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Case Report

The case of the disappearing aneurysm - spontaneous regression of a mycotic hepatic aneurysm secondary to intravenous drug use: a case report and literature review

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ABSTRACT

Hepatic artery aneurysms are a rare but potentially life-threatening vascular lesion which require urgent diagnosis and management. This case report and literature review highlights the case of a 41-year-old female with a history of intravenous drug use who developed a 14 mm mycotic hepatic artery aneurysm after being treated for infective endocarditis. The patient initially presented with fever and abdominal pain. Bedside echocardiogram demonstrated valvular vegetations requiring emergent metallic valvular replacement. During the patient's admission they developed further sequelae from endocarditis including splenic capsular rupture, renal infarcts and eventually hepatic artery aneurysm. This patient's hepatic artery aneurysm spontaneously thrombosed over less than a week and regressed without surgical or endovascular intervention. This case is not only the first documented case of spontaneous regression of mycotic hepatic artery aneurysm but highlights the importance of considerations for acute abdominal pain in those with a history of intravenous drug use and concomitant infective endocarditis. It also demonstrates the possibility of conservative management in visceral artery aneurysms.

Keywords: Endovascular, Hepatic artery aneurysm, Mycotic, Spontaneous regression, Endocarditis

INTRODUCTION

Mycotic artery aneurysms are a rare complication of systemic infections which may represent a diagnostic and therapeutic challenge.[1] Hepatic artery aneurysms are a rare but important cause of abdominal pain and were first described by the anatomist Wilson in 1809 describing a heart shaped outpouching of the left hepatic artery upon autopsy of a clergyman.[2] Guida comprehensively summarised the world history of 227 cases from 1809 to 1960, with the most recent summary of English literature describing 103 cases from 1985 to 1995.[3,4] Since then, various case reports have selectively reviewed parts of the literature pertaining to their size, management or associated complication.[5-7] Hepatic artery aneurysms have an incidence of 0.1-0.2% and make up 20% of all splanchnic artery aneurysms.[8] They are usually solitary with 80% located extrahepatically and are fusiform when <2 cm and saccular if >2 cm.[9] The most common location is the common hepatic artery (63%), then right hepatic (28%), left hepatic (5%), and both left and right hepatic (4%).[9] A 25-year retrospective cohort study demonstrated 59 visceral aneurysms where 100% of all hepatic artery aneurysms involved the common hepatic artery.[4] The most common aetiology is arteriosclerosis (34%) followed by medial degeneration (21%), trauma (18%), infection (16%) then congenital defects and arteriopathies like polyarteritis nodosa.[9] Hepatic artery aneurysms may present with right upper quadrant abdominal pain following rupture into the biliary system with associated fever, melena and or haematemesis. Obstructive jaundice less commonly occurs from hepatobiliary obstruction

following aneurysmal rupture or by extraductal compression of an intact expanding aneurysm. If left untreated the most worrisome complication is rupture into the intraperitoneal cavity or biliary tree. The frequency of hepatic artery aneurysm rupture is less than 20%, and the mortality rate occurring with rupture approximates 35%.[9] This literature review aims to address the 30-year knowledge gap of incidence, distribution, aetiology and complications of mycotic hepatic artery aneurysms. Intravenous drugs can cause systemic infections and mycotic aneurysms as a sequela. The most common cause of mycotic aneurysm is intravenous drug use.[10]

CASE REPORT

A 41-year-old female with a history of intravenous drug usage (IVDU) presented with five days of fever and abdominal pain. The patient's past medical history includes opioid IVDU, obesity, non-alcoholic fatty liver disease, and a previous right groin abscess surgically managed three years prior. On examination the patient was found to have a grade III systolic murmur heard loudest in the aortic region, and signs of digital emboli.

