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Case report

Popliteal vein aneurysm in a teenager with knee swelling

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ABSTRACT

Primitive vein popliteal aneurysms are rare and potentially fatal vascular disorders. The most dangerous complications of popliteal vein aneurysms are thromboembolic events, mainly pulmonary embolisms, a life-threatening event that requires a timely diagnosis and prompt management. As a treatable cause of recurrent pulmonary embolisms, their actual incidence is believed to be underestimated. Herein, we present a case report of a popliteal vein aneurysm in a previously healthy 16-year old male, presenting with a swelling behind his left knee that causes minimal discomfort while walking. When feasible, early surgical repair of both symptomatic and asymptomatic popliteal venous aneurysms is advised, since they are associated with an ill-defined possibility of pulmonary embolism and mortality, if left untreated.

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Introduction

The venous aneurysm is the term that describes localized venous dilation in a non-varicose vein without having an arteri-

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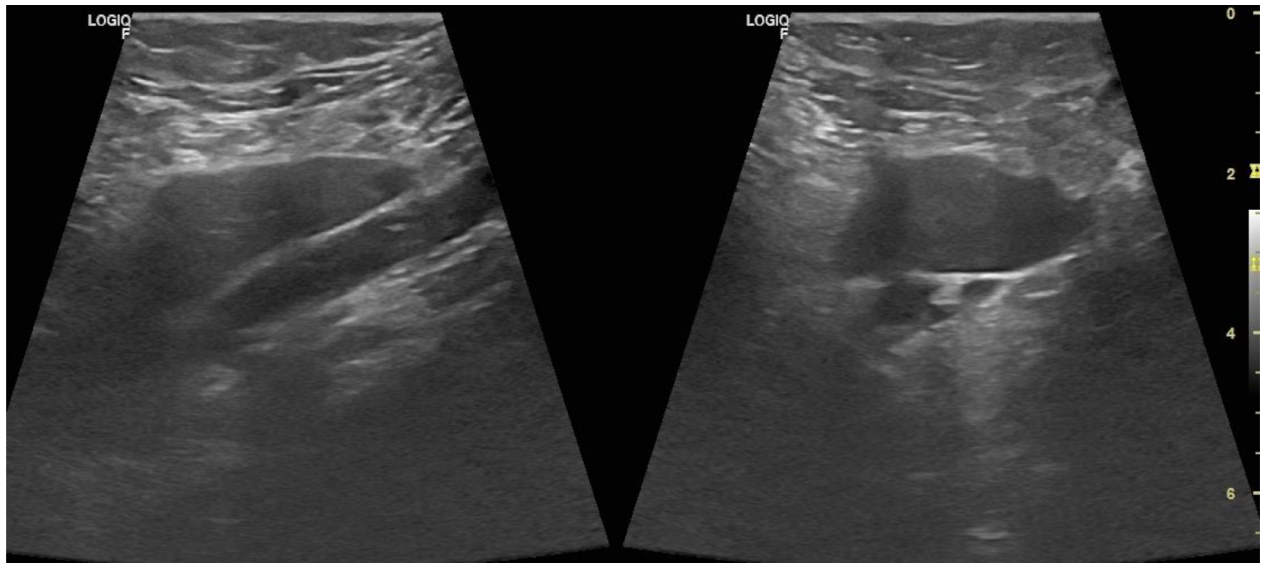


Fig. 1 – Axial and longitudinal views of the aneurysmal dilatation of the popliteal vein.

