosis of PE is made.² Palpation of a mass in the popliteal fossa

has been described in 20% of the cases.² In the review by Sessa et al,³ the percentage was divided equally between chance findings (49%) and presentation as thromboembolic disease (51%). The first case of recurrent PE from a PVA was reported by Dahl et al⁴ in 1976.

The cause remains unknown, and different hypotheses have been established, such as trauma, inflammatory processes, congenital factors, hypercoagulability, and others.³ The mean age at discovery was 45 years for Maldonado-Fernandez et al² and 59 years for Sessa et al.³ In all the reviews of PVA, a predominance of female sex is observed.^{3,5}

In patients with PE associated with PVA, the treatment of choice remains surgery to avoid thromboembolic recurrence.^{4,6} PVA is associated with a high risk of recurrent PE, and in this situation, anticoagulation alone is inadequate to prevent thromboembolic events.⁶⁻⁸

The main goal of surgery is to remove the aneurysm by maintaining the venous drainage of the limb. Procedures will depend on the particular morphologic features, findings, and circumstances of each case. Tangential aneurysmectomy with lateral venorrhaphy (TALV) is the most commonly performed procedure for saccular aneurysms.² Aneurysm resection with preservation of venous continuity is recommended when TALV cannot be satisfactorily performed or in patients with fusiform aneurysms because of the risk of leaving a diseased vein wall that may continue to enlarge.²

Long-term patency of surgery for PVA is poorly documented; recurrence of venous thromboembolic events after TALV or other procedures is rarely reported and remains also poorly documented.^{2,3} Immediate and long-term complications are not rare after immediate and long-term follow-up of PVA surgery. Furthermore, direct surgery of the popliteal vein can also be associated with an unsightly scar of the popliteal fossa.

We describe here a simple and new surgical option for treatment of PVA by ligation of the femoral vein, with long-term follow-up, in a young woman with PVA

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associated with recurrent PE. The surgical protocol was approved by the Institutional Review Board, and the patient's informed consent was obtained.

CASE REPORT

A 14-year-old girl had a history of bilateral PE, with initially negative etiologic screening. She received anticoagulation for 6 months. Three years later, she complained of a sudden pain in the right popliteal fossa with dyspnea for minimal effort. A D-dimer test result was positive, and computed tomography scan revealed bilateral PE. Venous ultrasound showed a venous aneurysm of the right popliteal fossa with substantial thrombus associated with significant spontaneous contrast enhancement. It was a saccular aneurysm of the outer wall of the popliteal vein with a diameter of 35 mm and a length of 50 mm, with very slow circulatory flow (Fig 1).

Magnetic resonance imaging confirmed a PVA ending approximately 15 mm above the articulation of the knee. It measured 30 × 20 mm axially, extended to a height of 45 mm, and contained thrombus covering half its volume (Fig 2). There was no evidence of an arteriovenous malformation or fistula. Oral anticoagulation was initiated.

After 6 months of oral anticoagulation, we decided to exclude this aneurysm in 2011. The prospect of a scar in the popliteal fossa and the short- and long-term risk of local complications of a direct surgical approach led us to propose a ligation-resection of the femoral vein just below the confluence of the great saphenous vein and the deep femoral vein to prevent the risk of recurrent PE and to obtain thrombosis of the PVA. This operation, using a simple surgical approach of the right femoral venous confluence through a short cutdown at the groin, was carried out successfully without any complication. Of course, the great saphenous vein as well as the deep femoral vein was preserved. Anticoagulation therapy was stopped a few days after the operation, and elastic compression was prescribed for 6 months.

Doppler ultrasound performed immediately and 8 months after ligation showed a patent femoral vein and a partially thrombosed popliteal aneurysm despite ligation and a very slow flow. No new PE events occurred, and clinically there was only a small increase of 2 cm in circumference of the right lower limb. She continued to perform normal activities without anticoagulation and kept a small amount of edema limited by the practice of swimming and occasional wearing of elastic stockings.

