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Case report

Splenic artery pseudoaneurysm: Challenges of non-invasive and endovascular diagnosis and management

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ABSTRACT

Splenic artery pseudoaneurysms (PAs) are uncommon and often occur as a complication of pancreatitis or trauma. Unlike true aneurysms, PAs are symptomatic in a majority of cases and patients can present with a constellation of non-specific symptoms. Diagnosis can be challenging due to variation in presenting features and mimicking pathologies. PAs are associated with a very high morbidity and mortality if left untreated. We present an unusual case of a 47-year-old gentleman diagnosed with a splenic artery pseudoaneurysm despite initial negative catheter angiography and discuss the challenges of splenic artery pseudoaneurysm diagnosis and management.

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Introduction

Pseudoaneurysms (PAs) are abnormal dilatations of arteries which form as a result of a breach in the wall of a vessel, leading to accumulation of blood, bounded and contained by the outermost vessel wall layer called the tunica adventitia [1]. In contrast, true aneurysms involve all 3 layers of the arterial wall: tunica intima, media and adventitia. A majority of true aneurysms of the splenic artery are clinically asymptomatic in their unruptured state (97.5%) [2]. Risk factors for

their development include: portal and systemic hypertension, liver transplantation, cirrhosis and pregnancy [1,2].

Splenic artery PAs are infrequently reported in the literature [1–3]. These usually occur on a background of pancreatitis, trauma or peptic ulcer disease. Unlike true aneurysms, patients with this condition are often symptomatic; however, the presenting features are varied and non-specific. Commonly reported signs and symptoms include: abdominal pain, haematemesis, melaena and chest pain. This non-specificity causes a diagnostic dilemma for many clinicians which is further complicated by the fact that small splenic artery PAs can

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be missed even on high-resolution modern imaging modalities such as computed tomography (CT) [4]. A high index of suspicion, prompt diagnosis and treatment is required as if left untreated, PAs are associated with high morbidity and mortality rates. The risk of rupture as high as 37% and a mortality rate approaching 90% when untreated, irrespective of aneurysm size [1,3].

We present an unusual case of a 47-year-old male diagnosed with a splenic artery PA following 2 triple-phase CTs and 3 contrast endovascular examinations.

Case report

A 47-year-old gentleman presented to his local district general hospital with acute epigastric abdominal pain. His past medical history included chronic pancreatitis secondary to alcohol excess complicated by the formation of multiple pseudocysts. An initial contrast-enhanced CT abdomen pelvis demonstrated a focal 3.8 cm expansile abnormality at the pancreatic tail with peripheral low density and a centrally enhancing component measuring 1.3 cm. This component was slightly hypodense to the splenic artery in the arterial phase and slightly hyperdense to the splenic artery on delayed phase images, raising the suspicion of a splenic artery PA (Fig. 1).

The patient was urgently transferred to our hepatobiliary centre, where he underwent angiographic evaluation of the coeliac axis and splenic artery, which demonstrated no evidence of PA or active haemorrhage (Fig. 2). Since the patient was clinically stable post-angiography, he was discharged from hospital with adequate safety-netting with a plan for re-imaging and angiography 1 month later.

A triple-phase CT on re-admission demonstrated a 5.3 cm abnormality at the tail of the pancreas, which had increased in size since the previous CT where it measured 3.8 cm. Once again, there was an enlarging well-circumscribed central component measuring 2.6 cm (previously 1.3 cm), which was hypodense to the splenic artery on arterial phase imaging and isodense to the portal vein on delayed phase imaging. Given the prior negative angiography study, this CT finding caused a diagnostic dilemma. The apparent venous enhancement raised the possibility of either a splenic vein aneurysm or a narrowed splenic artery PA acting as a mimic due to delayed filling.

Splenic venography demonstrated narrowing of the splenic vein close to the splenic hilum with multiple filling collateral vessels, but no venous aneurysm (Fig. 4). A repeat splenic artery angiogram showed a fine jet of contrast arising from a lower pole splenic artery, filling into a large PA sac (Fig. 5). The lower pole splenic artery was selectively cannulated and initially embolised with a 6 mm x 20 cm Ruby coil [5]. The proximal artery, across the neck of the PA, was then embolised with Onyx 34 [6]. A satisfactory angiographic result was obtained with no flow of contrast within the PA post-embolisation. A follow up CT 1 month later showed a decrease in size of the PA sac as well as an absence of active arterial contrast flow within the PA.

