Diagnosis and Surgical Management of Popliteal Venous Aneurysms: Report of Two Cases

Xueli Guo[1], Chuang Zhang [2], Yang Fu[3], Yonggan Zhang[4], Ningheng Chen[5], Wenming Li[6], Hongchao Fang[7], Bing Liang[8], Zifan Wang[9]

[1.] Department of vascular surgery, The First Affiliated Hospital of Zhengzhou University, Zhengzhou 450052, China
Guoxueli2000@tom.com

Abstract: Objective: The objective of this study was to explore methods for the diagnosis and treatment of popliteal venous aneurysms. **Methods:** We retrospectively analyzed the diagnostic and treatment processes used for 2 patients with popliteal venous aneurysms. The main symptoms in these 2 patients were pain and local swelling; pulmonary embolism (PE) was not found in these patients. Both the patients were treated using tangential aneurysmectomy with lateral venorrhaphy, followed by warfarin anticoagulation therapy for at least 1 year. **Results:** Both the patients recovered well with good popliteal vein shapes after surgery, as shown by angiography. No thrombosis-related complications were found until 1 year and 3 months after surgical intervention. **Conclusion:** Surgical resection should be performed as soon as possible after the diagnosis of popliteal venous aneurysm. Patients should be administered postoperative anticoagulation therapy to prevent thrombosis that may result from the potential risk of PE.

[Xueli Guo, Chuang Zhang, Yang Fu, Yonggan Zhang, Ningheng Chen, Wenming Li, Hongchao Fang, Bing Liang, Zifan Wang. **Diagnosis and Surgical Management of Popliteal Venous Aneurysms: Report of Two Cases**. *Life Sci J* 2012;9(4):4160-4163]. (ISSN: 1097-8135). http://www.lifesciencesite.com. 619

Keywords: Popliteal venous aneurysm; pulmonary embolism; anticoagulation; surgery; resection

1. Introduction

Popliteal venous aneurysm is extremely rare and has no precise definition. McDevitt believed that vein aneurysm is a local expansion of the vein and defined it as a condition in which the vein diameter is more than 2 times the normal vein diameter [1,2]. Popliteal venous aneurysm is a common form of venous aneurysm. Only about 160 cases of popliteal venous aneurysm have been reported worldwide since the first report in 1968 by May and Nissel [3]. We reviewed the data on the clinical management of 2 patients with popliteal venous aneurysms who were treated at our hospital between 2010 and 2011, and analyzed the diagnostic and treatment details.

2. Clinical Materials

Case 1

A 29-year-old man with a mass in the left popliteal fossa for 5 months was admitted to our hospital. On examination, a soft mass (size, 5 cm × 7 cm) was found superior to the left popliteal fossa; the mass showed mild tenderness, which was relieved when the affected limb was elevated. No swelling or hyperpigmentation was observed in the lower left limb. The arterial pulse rate was normal. The circumference of the left limb at the region superior to the patella was 10 cm, which was 2 cm larger than that of the right limb. Deep vein angiography revealed a localized popliteal vein aneurysm

Color Doppler ultrasonography showed communication between the aneurysm and the superficial femoral and popliteal veins (Figure 1). No thrombus was found within the veins. Magnetic resonance imaging (MRI) revealed a cystic mass within the soft tissue behind the left distal femur (Figure 2). Further, contrast-enhanced MRI revealed an enhanced blood vessel shadow at the edges of the lesions in the superficial femoral vein and popliteal vein. On the basis of these findings, we highly suspected the presence of a large venous malformation. The venous aneurysmal mass removed during the surgery was gourd-shaped (Figure 3) and 10 cm × 8 cm × 8 cm in size. The aneurysm was closely linked with the sciatic nerve; therefore, the mass was removed after the sciatic nerve was carefully separated from the mass. Many large- and small-sized branched venous openings were observed within the mass, but none of them showed a mural thrombus. The thickness and toughness of the wall of the mass were almost identical with that of a normal vein wall; therefore, we decided to perform tangential aneurysmectomy with lateral venorrhaphy. A 10.0 cm × 3.5-cm area of wall of the mass was removed, and the vascular wall of the mass was continuously sutured using 5-0 Prolene sutures. After surgical intervention, low molecular weight heparin (5000 U; twice daily for 3 days) was administered subcutaneously for anticoagulation; this was followed by oral administration of warfarin sodium tablet (5 mg per day). Low molecular weight heparin administration was discontinued when the international standard ratio (INR) was adjusted to 2~3, and balloon pressure treatment was performed to promote venous return; the patient was recommended to wear anti-thrombosis socks after being discharged

from the hospital. The patient was prescribed oral warfarin for 1 year. Intravenous angiography revealed good blood flow and popliteal vein form 1 year after surgery (Figure 4). A literature review confirmed that vein aneurysm of our patient was the largest reported to date; the largest diameter reported earlier was only 6 cm.