The different serial controls showed that the femoral vein and the PVA remained patent during 4 years after femoral vein ligation. Pulmonary scintigraphy compared with baseline examination performed at the time of surgery did not show any PE recurrence after 4 years of follow-up. Four years after surgery, during a journey at high altitude in Peru, she presented with pain in the popliteal fossa. The control Doppler ultrasound showed a complete thrombosis of the aneurysm that was persistent with a diameter of the thrombosed PVA of 4 cm. Finally, after >6 years of follow-up, the patient is asymptomatic, with a completely normal lifestyle.

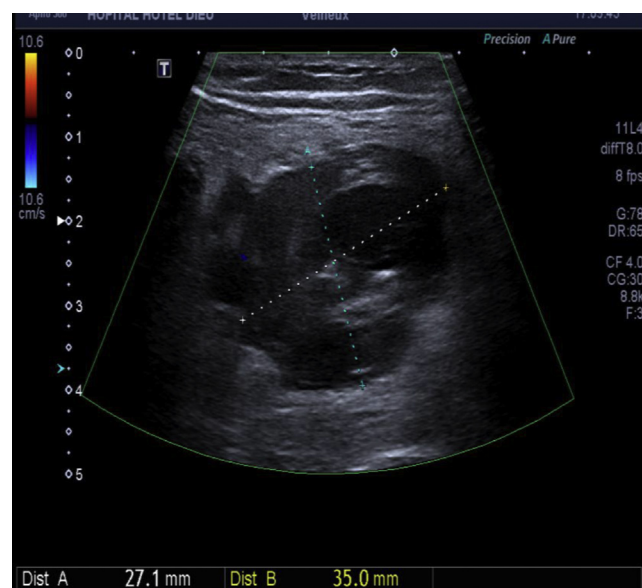


Fig 1. Ultrasound image of the popliteal venous aneurysm (PVA), cross-sectional view.

DISCUSSION

Complications related to PVA are mainly the occurrence of venous thrombosis and recurrent PE (>24% according to Sessa et al³), but there is also a risk of local compression, pain, bleeding, chronic venous disease, limb swelling, ulcers, and varicosities. Rupture is extremely rare.

The incidence of PVAs is underestimated as they can be asymptomatic. The incidence of reported cases is between 0.18% and 0.20% of the patients investigated by venous ultrasound.⁵

In 2000, Sessa et al³ reported their series of 25 patients and a review of 83 published cases. They recommended surgical treatment of all saccular aneurysms >20 mm and follow-up by ultrasound for fusiform aneurysms >20 mm. They also recommended postoperative compression therapy and 3 months of postoperative anticoagulation therapy. In their series of 25 patients, early thrombosis occurred in 3 patients, and another patient had wound infection.

In 2013, Maldonado-Fernandez et al² conducted a systematic review of the literature. Between 2000 and 2010, there were 91 patients analyzed; 52 patients were asymptomatic at diagnosis, and 36 patients had had episodes of thromboembolism. PVAs were saccular in 57 patients and fusiform in 11.

Surgical procedures and postoperative complications were reported in 102 patients in the last 12 years; 79 patients experienced TALV, 15 had vein bypass with venoplasty, 2 patients underwent surgical treatment with end-to-end anastomosis, and 3 patients had a simple ligation or resection of the popliteal vein. Complications occurred in 25 patients with 7 hematomas, 6 nerve

