


Popliteal vein aneurysm presenting as recurrent pulmonary embolism

Joel Lim^{1*}, Martin Marshall²

1. Department of Clinical Services, Royal Perth Hospital, Perth, Australia

2. Department of Diagnostic and Interventional Radiology, Royal Perth Hospital, Perth, Australia

* Correspondence: Dr. Joel Yong En Lim, Royal Perth Hospital, Resident Medical Officer, Postal address: 13 Fawcett Crescent, Canning Vale, WA 6155, Australia
 joel.lim@health.wa.gov.au

Radiology Case. 2015 Apr; 9(4):23-27 :: DOI: 10.3941/jrcr.v9i4.2509

ABSTRACT

Although rare, popliteal vein aneurysms can lead to pulmonary emboli, which can be fatal. We present a case of a popliteal vein aneurysm in a 39-year-old female who presented with her third episode of pulmonary embolism despite being on anticoagulants. Computed Tomography Venogram demonstrated a large Popliteal Vein Aneurysm measuring 71 x 36 x 77 mm which was surgically repaired. According to the current literature, anticoagulation is insufficient therefore early surgical intervention is recommended as it is safe and effective.

CASE REPORT

CASE REPORT

A 39-year-old female presented to the Emergency Department with dyspnoea, chest tightness and palpitations. This was on a background of two previous episodes of unprovoked Pulmonary Embolism (PE). The first occurred in March 2012 where the patient was discharged home with enoxaparin but re-presented in December with the second episode. The enoxaparin was switched to rivaroxaban, which she has been on since then. Previous thrombophilia screens have been normal.

Computed Tomography (CT) Pulmonary Angiogram (Philips Brilliance 64-slice) revealed multiple bilateral segmental and subsegmental pulmonary emboli (Fig 1). Doppler Ultrasound (GE Logiq E9) revealed an ovoid, well-defined structure within the left popliteal fossa. The flow characteristics within the structure i.e. swirling of the contents, biphasic venous waveform of low flow and communication with the popliteal vein, were all highly suggestive of a Popliteal Venous Aneurysm (PVA) (Fig 2, 3). This was

confirmed on the subsequent CT Arteriogram and Venogram (Philips Ingenuity 128-slice 140ml Omnipaque 350 contrast 4ml/s through a basilic vein injection) (Fig 4) as well as a CT Venogram performed through direct injection into a vein along the dorsum of the foot (Fig 5). Both investigations demonstrated venous filling of the large PVA measuring 71 x 36 x 77 mm as well as a normal popliteal artery.

The patient was commenced on anticoagulants and underwent an aneurysmectomy with lateral suture and venous patch without complications. She will be followed up in the Vascular surgery and Haematology outpatient clinics.

DISCUSSION

Etiology and Demographics

A venous aneurysm is defined as a fusiform dilatation at least twice the size of the normal vein[1]. One example of this is the PVA, which is very rare and only approximately 120

cases have been documented[2]. The popliteal vein usually measures 6.8mm in diameter on average[3]. A meta-analysis by Bergqvist et al. identified 105 cases with a slight female and left-sided dominance. The median ages (ranges) are 51 years (10-86) for females and 49 (10-82) for males[4]. The aetiology and risk factors of PVAs are unknown although it is postulated that congenital vein wall weakness, inflammation and infection contribute[2].

Clinical and Imaging Findings

Patients most frequently present with chest symptoms suggestive of pulmonary embolism, followed by local symptoms (most frequently palpable mass) and venous insufficiency respectively[4].

In the cases described so far, phlebography was the most commonly used imaging modality followed by duplex ultrasonography. However, there was a shift towards the latter in the recent studies[4]. CT or venography before surgical repair is recommended to delineate the venous anatomy and to assess the deep veins[5,6].

Treatment and Prognosis

Oral anticoagulation is insufficient in the treatment of PVAs, so early surgical repairs are recommended. Post operatively, the aim is to keep the reconstruction patent. This is achieved by several methods including compression devices and 3 months of anticoagulation to allow the reconstructed area to endothelialize[2,4].

There is no documented recurrence of pulmonary embolism post lateral tangential aneurysmectomy other than the one described by Falls whereby the patient was noted to have gradual increases in the size of his popliteal vein to 3.1cm[6].

Although rare, popliteal vein aneurysms can lead to pulmonary emboli, which can be fatal.

