Incidental venous aneurysms- a rare entity

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Learning objectives

- To raise awareness of rare occult venous aneurysms, their clinical manifestation and possible complications.
- To illustrate the multimodality imaging features of venous aneurysms in major intracranial, intraabdominal and popliteal vessels.
- Discuss the differential diagnosis of venous aneurysms
- Outline treatment options.

Background

- Venous aneurysm is a rare entity [1]. Sir William Osler first described venous aneurysm in The Lancet in 1913 [2].
- In the most recent literature, there have been only 9 reported cases of dural venous sinus aneurysms, 120 cases of recorded popliteal vein aneurysms and 200 cases of visceral venous aneurysms [3,4].
- However, with the advent of cross-sectional imaging, its diagnosis is becoming more prevalent as incidental findings in asymptomatic patient.
- Occasionally, they might be diagnosed following patient presenting with symptoms related to their complications. These differ according to the location of the aneurysm.

Pathophysiology and causes

- Aetiology remains poorly defined in the literature.
- It is defined as a localised area of venous dilation in a non-varicose vein, not associated with an arterio-venous malformation or a pseudo aneurysm [5]. The conventional definition is the diameter of the vein is 1.5 times of the normal contiguous vein [6].
- A true venous aneurysm may be fusiform or saccular.
- Histology:
  - Wall thinning.
  - Loss of smooth muscle layer with fibrous replacement.
  - Disruption of the elastic layers.
  - Normal histology of the adjacent normal-calibre vein segment [7].
- Venous aneurysms in the portal vein, dural venous sinuses or popliteal veins can be primary (congenital) or secondary.
- In the primary group, the commonly accepted theory is due to the inherent weakness in the vessel wall. This is supported by cases reported in children and young adult without significant medical history as well as in utero [8].
- Causes of secondary venous aneurysms include iatrogenic, inflammatory, posttraumatic complication or a result of an underlying disease process such
as liver disease, portal hypertension and pancreatitis for visceral aneurysms [8].

Presentation

- A popliteal vein aneurysm might present as a lump or pain in the popliteal fossa, more seriously the initial presentation can be due to its complication, such as pulmonary embolism [9].
- Aneurysm of the porto-venous system may be asymptomatic or present with abdominal pain.
- Dural venous sinus aneurysm may be asymptomatic, present with tinnitus or raised intracranial hypertension.

Complications

If undiagnosed, can lead to significant patient morbidity and mortality secondary to thromboembolic disease, bleeding and rupture.

Imaging findings OR Procedure details

We present a series of 3 cases of incidental venous aneurysms, discuss their clinical presentations, imaging features and differential diagnoses.

- Case 1: A 59-year-old female with recurrent pulmonary emboli (Fig. 1 on page 4) underwent MDCT (Multidetector Row Computer Tomography) of the abdomen and pelvis, includind the upper leg to investigate the cause and planning for placement of IVC (Inferior vena cava) filter. MDCT demonstrated a right popliteal venous aneurysm with partial thrombus as a source of recurrent pulmonary emboli (Fig. 2 on page 4, Fig. 3 on page 5). Additionally, the patient was later found to have patent foramen ovale which had led to brain emboli and infarcts (Fig. 4 on page 7). Following the diagnosis, the patient subsequently had ligation of the popliteal vein aneurysm.

- Case 2: A 76-year-old male presenting with recurrent neurological deficit and falls underwent MDCT brain, which demonstrates a well-defined scalloping of the left occipital bone (Fig. 5 on page 8a) due to left transverse sinus aneurysm. Further MDCTV (MDCT venogram) (Fig. 5 on page 8b) showed no intravenous contrast medium is seen in the thrombosed aneurysmal left transverse sinus. MRI (Magnetic resonance imaging) demonstrated absence of flow void on the T2-weighted image, distended transverse sinus and filling defects of the left transverse sinus. On
the T1 post intravenous contrast sequence, no added contrast enhancement is seen in the thrombus (Fig. 6 on page 8, Fig. 7 on page 9a-b).