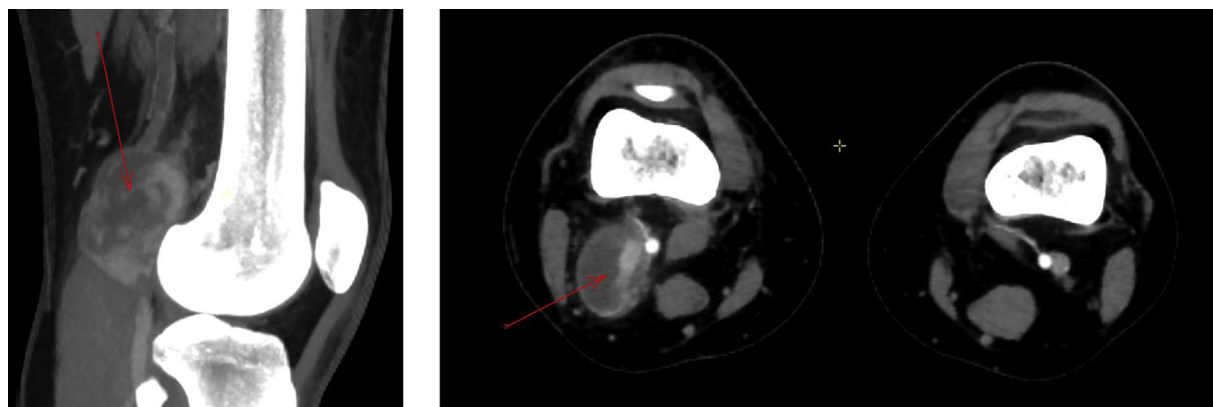


Fig 2. Magnetic resonance images of the popliteal venous aneurysm (PVA), sagittal section and cross-sectional view.

injuries, 3 local infections, 5 early thromboses, 1 late thrombosis, and 3 surgical relapses. The follow-up was between 3 and 66 months.

The procedure most frequently reported is TALV, which was first described by Aldridge et al⁹ in 1993. As long as a large enough diameter vein can be achieved after tangential aneurysmectomy, the morphology of the aneurysm does not influence the type of surgical repair performed.¹⁰ We propose here a new, less invasive surgical approach for the treatment of PVA: ligation and section of the femoral vein, just below the confluence of the great saphenous vein.

The concept of femoral vein ligation was first introduced by Homans¹¹ in 1934 to prevent the occurrence of PE in patients with DVT. During at least three decades, beginning in the 1940s, it was a well-established surgical procedure in patients with DVT or PE.^{12,13} In a large series of >2000 patients, Donaldson¹² reported a 95% success rate in controlling emboli and also a low rate of long-term sequelae. Edema is the most frequent manifestation after femoral vein ligation but is most often markedly diminished in the early postoperative course. On the other hand, Masuda et al¹³ analyzed the long-term effects of this procedure in a series of vein ligations performed between 1969 and 1986. After a mean follow-up of >13 years, normal or nearly normal extremities was observed in 83% of patients, and 14% developed mild to moderate symptoms of pain or swelling. Interestingly, the two factors associated with a worse long-term clinical outcome were an incompetent profunda femoris and an obstructed great saphenous vein. For these reasons, we think that ligation of the femoral vein for PVA should not be proposed in patients with a history of ilio-femoral thrombosis or in patients who have previously had an operation of the great saphenous vein or who have superficial venous insufficiency.

As previously described, ligation of the femoral vein must be performed at the confluence of the profunda femoris to prevent the formation of a stump in which

thrombus could develop and propagate proximally. Furthermore, the two ends of the divided vein were separated by 1 to 2 cm by the ligation and interruption process to avoid the occurrence of local collaterals.

In our patient, after a follow-up of >6 years, the functional and anatomic results are good. She has a normal lifestyle and only occasionally uses an elastic stocking. She had no recurrence of PE demonstrated by control ventilation-perfusion scan. Interestingly, ligation of the femoral vein did not immediately induce PVA thrombosis in our patient.

There is no formal recommendation for the treatment of PVA because of the scarcity of cases. The indications for treatment must take into account the potential thromboembolic risk, and almost all authors recommend surgical treatment of symptomatic aneurysms (thrombosis, PE, pain), given their embolic risk.^{2,3} TALV remains to date the procedure of choice, but it is potentially associated with acute or long-term occurrence of popliteal thrombosis and local complications. Ligation of the femoral vein is a simple operation that could be proposed as another surgical option in patients without great saphenous or superficial vein insufficiency and normal flow in the deep femoral vein. Of course, the patient must be informed of advantages and drawbacks of both approaches, including the potential risk of post-thrombotic syndrome. Furthermore, the indication for femoral vein ligation of a PVA should be confirmed by further studies in well-selected patients.

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