Case 2

A 36-year-old woman complained of pain in the right leg for 1 year, and 10 days before being admitted to our hospital, she was found to have a popliteal fossa mass in the right limb. Examination of the right popliteal fossa showed a soft walnut-sized mass, with no tenderness, clear boundary, no local swelling and ulcers, normal arterial pulse rate at all levels, and normal peripheral blood supply. Deep vein angiography showed a mass shadow at the right popliteal vein (Figure 5). MRI of the right popliteal fossa showed a cystic mass behind the femur; this finding suggested that the patient had a popliteal venous aneurysm. During surgical operation, we first isolated the popliteal vein showing a partially eccentric expanding mass; the lesion was about 4.0 cm × 3.5 cm × 3 cm in size and linked closely with the tibial nerve (Figure 6). The popliteal vein and the tibial nerve were separated carefully, and a blocked belt was used at both ends of the popliteal venous aneurysm; after right lower limb exsanguination, a pneumatic tourniquet was used and the mass was removed. Many side ~vein openings that resembled the structure of a honeycomb were found within the mass. The aneurysm wall was partially thick and hard, and the trunk of the popliteal venous aneurysm was unobstructed. Part of the blood vessel with the expanding mass was removed, and the vascular wall was continuously sutured using 5-0 Prolene sutures; the balloon tourniquet was then released, and the incision was closed after careful homeostasis. Postoperative balloon pressure treatment was administered for 14 days, and low molecular weight heparin (5000 U; twice daily for 3 days) was injected subcutaneously; this was followed by oral administration of warfarin sodium tablets to adjust the INR to 2~3. Six months after surgery, deep vein angiography showed normal popliteal vein diameter, smooth wall, and venous blood flow (Figure 7).

3. Discussion

The cause of popliteal vein aneurysm is not clear. It may be related to congenital vascular malformation, trauma, inflammation, and vascular degeneration [4]. Microscopic examination of the popliteal venous aneurysm wall shows degeneration of inner cells and absence of elastic fibers and smooth muscle cells. Therefore, congenital factors coupled with mechanical force may be the cause of most popliteal venous aneurysms.

Popliteal venous aneurysms can lead to serious complications, such as deep vein thrombosis and recurrent pulmonary embolism, or even death; however, aneurysm rupture has not yet been reported. Popliteal venous aneurysm could be saccular and fusiform, and the cystic aneurysm relatively easily forms a vortex and generates local thrombosis [5]. In this study, the aneurysm in the first case was gourd-shaped (with 2 spindles) and that in the second case was cystic. About 70% to 80% of patients with popliteal vein aneurysms have pulmonary embolism, and in the others, the aneurysms manifest as a popliteal fossa mass or chronic venous function insufficiency [7]. Deep vein thrombosis and pulmonary embolism or other complications were not observed in our patients. Ultrasonography is the preferred diagnostic method for detecting popliteal venous aneurysms, and it can be used to clearly determine the size of the mass and of the thrombus within the mass. Venography may be a more sensitive technique for determining the type and size of the mass. Magnetic resonance venography (MRV) or computed tomographic venography (CTV) can be used for further examination and can explain the anatomical relationship between the mass and its surrounding tissues.

Treatment options differ according to the mass size of popliteal venous aneurysms; patients with smaller aneurysms (diameter less than 2 cm) have low risk of thrombosis, and anticoagulation therapy with periodical follow-up by using color-ultrasonography may be effective. However, despite the administration of anticoagulant therapy, 80% of the patients with large popliteal vein aneurysms developed pulmonary embolism. For example, 2 patients with popliteal venous aneurysms who were administered only a simple anticoagulant therapy after surgery had fatal pulmonary embolisms [6]. Therefore, surgery is the best treatment choice for patients with large cystic popliteal venous aneurysms, particularly patients with a thrombus in the vessel with the aneurysm. The surgery is aimed at removing the thrombus within the mass, restoring normal blood vessel status, and preventing blood clot regeneration. Surgical methods may include tangential aneurysmectomy with lateral venorrhaphy, complete removal of the mass and end-to-end anastomosis, mass resection and bypass surgery, and mass resection and patch angioplasty with vein ligation [6]. Of these methods, tangential aneurysmectomy with lateral venorrhaphy is the most commonly used surgical procedure for treating popliteal venous aneurysms.

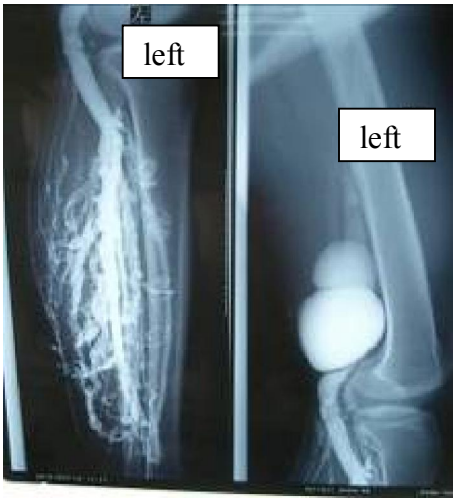

Fig. 1 Gourd-shaped popliteal venous aneurysm, as shown by angiography

Fig. 2 Magnetic resonance imaging of the first case of popliteal venous aneurysm

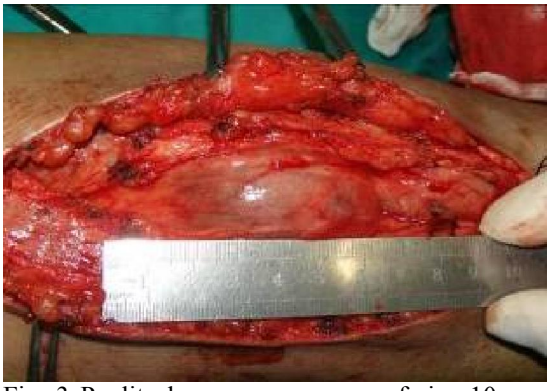

Fig. 3 Popliteal venous aneurysm of size 10 cm × 8 cm × 8 cm. A literature review revealed that the venous aneurysm treated at our hospital was the largest reported to date.