Differential Diagnosis

Although rare, PVAs should form part of the differential diagnoses in patients with venous thromboembolism when the thrombophilia screen is negative, due to the risk of pulmonary embolism, which can be fatal. The differential diagnoses include popliteal artery aneurysm, popliteal artery entrapment syndrome, Baker's cyst and tibiofibular cyst.

Popliteal arteries are classified as aneurysmal if their diameters exceed 0.7cm. It is important that popliteal artery aneurysms are diagnosed as 45% of patients are asymptomatic but these have a risk of limb-threatening thrombotic complications. Symptomatic patients present due to effects of limb ischaemia, such as claudication and pain at rest. Ultrasound findings include the presence and patency of the aneurysm. Doppler ultrasound aids in distinguishing aneurysms from masses such as cysts. Angiography may not be helpful as the aneurysm may not be visualised if there is artery

occlusion. MRI is able to delineate the aneurysmal sac and mural thrombus[8].

Popliteal artery entrapment syndrome is caused by an abnormal relationship between the gastrocnemius muscle and the popliteal artery, resulting in extrinsic arterial compression. Rarely, an anomalous fibrous band or the popliteus muscle may be involved. Typically, young athletic males present with calf claudication. Ultrasound can demonstrate this arterial compression when manoeuvres such as plantar flexion and feet dorsiflexion are performed. Angiography findings are usually nonspecific and have a wide spectrum reflecting the different stages. These include occlusion, dynamic stenosis, deviation and ectasia. MRI can delineate the abnormal anatomy such as the muscle or fibrous slip[8, 9].

The Baker's cyst is a persistent synovial joint fluid effusion that presents as a posterior knee mass. Ultrasonography shows an anechoic mass. MRI demonstrates an oval mass that is hypointense on T1-weighted images and hyperintense on T2-weighted images[7].

Tibiofibular cysts also present as a posterior knee mass. Their ultrasonography and MRI findings are similar to Baker's cysts[7].

TEACHING POINT

Although rare, popliteal vein aneurysms can lead to pulmonary emboli, which can be fatal. Imaging findings on ultrasound include a popliteal fossa mass which demonstrates swirling of its contents, biphasic venous waveform of low flow and communication with the popliteal vein.

REFERENCES

1. McDevitt D, Lohr J, Martin K, Welling R, Sampson M. Bilateral popliteal vein aneurysms. *Ann Vasc Surg* 1993 ; 282-286. PMID: 8318394
2. 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* 2002;32:902-12. PMID: 11054222
3. Hertzberg B, Kliwer M, DeLong D et al. Sonographic estimates of vein size in the lower extremities: subjective assessment compared with direct measurement. *JCU* 1998; 26(3): 113-7. PMID: 9502032
4. Bergqvist D, Bjorck M, Ljungman C. Popliteal venous aneurysm: a systematic review. *World J Surg* 2006;30:273-79. PMID: 16479328
5. Gabrielli R, Vitale S, Costanzo A et al. Our experience of popliteal vein aneurysm. *Interact Cardiovasc Thorac Surg* 2010 Dec;11(6):835-7. PMID: 20880881

6. Falls G, Eslami M. Recurrence of a Popliteal Venous Aneurysm. *Journal of Vasc Surg* 2010;51 (2):458-459. PMID: 19837541
7. Fiori R, Chiappa R, Gaspari E et al. A Rare Case of Popliteal Venous Aneurysm. *Case Reports in Medicine* 2010. PMID: 20224754
8. Wright L, Matchett W, Cruz C et al. Popliteal Artery Disease: Diagnosis and Treatment. *Radiographics* 2004;24 (2):167-479. PMID: 15026594
9. Macedo T, Johnson C, Hallett J et al. Popliteal Artery Entrapment Syndrome: Role of Imaging in the Diagnosis. *AJR Am J Roentgenol* 2003;181 (5):1259-1265. PMID: 14573416



Figure 1 (top): 39 year old female with Popliteal Vein Aneurysm.

Findings: Computed Tomography Pulmonary Angiogram transverse view showing multiple bilateral segmental pulmonary emboli (white arrows).

