ACS Case Reviews in Surgery
Vol. 3, No. 5

Hepatic Artery Aneurysms: An Uncommon Presentation of a Deadly Disease Process

AUTHORS:
Elseth AJ; Mulhall JR; Thomas KM; Simon TE; Martin ED; Givens MD

CORRESPONDING AUTHOR:
Anna J. Elseth, DO
Department of General Surgery
Dwight D. Eisenhower Army Medical Center
300 Hospital Road
Fort Gordon, GA 30907
Phone: (334) 733-5537
Email: anna.elseth@gmail.com; anna.j.elseth.mil@mail.mil

AUTHOR AFFILIATION:
Dwight D. Eisenhower Army Medical Center
Fort Gordon, GA 30905

Background	An otherwise healthy female presented with symptoms consistent with biliary pathology and was diagnosed with a hepatic artery aneurysm. These occur in 0.4 percent of the general population and are generally only symptomatic when dissecting. These aneurysms must be promptly recognized and treated appropriately when symptomatic to prevent potentially lethal outcomes.
Summary	Our patient is a 58-year-old female with no significant comorbidities presenting right upper quadrant pain and a differential diagnosis suspicious for cholecystitis. After a right upper quadrant ultrasound and computer tomography were obtained, it was determined she instead had a symptomatic right hepatic artery aneurysm that was not actively dissecting. This was successfully treated with endovascular coil embolization resulting in complete resolution of her symptoms.
Conclusion	Rupture of a hepatic artery aneurysm is a true surgical emergency and requires clinical and surgical familiarity. These aneurysms are generally silent unless actively dissecting and must be treated urgently if symptomatic. While not high on the differential for right upper quadrant pain, hepatic artery aneurysms must be considered the primary cause of the symptoms and urgently repaired in this setting if discovered on imaging.
Key Words	hepatic artery aneurysm; splanchnic artery aneurysm; visceral artery aneurysm; endovascular repair

DISCLOSURE STATEMENT:
The authors have no conflicts of interest to disclose.

FUNDING/SUPPORT:
The authors have no relevant financial relationships or in-kind support to disclose.

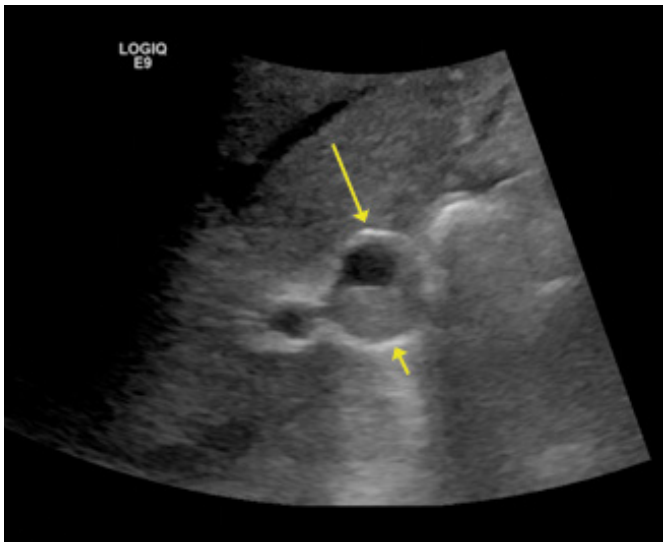
RECEIVED: July 19, 2020
REVISION RECEIVED: September 19, 2020
ACCEPTED FOR PUBLICATION: November 1, 2020

To Cite: Elseth AJ, Mulhall JR, Thomas KM, Simon TE, Martin ED, Givens MD. Hepatic Artery Aneurysms: An Uncommon Presentation of a Deadly Disease Process. *ACS Case Reviews in Surgery*. 2021;3(5):73–77.

Case Description

A 58-year-old female presented to the emergency department with a three-day history of worsening mid-epigastric and right upper quadrant pain with nausea and vomiting. Her medical history only included migraines, and she had no history of atherosclerosis or connective tissue disease. Her only surgery was a right adrenal biopsy for adrenal adenoma 17 years prior. She had not experienced any recent trauma and had no family history of aneurysms or connective tissue disorders. On physical exam, she had significant tenderness to palpation in the right upper quadrant and mid-epigastrium without signs of diffuse peritonitis. Given her age, body habitus, and clinical presentation, the primary concern was a biliary pathology. Laboratory evaluation was unremarkable, and a right upper quadrant ultrasound (RUQUS) demonstrated no evidence of biliary disease; however, an ovoid lesion measuring 2.6 × 2.7 × 2.7 cm was discovered (Figure 1).