- Case 3: An 80-year-old female with biliary colic presented to the department for ultrasound assessment of the abdomen. A 4cm hypoechoic area was demonstrated in the region of the pancreatic head (Fig. 8 on page 10), which was thought to be a mass or cystic lesion. MDCT demonstrated a superior mesenteric vein (SMV) aneurysm extending into the portal venous confluence (Fig. 9 on page 11, Fig. 10 on page 12), no other sinister pathology was identified. The patient is currently under watchful surveillance and has not undergone any form of surgery.

Images for this section:

**Fig. 1:** Axial CT of a 59-year-old female patient demonstrating pulmonary emboli in the right inferior pulmonary artery and segmental branches of left pulmonary artery (yellow arrows).
**Fig. 2:** a: Axial imaging of both lower limbs showing aneurysmal dilatation of the right popliteal vein containing a thrombus (40 x 30 mm). This was identified as the cause of recurrent pulmonary embolism. b: Coronal imaging of both the lower limb showing aneurysmal dilatation of the right popliteal vein (yellow arrow) compare to the normal left popliteal vein (red arrow).
Fig. 3: Maximum intensity projection in coronal plane demonstrating the aneurysmal popliteal vein containing thrombus (yellow arrow).
**Fig. 4:** T2-weighted axial MRI of the brain showing a hyperintense lesion in the right lentiform nucleus representing an infarct from brain emboli (yellow arrow).

**Fig. 5:** (a) Axial MDCT head in bone window demonstrating a well defined scalloping of the left occipital bone at the region of the left tranverse sinus (yellow arrow). (b) MDCT venogram seen coronally demonstrating a well defined scalloping of the left occipital bone at the region of the left tranverse sinus. There is no contrast seen in the thrombosed left tranverse sinus.
Fig. 6: T2-weighted axial MRI of the brain showing absence of flow void (yellow arrow) in the left transverse sinus raises the suspicion of slow flowing blood and thrombus.
Fig. 7: (a) T1-weighted coronal MRI of the brain showing high signal intensity in the left transverse sinus consistent with thrombus (yellow arrow). (b) T1-weighted post contrast study shows no enhancement of the left transverse sinus, which indicates it as a thrombus rather than an enhancing mass.
**Fig. 8:** Transverse ultrasound sections of the abdomen showing a 40mm hypoechoic area in the region of the pancreatic head.
Fig. 9: Axial abdominal CT demonstrating 44x38mm aneurysmal dilatation of the superior mesenteric vein extending to the portal vein confluence.
Fig. 10: Maximum intensity projection in coronal plane showing aneurysmal SMV (yellow arrow).
Conclusion

Differential diagnosis:

Intracranial :

- Vascular
  - Arterio-venous malformation
- Tumour
  - Meningioma

Intraabdominal :

- Arterial aneurysm
- Biliary dilatation
- Lymph nodes

Popliteal swelling/mass

- Baker’s cyst
- Haematoma
- Varicose veins

Treatment:

- On review of the available literature, treatment options are considered on symptoms/severity of each case.
- List of treatment options:
  - Watchful surveillance
    - An asymptomatic portovenous aneurysm will have conservative treatment whilst a large aneurysm will undergo surgery to prevent risk of fatal complication, such as rupture or thrombosis
  - Endovascular stenting, coiling or embolisation [9]
  - Surgical ligation/resection
    - A popliteal vein aneurysm that causes recurrent pulmonary embolism will receive surgical ligation.

Learning points

- Venous aneurysm is considered when the diameter is 1.5 times of the contiguous normal vein.
- May be asymptomatic.
- Fatal complications include pulmonary embolism and septic brain embolism can be the first presentation.
• Ultrasound is good first choice of investigation for visceral and peripheral venous system.
• CT and MRI are useful to further delineate anatomy.
• Unsuspected venous aneurysms, although rare, can be mistaken for masses or tumours. Awareness of these entities and a multimodality approach would help to give a prompt diagnosis and facilitate accurate patient management preventing further complications.

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