Technique: Philips Brilliance 64-slice, mAs 201, kVp 100, slice thickness 4mm, Omnipaque at 4ml/sec

FIGURES

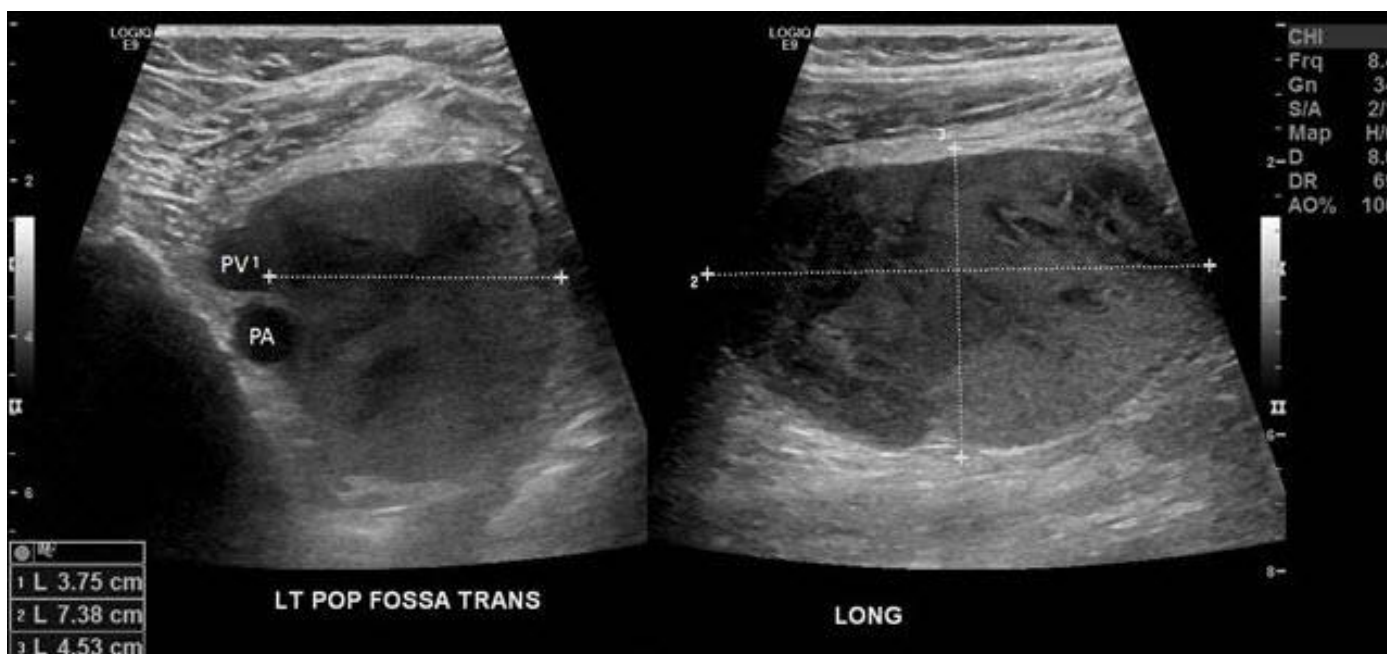


Figure 2: 39 year old female with Popliteal Vein Aneurysm.

Findings: Duplex ultrasonography demonstrating a 74 x 45 x 38 mm popliteal vein aneurysm (dotted line) communicating with the popliteal vein (PV). The popliteal artery (PA) is also visualized.

Technique: Duplex ultrasonography with GE Logiq E9, 9 linear, 8.4Mhz

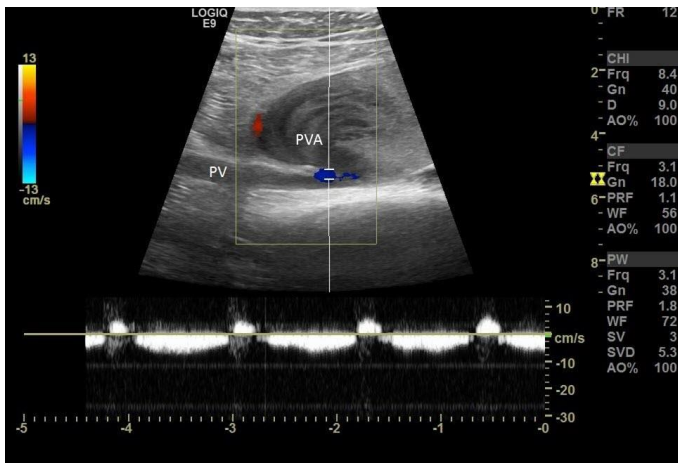


Figure 3: 39 year old female with Popliteal Vein Aneurysm. Findings: Duplex ultrasonography sagittal view demonstrating biphasic venous flow in the Popliteal Vein Aneurysm (PVA) from the popliteal vein (PV). Technique: Duplex ultrasonography with GE Logiq E9, 9 linear, 8.4Mhz