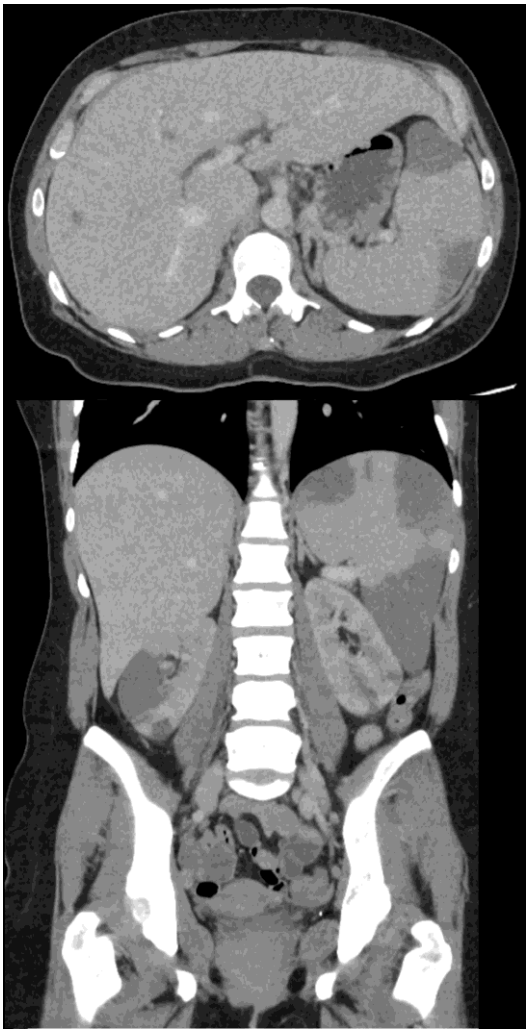

Figure 1: Axial and coronal images of initial CT scan showing splenic and renal infarcts.

Initial blood tests revealed a white cell count of 19.6×10^9/l, a C-reactive protein level of 333 mg/l and an estimated glomerular filtration rate of 34 ml/min on a baseline of 80 ml/min. Echocardiogram showed a large mobile vegetation 13 mm in diameter of a trileaflet aortic valve, associated with moderate aortic regurgitation. Initial contrast CT abdomen and pelvis (CTAP) showed splenic and bilateral renal infarcts with small low-attenuation lesions highly suspicious for hepatic abscesses, but no aneurysms (Figure 1). Blood cultures grew *Staphylococcus aureus* in keeping with infective endocarditis. Treatment with intravenous flucloxacillin and meropenem was guided by sensitivities. A metallic aortic valve replacement was performed emergently.

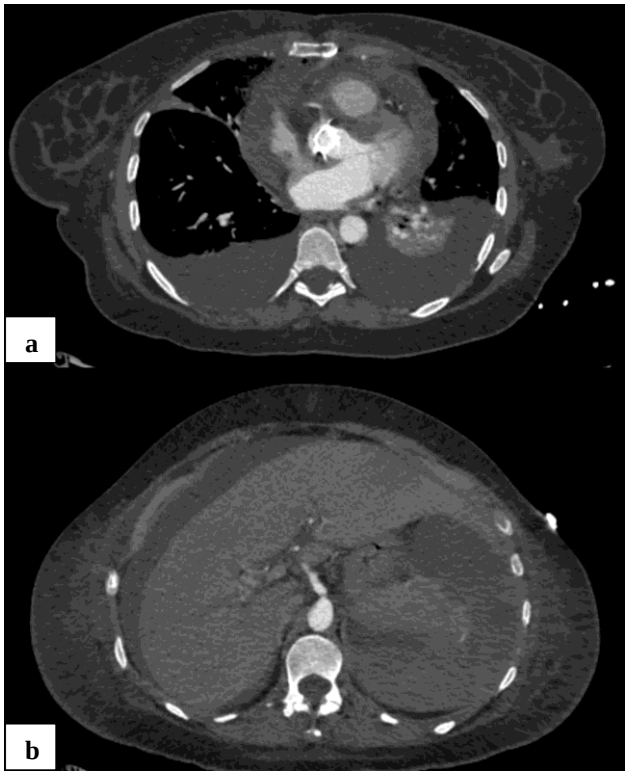

Figure 2 (a and b): Axial CT imaging showing metallic heart valve, pericardial effusion and splenic haemorrhage.