Figure 1. Right Upper Quadrant Ultrasound Demonstrating Ovoid Lesion. Published with Permission



Computed tomography (CT) of the abdomen and pelvis was obtained and demonstrated a 3.2 × 2.7 cm saccular aneurysm involving the right hepatic artery (RHA). There was no evidence of dissection. There was an associated mural thrombus in the aneurysmal body of the RHA aneurysm without any associated stenosis (Figure 2 to Figure 4). She did not have any concomitant aneurysms in either her splanchnic vasculature or her non-splanchnic vessels.

Figure 2. Axial View of Hepatic Artery Aneurysm on CT. Published with Permission

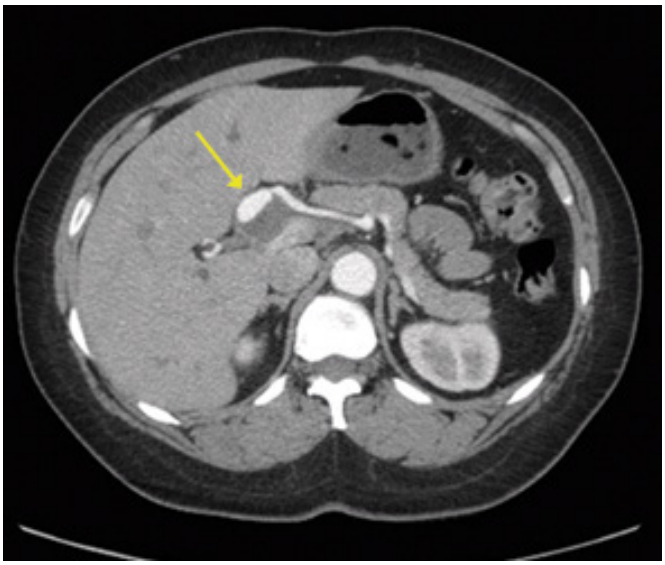


Figure 3. Coronal View of Hepatic Artery Aneurysm on CT. Published with Permission

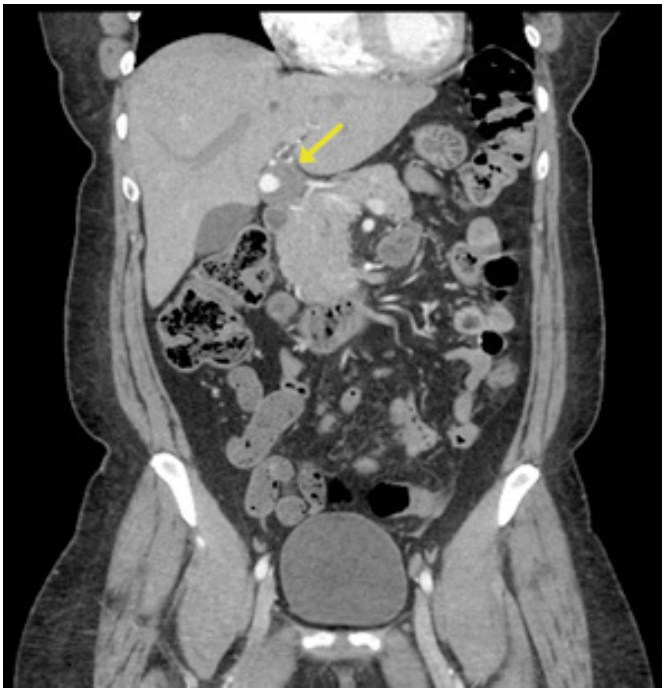
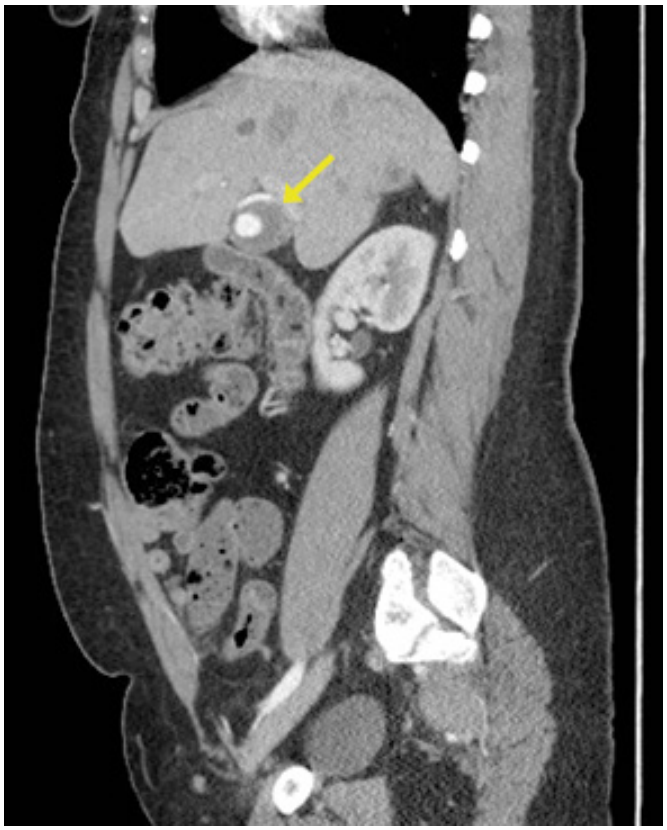