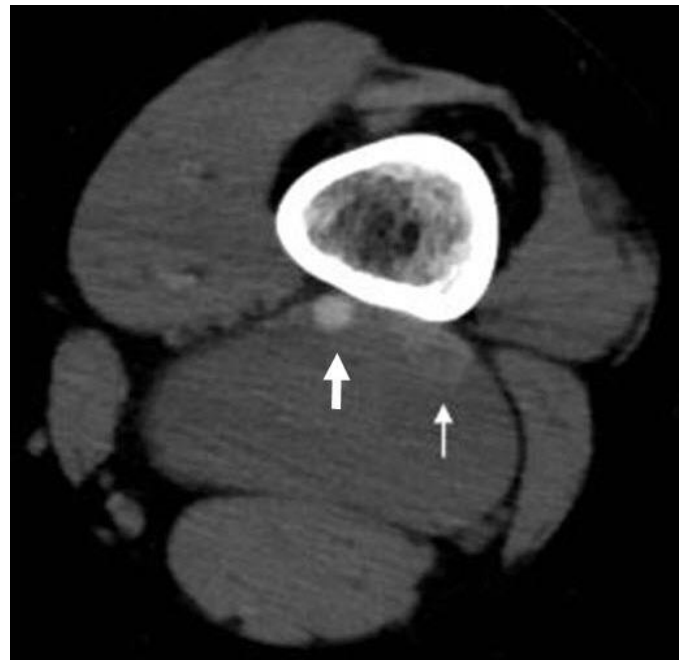


Figure 4: 39 year old female with Popliteal Vein Aneurysm. Findings: Computed Tomography Angiogram and Venogram transverse view demonstrating the popliteal artery (thick arrow) and filling of the Popliteal Vein Aneurysm (thin arrow) demonstrated. Technique: Philips Ingenuity 128-slice with 140ml Omnipaque 350 contrast at 4ml/s through a basilic vein injection, mAs 101, kVp 100, slice thickness 2mm