The patient's abdominal pain persisted which was investigated by repeat CTAP imaging (Figure 2). This revealed splenic capsular rupture and haemorrhage. The splenic artery was embolised using coils demonstrated on repeat imaging (Figure 3). The patient later became unwell with ongoing sepsis, acute kidney injury and refractory hyperkalaemia leading to a prolonged stay on the intensive care ward and requiring dialysis.

Due to a worsening of abdominal pain and new abdominal distension, a further repeat CTAP was performed. This demonstrated a 2 cm abnormal area of enhancement in segment 4 of the liver (Figure 4). Subsequent contrast ultrasound imaging characterised this as a 14 mm mycotic aneurysm of the right hepatic artery (Figure 5). The

decision was taken to manage the mycotic hepatic artery aneurysm conservatively at this point, due to several concerns with interventional management. Firstly, the patient was anticoagulated at the time for the new metallic aortic valve, increasing the bleeding risk of a procedure. Secondly, the patient had significant scarring of the bilateral groins due to prolonged and intensive IVDU access of the groin. A hostile groin leading to altered anatomy, loss of normal anatomical planes and scarring of the surrounding tissues would increase the intraoperative risk of a procedure. Thirdly, the patient had already been unwell with several complications of infectious endocarditis and was asymptomatic from the perspective of the aneurysm itself at the time. Subsequent repeat imaging during the admission demonstrated a partially thrombosed, and then later a fully thrombosed aneurysm (Figure 6).

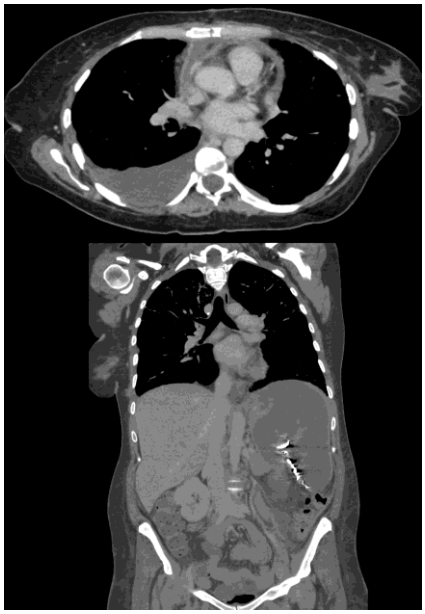

Figure 3: Axial and coronal CT imaging post splenic artery coiling.

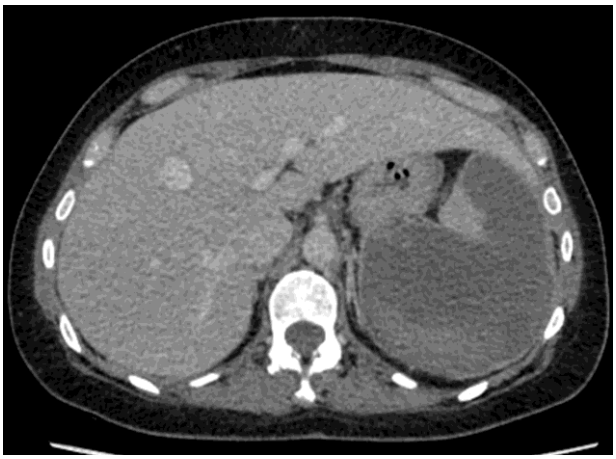

Figure 4: Axial CT imaging showing an enhancing focus in the liver representing a mycotic hepatic artery aneurysm.

The patient went on to complete ten weeks of meropenem and was discharged from hospital. At the time of writing the patient has represented to hospital with symptoms related to their endocarditis but unrelated to the mycotic hepatic aneurysm.