Figure 4. Sagittal View of Hepatic Artery Aneurysm on CT. Published with Permission



Because of the symptomatic nature of the HAA and the concern for impending rupture, the patient was admitted to the intensive care unit and then taken to the angiography suite, where an endovascular approach was taken, given her hemodynamic stability. Percutaneous access of the left radial artery was obtained, the aneurysm was identified (Figure 5) and coiled utilizing two 20 mm × 50 cm Terumo™ framing coils. Given the diameter of her RHA and the saccular morphology of the aneurysm, coils were utilized to repair the aneurysm. A covered stent was not placed due to concern that it would likely result in thrombosis and obliteration of the arterial lumen.

Figure 5. Angiogram of Right Hepatic Artery Aneurysm. Published with Permission

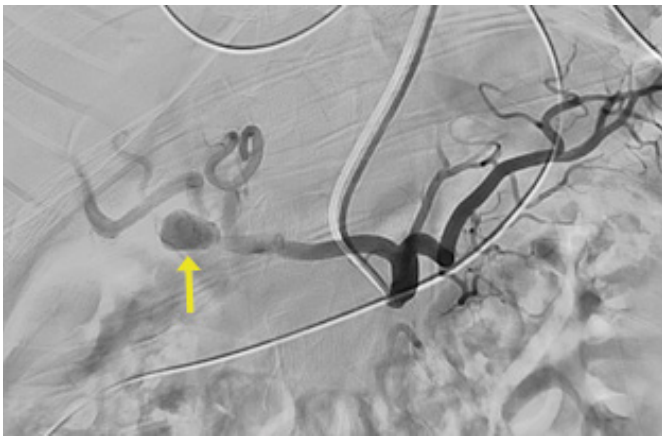
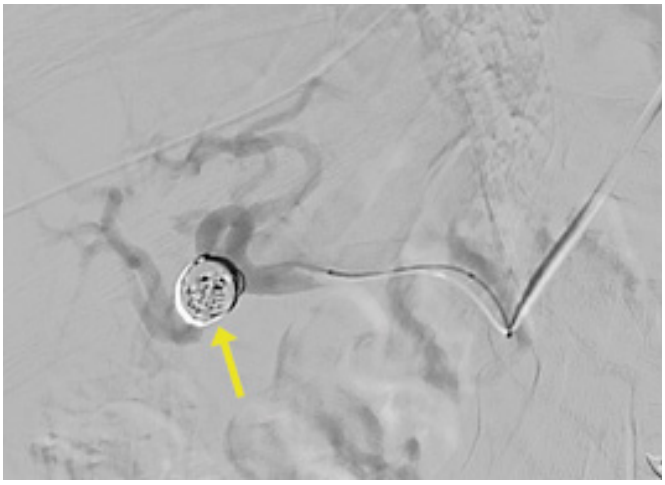


Figure 6. Completion Angiogram Demonstrating Coils and Distal Blood Flow to Right Lobe of Liver. Published with Permission



Completion angiogram demonstrated the coils in the HAA with preservation of flow in the distal right hepatic artery, maintaining blood flow to the right lobe of the liver (Figure 6). Following the procedure, the patient's symptoms resolved completely. LFTs remained normal throughout her stay. CT exam seven months after her procedure demonstrated the coil embolization in the previously present RHA aneurysm, and the patient remains asymptomatic 18 months later.