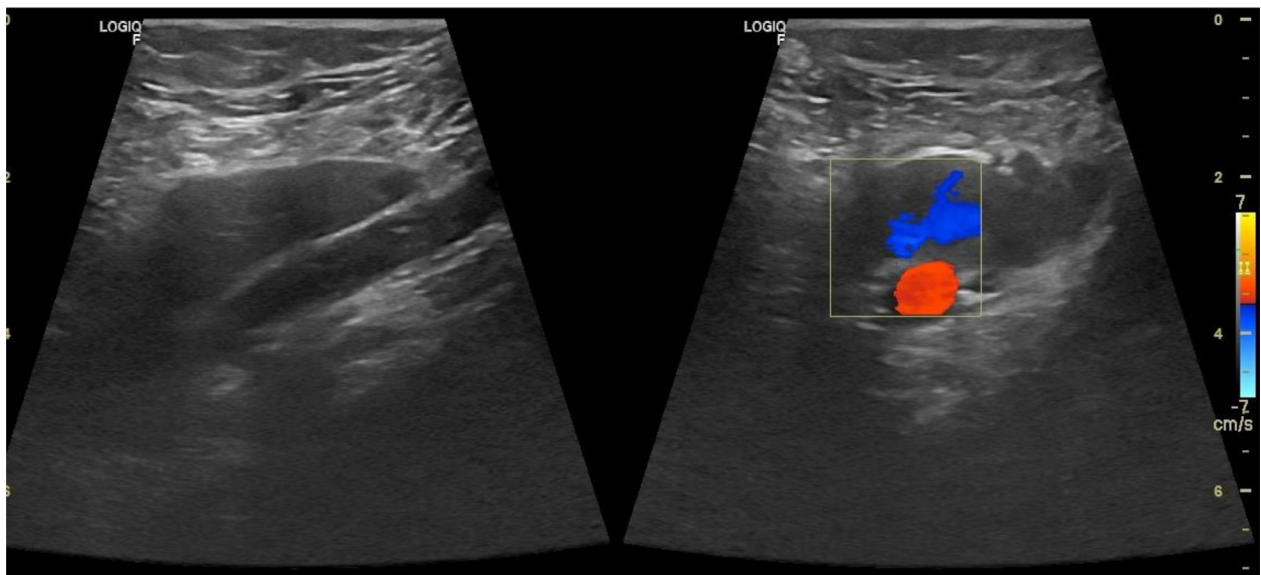


Fig. 2 – Axial and longitudinal views of the aneurysm with color doppler ultrasound.

ovenous fistula [1]. The exact pathogenesis is unknown; however, localized degenerative change due to trauma, inflammation, or congenital weakness due to connective tissue defects in the vessel wall can be the potential triggers [1]. Primary venous aneurysms are uncommon and clinically stable in most instances. In contrast, popliteal venous aneurysms are potential exceptions and may have fatal consequences. They yield a relatively higher risk for deep venous thrombosis, pulmonary embolism, and death [2].

The majority of popliteal venous aneurysms are asymptomatic; however, the strongest association with pulmonary embolism has been found in reported cases, followed by popliteal fossa mass and post-thrombotic syndrome. Clinical presentation and consequences largely depend on the size of the aneurysm. The likelihood of experiencing deep venous thrombosis is related to the size of the aneurysm. Therefore, in general, surgical treatment or lifelong anticoagulation should be offered in a patient with popliteal vein aneurysms >20 mm [3].

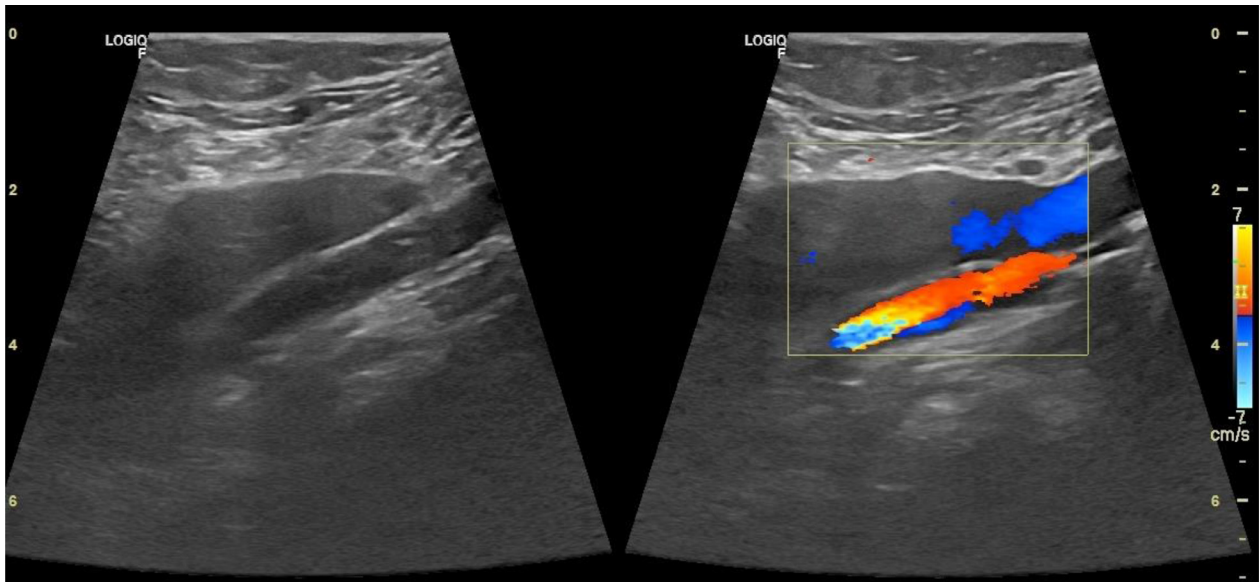


Fig. 3 – Longitudinal view of the aneurysm with color doppler ultrasound.