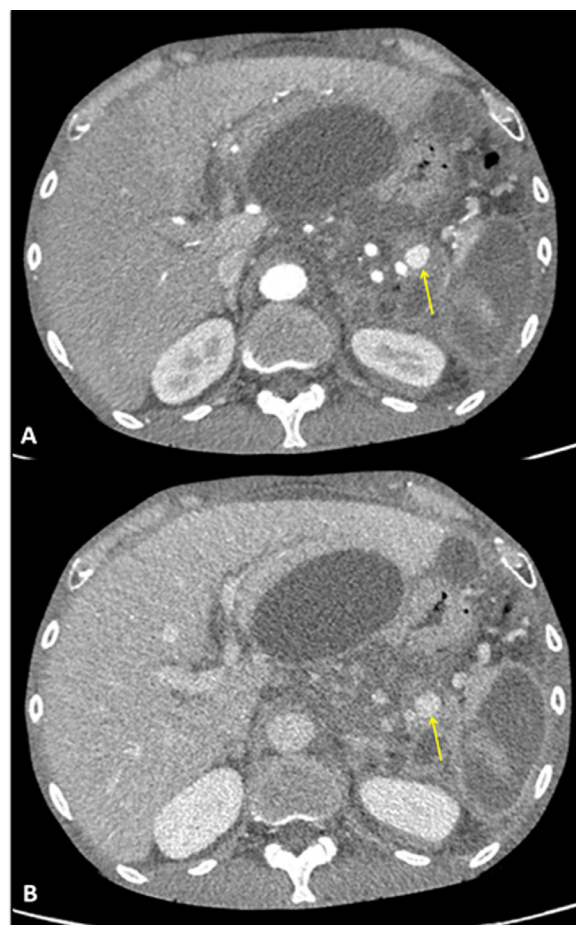


Fig. 1 – Contrast-enhanced CT abdomen pelvis in the arterial (A) and portal venous phase (B) demonstrating a focal, expansile abnormality at the pancreatic tail, adjacent to the splenic artery, with a central enhancing component (yellow arrows). Multiple low density collections consistent with pancreatic pseudocysts and sequelae of chronic pancreatitis are also demonstrated (Color version of figure is available online).

Discussion

Pancreatitis (acute or chronic) is the leading cause of splenic artery PAs [3]. The aetiopathogenesis is attributable to pancreatic enzymes digesting the splenic artery adventitia, resulting in arterial wall weakness and, consequently, expansion of the outer layer [7]. There have also been documented cases of post-traumatic splenic artery PAs [8] thought to occur as a result of shearing forces causing damage to the arterial wall [9]. Efficient and prompt diagnosis of splenic artery PAs remains a challenge due to their infrequency and non-specific presenting clinical features. CT is a widely used non-invasive assessment tool and PAs often demonstrate contrast enhancement in the arterial phase. Small PAs can be missed on non-invasive CT evaluation alone [4].

In current practice, the preferred method of radiological evaluation is invasive angiography which can also offer the



Fig. 2 – Selective angiography of the coeliac axis (A) and splenic artery (B) depicting no fluoroscopic evidence of PA or active haemorrhage.

therapeutic option of embolisation if a PA is detected [10–13]. Due to the high risk of rupture without treatment, all splenic artery PAs should be treated regardless of size or clinical manifestation [14]. The treatment of choice is typically coil embolisation or possibly a stent-graft placement across the lesion if the anatomy permits (ie, in the event of more proximal lesions and non-tortuous arterial segments to facilitate device passage). Distal and proximal embolisation (sandwich technique) across the aneurysm neck is typically required to prevent collateral circulation resulting in continued sac pressurization. Alternatively, a sac-packing technique with coils or parent artery glue embolization has also been used. Intentional embolization of the entire splenic artery may be required in complex, high-risk splenic PAs [15,16]. Serial CT imaging for monitoring is advised following coil embolisation due to reports of recanalization [17].

However, the most frequently reported procedure for the treatment of PAs in existing literature is arterial ligation and splenectomy with distal pancreatectomy [3]. This has excellent reported success rates in the literature however, is associated with increased risk of morbidity and mortality (9% and 1.3% respectively) [17]. Therefore, endovascular or percutaneous embolisation is the most common and favoured ap-