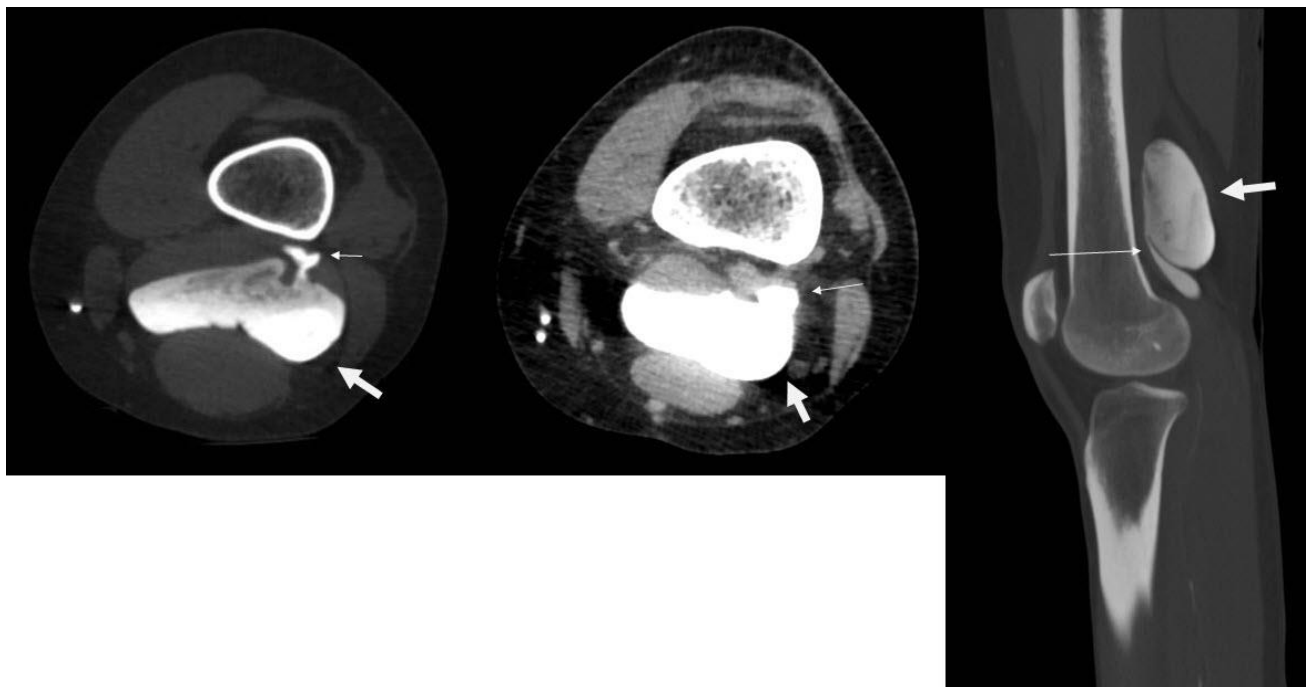


Figure 5: 39 year old female with Popliteal Vein Aneurysm. Findings: Computed Tomography Venogram transverse (a, b) and reformatted sagittal (c) views demonstrating the compressed popliteal vein (thin arrow) communicating with the aneurysm (thick arrow) with intravenous contrast traversing the two structures. Technique: Philips Ingenuity 128-slice with 140ml Omnipaque 350 contrast at 4ml/s through direct injection into a vein along the dorsum of the foot
a) mAs 115, kVp 100, slice thickness 1.5mm
b) mAs 100, kVp 100, slice thickness 1.5mm
c) mAs 102, kVp 100, slice thickness 3mm

Definition	Fusiform dilatation at least twice the size of the normal vein
Etiology	Unknown although it is postulated that congenital vein wall weakness, inflammation and infection contribute
Incidence	Only approximately 120 cases have been documented
Gender ratio	Slight female predominance
Age [median (range)]	51 (10-86) for females, 49 (10-82) for males
Risk factors	Unknown
Treatment	Early surgical intervention
Prognosis	Only 1 case of documented recurrence of pulmonary embolism
Findings on imaging	Ovoid, well-defined structure within the popliteal fossa on ultrasound. The structure demonstrates swirling of its contents, biphasic venous waveform of low flow and communication with the popliteal vein. Angiography and Magnetic Resonance Imaging are able to delineate the venous anatomy.

Table 1: Summary table of popliteal vein aneurysm.

Differential diagnosis	Clinical features	Imaging features on Ultrasound	Imaging features on Angiography	Imaging features on MRI
Popliteal vein aneurysm	Chest symptoms with suspicion of Pulmonary Embolism, local symptoms such as palpable mass	Aneurysm morphology	Delineated venous anatomy	Delineated venous anatomy
Popliteal artery aneurysm	Claudication, rest pain	Presence and patency of aneurysm, Doppler distinguishes aneurysm from masses such as cysts	May not visualise especially if artery is occluded	Delineated aneurysmal sac and mural thrombus
Popliteal artery entrapment syndrome	Claudication	Arterial compression elicited by manoeuvres such as plantar flexion and foot dorsiflexion	Arterial occlusion, deviation, aneurysm, ectasia and dynamic stenosis	Entrapment anatomy, abnormal muscle or fibrous slip responsible for entrapment
Baker's cyst	Posterior knee mass	Anechoic mass		Oval mass hypointense (T1) and hyperintense (T2)
Tibiofibular cyst	Posterior knee mass	Anechoic mass		Oval mass hypointense (T1) and hyperintense (T2)

Table 2: Differential diagnosis table for popliteal vein aneurysm (4,5,7,8,9).

ABBREVIATIONS

CT = Computed Tomography
MRI = Magnetic Resonance Imaging
PE = Pulmonary Embolism
PVA = Popliteal Vein Aneurysm

KEYWORDS

Popliteal; vein; aneurysm; pulmonary; embolism

Online access

This publication is online available at:
www.radiologycases.com/index.php/radiologycases/article/view/2509

Peer discussion

Discuss this manuscript in our protected discussion forum at:
www.radiolopolis.com/forums/JRCR

Interactivity

This publication is available as an interactive article with scroll, window/level, magnify and more features.
Available online at www.RadiologyCases.com

Published by EduRad



www.EduRad.org