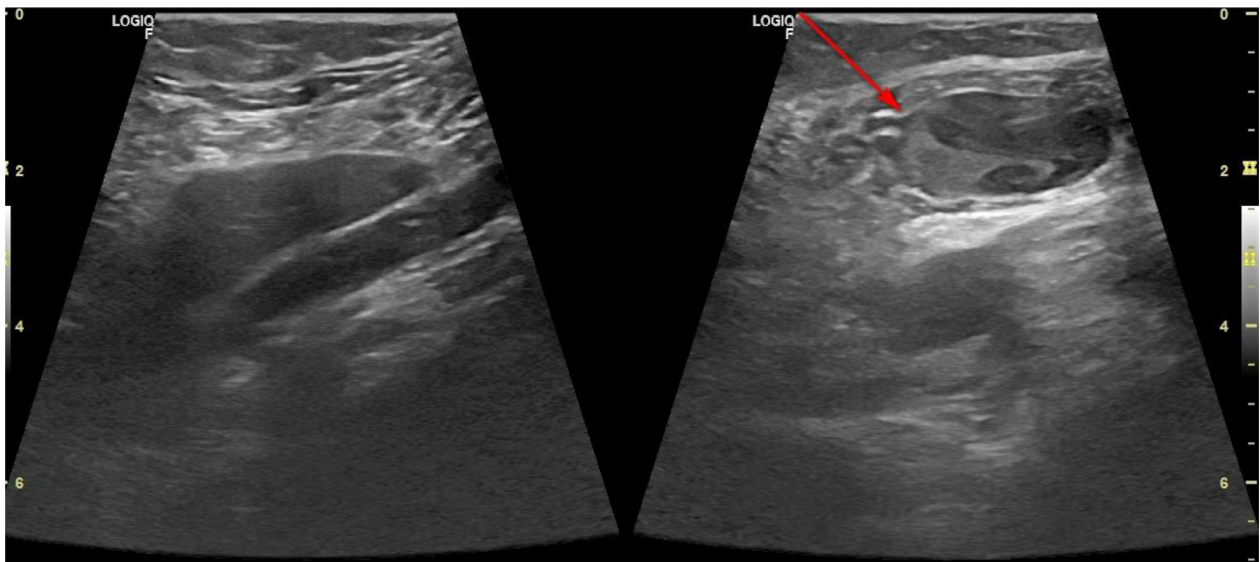


Fig. 4 – Partially thrombosed aneurysm evident in the ultrasound images.

Case report

A previously healthy 16-year-old male, is referred to the Radiology Department concerning a swelling behind his left knee, causing slight discomfort while walking. The patient is asymptomatic and does not report any other complaints.

On physical examination, a soft, palpable, nontender mass is present in the left popliteal fossa.

A standard ultrasound, as well as a color flow and pulsed waved doppler (PWD) ultrasound were obtained. They revealed an aneurysmal dilatation of the left popliteal vein, PWD ultrasound showed a lack of signal in the aneurysmal segment of the popliteal vein. Subsequently, both an MRI