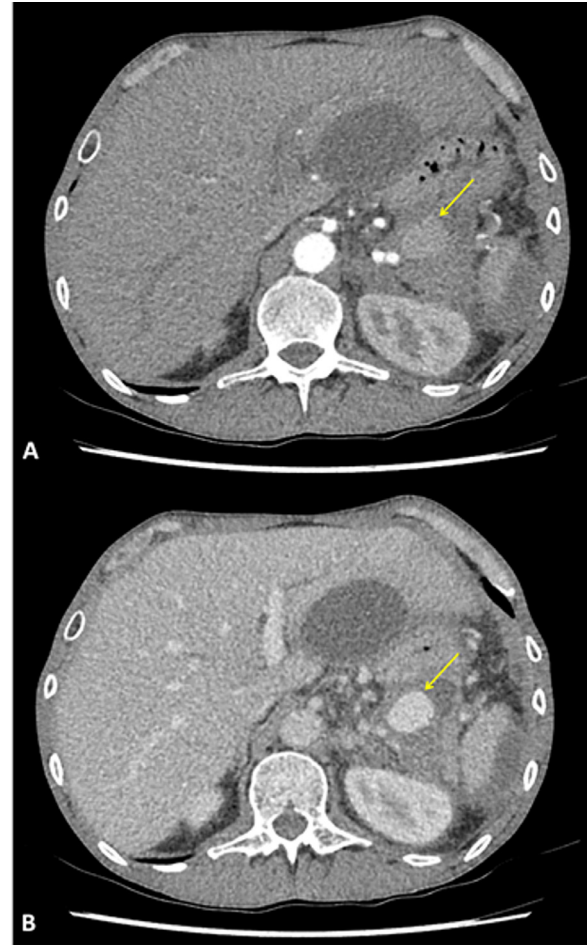


Fig. 3 – Contrast-enhanced CT abdomen pelvis in the arterial (A) and portal venous phase (B) one month later illustrating an enlarging abnormality at the tail of the pancreas with a growing centrally enhancing component (yellow arrows) (Color version of figure is available online).

proach of PA management in current practice due to improving technical success rates and safety profile [11–13].

Our case highlights multiple challenges and learning points in the diagnosis and management of splenic artery PAs. Our patient had an initial CT indicating a splenic artery PA (Fig. 1). However, the first angiogram demonstrated no fluoroscopic evidence of PA or active bleeding (Fig. 2). The second CT (Fig. 3) showed atypical contrast enhancement patterns with hyperattenuation on the delayed phase, raising the possibility of a venous aneurysm. The diagnosis was finally made with a repeat dual venography and angiographic study (Figs. 4 and 5), revealing no focal venous dilatation, but a narrow-neck splenic artery PA that was subsequently embolised. It is therefore essential to have a high index of suspicion for PAs. In the event of a negative initial angiogram, we propose that a low threshold for repeat interval angiography should be considered. PAs with a narrow neck may intermittently fill, which likely explains the initial negative angiogram. This can prove to be technically challenging since interventionalists may require to be in close proximity to the neck of

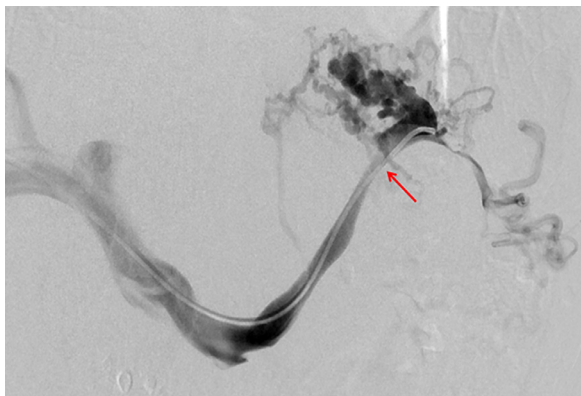


Fig. 4 – Splenic venography performed via a right portal vein puncture. This demonstrated narrowing of the splenic vein close to the splenic hilum (red arrow) with multiple filling collateral vessels but no venous aneurysm (Color version of figure is available online).

the PA to demonstrate progressive filling sufficient for a diagnosis [18].

In addition, our case also demonstrates that PAs may have a different density from the splenic artery depending on the

rate of contrast filling. This is highlighted in Figure 3, where the PA displayed more pronounced venous phase enhancement compared to the arterial phase which, along with the negative first angiography, raised the suspicion of a venous aneurysm. The differential pattern in the rate of contrast filling within the PA may be explained by inherent circulatory differences and the size of the PA neck, as previously discussed.

Cone-beam CT is a technique which can provide reconstructed cross-sectional or 3-dimensional images during catheter angiography, therefore allowing selective contrast injection and opacification of vascular structures. It has shown to improve the technical success rates of transarterial chemoembolisations in patients with hepatocellular carcinoma and has several other reported useful vascular applications [19]. In retrospect, this complementary technique may have provided better diagnostic clarity in the first angiographic study, however was not available in our clinical workstation.

A venous aneurysm is a very rare differential diagnosis to consider. However, these often occur in the context of portal hypertension and are usually asymptomatic and incidentally detected in contrast to PAs [20,21]. Other common pathologies that can mimic splenic artery PAs especially on CT imaging include peri-pancreatic cysts [22] and neuroendocrine tu-



Fig. 5 – (A) and (B) Splenic artery angiogram depicting a fine jet of contrast arising from a lower pole splenic artery, with progressive contrast filling into the PA sac (red arrows). (C) Post-embolisation angiogram depicting excellent results and no flow of contrast within the PA (Color version of figure is available online).

mors [1], the latter usually demonstrating marked arterial hyperenhancement, similar to PAs. High-density material within a peri-pancreatic cystic lesion should raise suspicion of a thrombus within a PA [1].

In summary, splenic PAs are uncommon and can prove to be a diagnostic challenge, especially in the event of narrow-neck PAs which display atypical imaging features. A high index of suspicion is therefore required and we recommend repeat imaging and angiography for further clarity and evaluation if there is diagnostic uncertainty.

Patient consent

The authors of this manuscript have obtained written, informed consent from the patient to write up the case report and for the use of images pertinent to the case. We have ensured anonymity of all clinical and graphical data used.

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