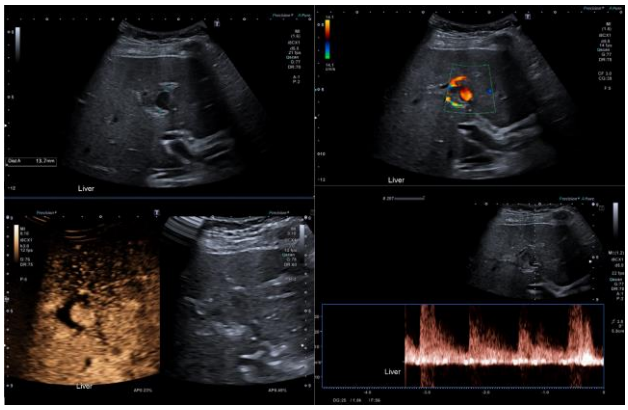

Figure 5: Ultrasound scan of the liver with contrast characterizing and confirming the mycotic hepatic artery aneurysm.

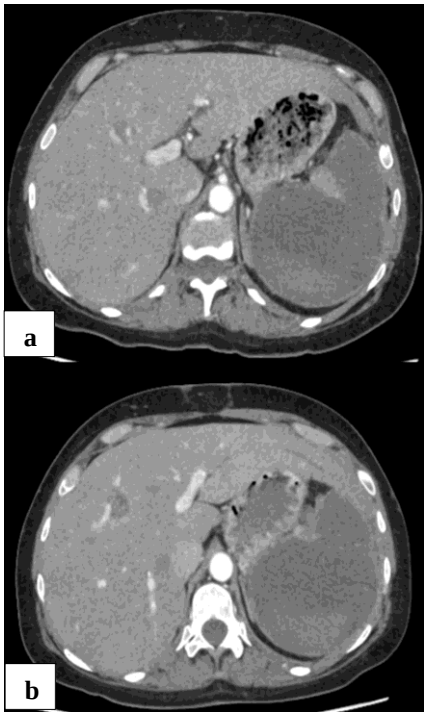

Figure 6: Follow up axial CT imaging showing spontaneous thrombosis of hepatic artery aneurysm – (a) taken on 22 October 2024 and (b) taken on 25 October 2024.

DISCUSSION

The hepatic artery is a term used to describe a group of arteries including the common hepatic artery, hepatic artery proper and the branches of the left and right hepatic arteries. The hepatic artery is itself a branch of the coeliac artery, also known as the coeliac trunk, or coeliac axis.

Aneurysms of the hepatic artery are an important consideration of presentation in abdominal pain. Hepatic artery aneurysms may be quiescent for a long time but have the highest risk of rupture of all visceral artery aneurysms with up 44-60% of those going on to rupture.[1,11] Risks of rupture include a high mortality rate of 20-80%.[12]

Mycotic aneurysms, sometimes referred to as infected aneurysms, are caused by arterial wall injury secondary to infection seeding. This is most commonly due to bacteria but may also be secondary to viruses or fungi. The name 'mycotic' refers to their fungus-like appearance when first discovered by William Osler in 1885, rather than describing a specific underlying pathogenic organism. The most common pathogens causing mycotic aneurysms in Western countries are *S. aureus* (28%), *Salmonella spp* (15%), and *Pseudomonas aeruginosa* (10%).[14] At particularly increased risk are those with underlying malignancy and those with a history of chemotherapy, as well as people with a history of prolonged corticosteroid therapy.

The most common underlying cause of mycotic aneurysm is intravenous drug use and haematogenous spread, most commonly secondary to infective endocarditis.[11] Mycotic aneurysms may form primarily from direct suppuration, secondarily from septic emboli causing occlusion such as in infective endocarditis or lastly from overwhelming systemic sepsis causing pathogens to adhere to the vessel walls.[14] Septic emboli are infected blood clots that travel through the bloodstream causing damage to other organs. Sequelae of severe endocarditis can be septic emboli which this patient has likely had.