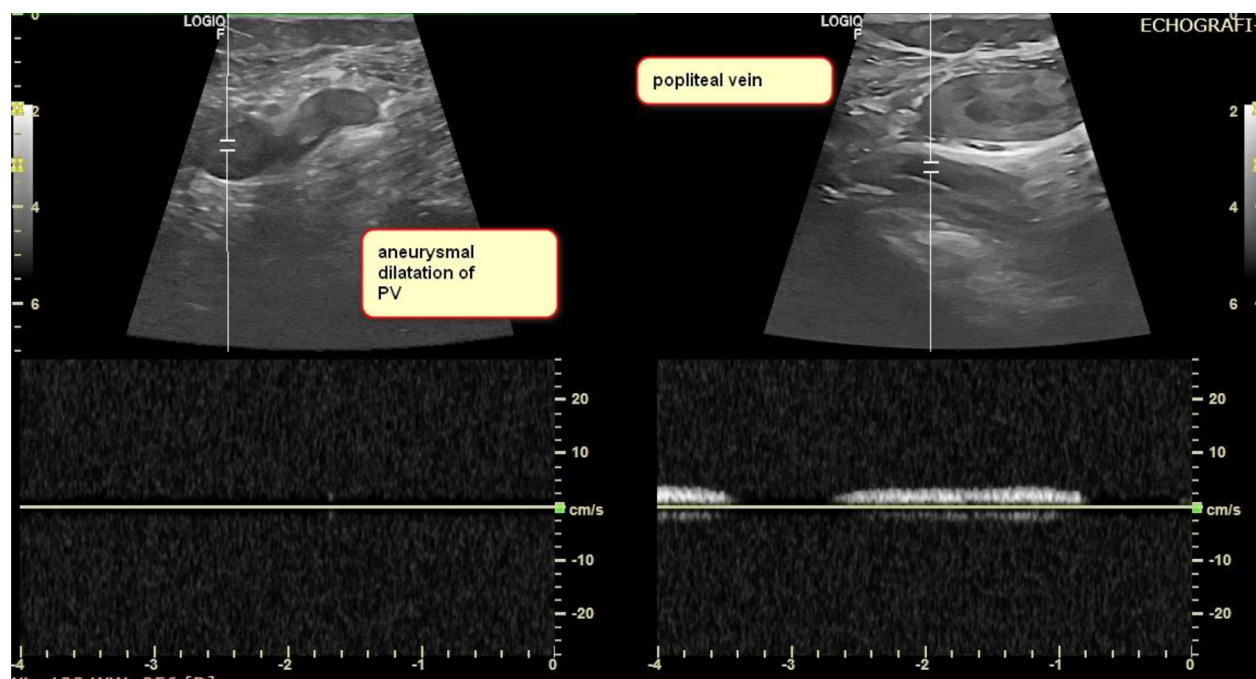


Fig. 5 – PWD ultrasound images show the signal in the popliteal vein and the lack of signal in the aneurysmal segment.

and CT of the venous system of the inferior limbs were ordered. Proton density weighted MRI sequences confirmed the presence of the aneurysm of the left popliteal vein. In a 3D CT reconstruction of the venous system of the left lower extremity, the aneurysm is evident and multiplanar reconstruction images revealed the partially thrombosed aneurysm in the left popliteal vein. The imaging examinations did not reveal any aneurysms or other vascular abnormalities in other locations. The patient made no reference to current or previous signs or symptoms suggestive of pulmonary embolism.

Due to the patient's age and lack of symptomatology, it was decided on an endovascular treatment approach. Surgical findings were consistent with the imaging and ultimately confirmed the diagnosis of the aneurysm of the left popliteal vein. The patient underwent a successful tangential aneurysmectomy and lateral venorrhaphy and was placed on prophylactic anticoagulation. [Figures 1-11](#)

Discussion

Venous aneurysms are rare vascular disorders. Popliteal vein aneurysms constitute the second most common type of venous aneurysms [3]. Due to their rarity, popliteal vein aneurysm is yet to be adequately defined. McDevitt et al. [4] defined them as a dilatation twice the size of the normal diameter of the popliteal vein, whereas a dilatation three

times the size of the normal diameter of the popliteal vein is the definition proposed by Maleti et al. [5] Popliteal vein aneurysms are predominantly real aneurysms involving all three layers of the venous wall [6]. The majority are saccular aneurysms, around 76%, with the remainder being fusiform [6,8].

Pathogenesis of popliteal vein aneurysms is not fully understood, however localized degenerative changes, varicose veins, trauma and a congenital predisposition have been proposed as possible etiological factors [3,6-8]. Aldridge et al. suggests that popliteal vein aneurysm arise in congenitally predisposed individuals that are exposed to mechanical and/or rheological factors [7]. Chronic inflammation due to underlying venous hypertension is believed to promote degenerative changes to the venous wall [3]. Nevertheless, several studies have revealed a lack of inflammatory reaction, suggesting that inflammation occurs secondary to the development of the aneurysm without directly contributing to its pathogenesis [7,9]. Several studies have underlined the role of *endophlebohypertrophy*, a progressive intimal proliferation of elastic, muscle, and connective tissue and *endophleboscrosis*, a degenerative process involving the loss of medial muscle cells, elastic fibers and progressive fibrosis, in the pathological mechanisms responsible for popliteal vein aneurysms. [7-9] These pathological changes are consistent with the histological evaluation of these aneurysms [6,9].