Fig. 4 The popliteal vein is patent and in good shape

Fig. 5 Popliteal vein patency, as seen on plain radiography

Fig. 6 The cyst-shaped popliteal venous aneurysm

Fig. 7 The popliteal vein showing normal shape; the scale shows the inner diameter

Tangential aneurysmectomy with lateral venorrhaphy was chosen for the 2 patients in our study, mainly because the walls of the venous aneurysms in these patients were thick; the structure of the aneurysm wall was similar to that of a normal vein; the venous pressure was low; and vein expansion was generally not easy to restore. We observed numerous vein branch openings in the wall of the venous aneurysm, and these branch openings need to be ligated if the mass wall is to be removed. If all vein branches in the mass wall are ligated, it may cause venous system reflux disorder of the lower extremity and cause long-term swelling.

Blocking only the proximal and distal ends of the mass is not enough to restrict blood flow; pneumatic tourniquets may also be required. When partial resection of the mass and unilateral suturing are not successfully completed, or in patients with a high risk of partial mass re-expansion after the removal of the fusiform aneurysm wall, mass resection with end-to-end anastomosis may be performed; however, surgeons should ensure that there is no tension in the vessel during this procedure.

Mass resection and bypass surgical procedures can be used when the vein wall is thin, because of which anastomosis cannot be performed, or when the tumor cavity is filled with blood clots. The veins preferred for bypass are autologous veins, such as the great saphenous vein, small saphenous vein, and internal jugular vein. If a normal vein diameter cannot be maintained after partial removal of the aneurysm wall, mass resection and patch angioplasty may be performed for the above-mentioned veins. If the small saphenous vein entrance is occupied by the popliteal vein aneurysm, the vein can be easily cut and Diagnosis and surgical management of popliteal venous aneurysms patches can be made from it to reinforce the anastomosis after mass removal [7]. Vein ligation is not generally performed, because it can cause long-term venous reflux disorders after ligation. Irrespective of the surgical procedure chosen, postoperative anticoagulant therapy is critical for maintaining long-term popliteal vein reflux after popliteal vein reconstruction. To this end, we recommend oral administration of warfarin for a minimum of 1 year. Further, the use of a pressure pump for preventing postoperative venous thrombosis or anti-thrombosis elastic stockings may help during recovery.

4. Conclusion

Popliteal venous aneurysms are very rare and can cause a potential risk of pulmonary embolism; therefore, popliteal venous aneurysm should be considered when there is unexplained pulmonary embolism. Ultrasonography is the preferred method and venography is the gold standard for diagnosing popliteal venous aneurysms. For popliteal venous aneurysm patients with non-clinical manifestation of the pulmonary embolism, surgical resection of the mass should be performed as early as possible after diagnosis; tangential aneurysmectomy with lateral venorrhaphy is the most common surgical approach. Long-term anticoagulation therapy after surgery is necessary for such patients.

Corresponding Author:
Ph.D Xueli Guo
Department of vascular surgery, The First Affiliated Hospital of Zhengzhou University, Zhengzhou 450052, China
E-mail: Guoxueli2000@tom.com

References

1. May R, Nissel R. Aneurysma der vena poplitea. Rofo Fortschr Geb Rontgenstr Neuen Bildgeb Verfahr. 1968, 108（3）:402-3.
2. McDevitt DT, Lohr JM, Martin KD, Welling RE, et al. Bilateral popliteal vein aneurysms. Ann Vasc Surg. 1993, 7（3）:282-6.
3. Celoria G, Brancaccio G, Russo D, et al. Popliteal venous aneurysm: case report. Phlebology. 2011, 26（6）:246-8.
4. Herrera LJ, Davis JW, Livesay JJ. Popliteal vein aneurysm presenting as a popliteal mass. Tex Heart Inst J. 2006, 33（2）:246–8.
5. Tambyraja AL, Moores c, chalmers RT, et al. Primary popliteal venous aneurysm. J Vasc Surg. 2004, 40（4）:912.
6. Sessa C, Nicolini P, Perrin M, et al. Management of symptomatic and asymptomatic popliteal venous aneurysms: a retrospective analysis of 25 patients and review of the literature. J Vasc Surg. 2000, 32（5）:902-12.
7. Gillespie DL, Villavicencio JL, Gallagher C, et al. Presentation and management of venous aneurysms. J Vasc Surg. 1997, 26（5）:845-52.