Discussion

Splanchnic artery aneurysms (SAA) affect 0.1 to 2 percent of the general population.[1] They are so uncommonly discovered that even 10-year retrospective reviews often have fewer than 50 subjects. In fact, one of the more extensive retrospective reviews conducted over 15 years has only 100 patients.[2] Splenic artery aneurysms are the most common SAA and account for 60 percent of SAAs.[3]

Hepatic artery aneurysms (HAA) are the second most common SAA but only occur in 0.02 to 0.4 percent of the population. They are identified most commonly in the postmortem setting because they are rarely symptomatic. Despite this, these aneurysms are the most likely of the splanchnic aneurysms to undergo spontaneous rupture.[4] They are most often discovered as an incidental finding on computed tomography performed for other disease processes. HAAs are more commonly seen in males in the sixth decade with severe atherosclerosis.[5-7]

Most SAA are found incidentally on screening exams performed for other concerns and are most commonly identified in patients with significant atherosclerosis. Our patient is unique in that her history and physical exam were concordant with biliary pathology, but once her HAA was identified and treated, her symptoms resolved. Additionally, she did not have any of the risk factors generally associated with SAA development, specifically atherosclerotic disease.

True splanchnic aneurysms are associated with similar risk factors as thoracic and abdominal aortic aneurysms, namely atherosclerosis, fibromuscular dysplasia, or connective tissue diseases.[3] Predisposing factors specific to splanchnic artery aneurysms include multiparity, post-transplant of intra-abdominal organs, and portal hypertension. True aneurysms can be saccular or fusiform in morphology.[8] There is no established data to support an increased risk of rupture with either morphology. True aneurysms are often asymptomatic unless they rupture or dissect.

Pseudoaneurysms often arise due to trauma or infection, particularly in the setting of chronic pancreatitis, and account for greater than 50 percent of all HAAs. Pseudoaneurysms, unlike true arterial aneurysms, must be repaired urgently regardless of size, as they are at increased risk of rupture. The most recent recommendations state that all symptomatic HAAs, HAAs greater than 2 cm, or HAAs that expand by >0.5 cm in a year be repaired. Additionally, repair is required in all HAAs irrespective of size in patients with vasculopathies.[9,10]

Rupture of an HAA is a surgical emergency with a reported mortality of 80 to 100 percent. Therefore, HAAs require clinical and surgical familiarity. Open surgical techniques include ligation, aneurysmectomy with end-to-end anastomosis, aneurysmorrhaphy, or bypass grafting.[11] Common endovascular techniques include catheter-directed coil embolization, exclusion with a covered stent, or flow diverting stents. Extra-parenchymal HAAs distal to the GDA are treated with arterial reconstruction. If the right hepatic or proper hepatic arteries are ligated, careful attention must be paid to the gallbladder as it is at risk for ischemic necrosis.[8,9,12]

Open repair was considered the gold standard as it allows for excellent visualization of the visceral anatomy. Endovascular repairs have numerous advantages, including associated shorter hospital length of stay, faster recovery, decreased cost, and ability to perform under local anesthetic or conscious sedation.[9,10] The Society of Vascular Surgery now recommends taking an endovascular approach whenever feasible.[10]

Conclusion

Our patient presented with symptoms consistent with biliary pathology. Her HAA was not an incidental finding and was the etiology of the symptom pattern in this patient's case, which is incredibly uncommon in cases of true HAAs. Additionally, it adds to the growing body of literature demonstrating minimally invasive endovascular techniques being utilized safely and successfully in true HAAs. This disease process requires clinical familiarity for both the general surgeon and the vascular surgeon as it can be lethal. In this case, it was not initially considered in the primary differential diagnosis for right upper quadrant pain.

Lessons Learned

Further workup is warranted in patients with common presentations to rule out life-threatening processes if initial imaging is discordant with the differential diagnosis based on history and clinical exam. Hepatic artery aneurysms, though rare, must be treated urgently if symptomatic.

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