Several diagnostic modalities have been employed in the diagnosis of popliteal vein aneurysms including venography, duplex ultrasound, magnetic resonance imaging, computerized tomography and surgical exploration [6,9]. Previous stud-



Fig. 6 – PDW atSE - sagittal view revealing the aneurysm and the varicose veins.

ies recommended venography as the gold standard of diagnosis and necessary to obtain prior to surgery. However, newer studies have increasingly suggested duplex ultrasound should be used instead, due to its non-invasive nature and high accuracy in delineating the location and the size of the aneurysm, the presence of an intraluminal clot, the venous patency, as well as changes in the normal blood flow in the aneurysmal segments [3,6-9]. Our patient was diagnosed using a combination of imaging modalities, including color doppler and PWD ultrasound, as well as venous MRI and CT angiography.

Current literature indicates that as duplex ultrasound and other non-invasive imaging modalities become increasingly incorporated in the assessment of the venous system of the lower limbs, the number of popliteal vein aneurysms diagnosed as incidental findings, is likely to increase as well. Through this case report, we hope to emphasize the importance of including popliteal vein aneurysms in the differential diagnosis, when evaluating a popliteal mass, as well as in patients presenting with thromboembolic events, in the absence of thrombophilia or risk factors associated with deep vein thrombosis.



Fig. 7 – PDW SPAIR - sagittal view revealing the aneurysm and the varicose veins.