Traditionally, diagnosis was made via conventional angiography. However, this has been largely replaced with multi-detector CT and MRI in multiple phases of contrast-enhancement. If accessible, doppler ultrasonography can also allow for fast and accurate assessment. The typical imaging features of a mycotic aneurysm include a region of arterial dilation, usually saccular, and perivascular oedema. It may have a lobulated contour and thickened wall. Treatment for mycotic aneurysms involves long-term antimicrobial therapy and the first line treatment for hepatic artery aneurysms is generally endovascular repair.[14]

While there are numerous potential complications arising from illicit drug use, it is particularly important to note the increased risk of infection and infective-like syndromes in IVDU because of the frequently unclean conditions in which illicit drugs are injected. HIV and hepatitis are two very well-known and feared complications of IVDU, but the relevant complications in this case (bacterial endocarditis and sepsis) are just as high-risk. However, fever in IVDU is a multifaceted and complicated presentation: while not germane to this case, it is important to note that syndromes such as the 'cotton fever' that develops because of *Enterobacter agglomerans* endotoxin, mainly seen in heroin users, is an example of an infective-like syndrome that is blood culture-negative and does not respond to empirical antibiotic therapy.

The most common infections seen in the IVDU population are skin and soft-tissue infections, which is due to the various available routes to a user including subcutaneous and intramuscular as well as intravenous. There are numerous potential causative organisms, such as relatively common Staphylococcal or Streptococcal infections, but there are more uncommon pathogens such as *Clostridium spp.* or even *Bacillus anthracis* to be aware of in user subgroups. In these patients, it is important not to immediately consider less common blood culture results as contaminants. IVDU itself causes trauma to the vessel wall directly, and can introduce pathogens directly into the bloodstream, creating the environment for further vascular damage as well as the risk of infective endocarditis, thereby creating the potential for seeding of septic emboli and mycotic aneurysms develop. In this case, cultures grew *S. aureus* which was treated with IV flucloxacillin and meropenem. IVDU is associated with decreased engagement with health services, and in cases such as these the sequela of late presentation is evident: unchecked infective endocarditis leads to the overgrowth and destruction of heart valves, and frequently requires valvular replacement. Indeed, this patient underwent an emergent metallic aortic valve replacement.

Spontaneous regression of mycotic aneurysms has been documented previously in other vessels but at the time of writing no spontaneously regressed mycotic hepatic artery aneurysms have been documented in the literature. Resolution of an aneurysm without intervention by itself is uncommon, but a self-resolving mycotic aneurysm is atypical due to their nature of having an infected vessel wall. There remains a paucity in the literature discussing mycotic aneurysms. This case demonstrates the link between IVDU, endocarditis and some of the sequelae of septic emboli. The patient became unwell with several complications associated with her endocarditis. Renal infarct led to an acute kidney injury eventually requiring dialysis in the intensive care ward with ongoing symptoms related to the pericardial effusion. The splenic haemorrhage required coil embolization by endovascular procedure. Mycotic aneurysm repairs have an increased postoperative complication rate likely due to the comorbidities and concomitant issues such as those described.

CONCLUSION

Mycotic hepatic artery aneurysms require a multidisciplinary approach to diagnose and treat with appropriate antimicrobial therapy and usually surgical or endovascular interventions. This case illustrates the challenges in managing the complexities of an acutely unwell patient with infective endocarditis and the sequelae of septic emboli causing splenic capsular infarct, renal infarct and mycotic hepatic artery aneurysm. In this case the hepatic artery aneurysm resolved without intervention.

This patient's mycotic hepatic artery aneurysm spontaneously thrombosed and regressed without surgical or endovascular intervention. This case is the first documented case of spontaneous regression of mycotic hepatic artery aneurysm and highlights the importance of considerations for acute abdominal pain in those with a history of intravenous drug use and concomitant infective endocarditis. It also demonstrates the possibility of conservative management in visceral artery aneurysms. Further research into the indications for surgical versus conservative management of mycotic artery aneurysms is needed to improve our understanding of the management of these conditions.

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