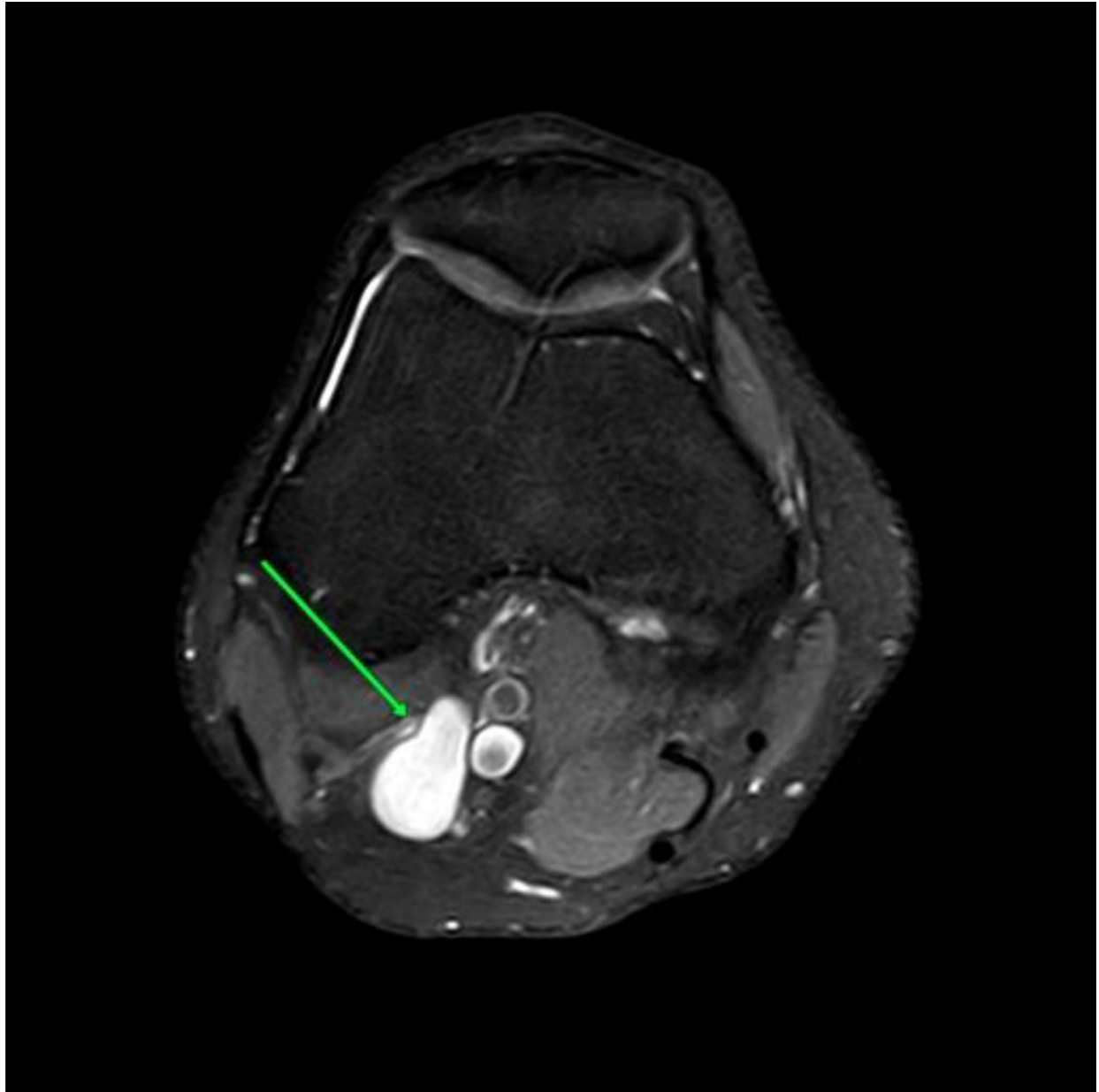


Fig. 8 - PDW SPAIR - axial view showing the neck of the aneurysm.



Fig. 9 – PDW SPAIR - axial view of the aneurysm.



Fig. 10 – 3D reconstruction CT documenting the aneurysm of the left popliteal vein.

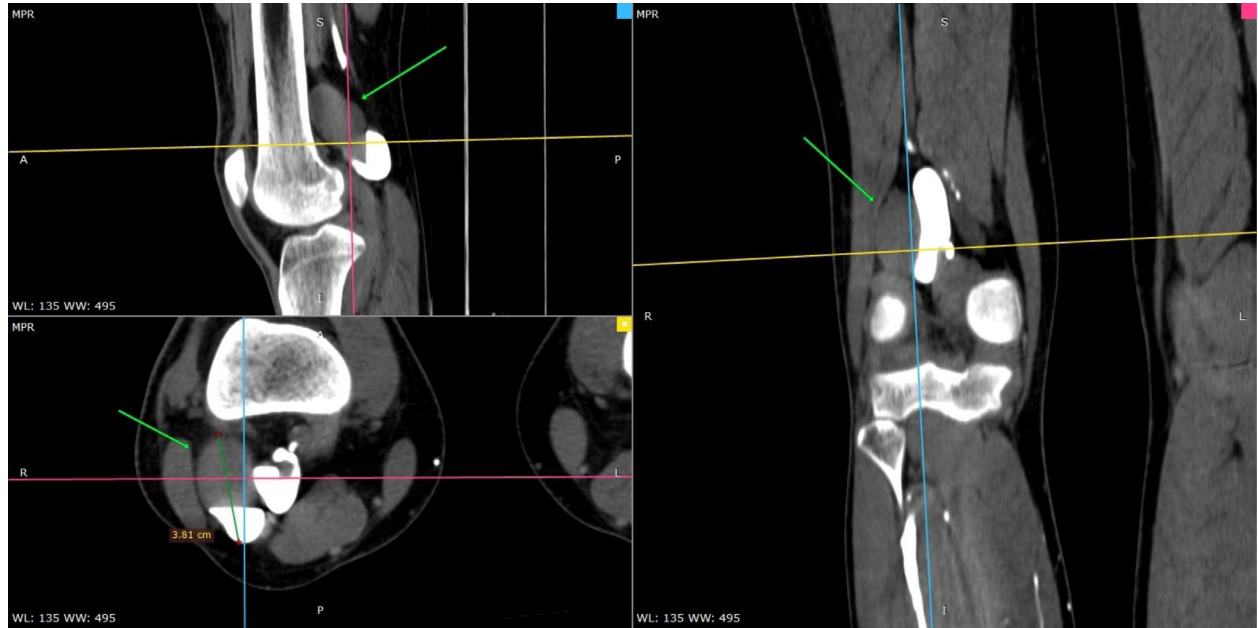


Fig. 11 – Multiplanar CT view showing the partially thrombosed aneurysm

Conclusion

In conclusion, popliteal venous aneurysms represent an uncommon pathology of the venous system. They can be life-threatening, as potential intraluminal clots in the aneurysm can embolize, causing fatal thromboembolic events. To prevent these detrimental complications, early diagnosis and prompt surgical repair are essential. Notably, popliteal vein aneurysms are very rare in our patient's age group, with studies suggesting they are commonly encountered around the fourth and fifth decade.

Patient consent

Patient consent has been obtained.

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