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Case Report

Persistent pseudoaneurysm after non-operative management of a Grade 4 liver injury

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ABSTRACT

A hepatic pseudoaneurysm (HPA) after blunt or penetrating liver injury is an unusual but potentially lethal complication that can develop from an injured hepatic artery branch [1–5]. Endovascular intervention with coil embolization to treat HPA is a safe and effective method and has become the standard first-line treatment, with a success rate achieving 70–100 % [13,14,15]. Infrequently the pseudoaneurysm is fed by collateral vessels and endovascular intervention may be unsuccessful. Other minimally invasive treatment options that can be considered include image guided percutaneous thrombin injection, endovascular placement of covered stents and injection of liquid agents such as fibrin glue [10,11]. We present a case of a young female who developed a post-traumatic persistent hepatic pseudoaneurysm requiring a total of nine interventions, including six endovascular interventions with angiography, three endoscopic procedures for bleeding, one percutaneous injection, and two re-admissions to the hospital. Although she avoided initial operative management, her three-month hospital course can be considered a failure of conservative management of blunt hepatic trauma due to the accrued health care costs and resources. The literature on the management of persistent pseudoaneurysm is limited. The decision to treat a persistent HPA that are found incidentally and stable in size needs further investigation.

Background

A hepatic pseudoaneurysm (HPA) after blunt or penetrating liver injury is an unusual but potentially lethal complication that can develop from an injured hepatic artery branch [1–5]. A pseudoaneurysm occurs when an injured artery leaks into the surrounding tissue, creating a false aneurysm that has direct communication with the artery. This high-pressure cavity carries a life-threatening risk of rupture [6].

Hepatic pseudoaneurysms are predominantly caused by blunt trauma hepatic injury, however cases have also been reported after liver biopsies, hepatobiliary surgery, gallstone disease, and pancreatitis [6–9]. Endovascular intervention with coil embolization is a safe and effective method and has become the standard first-line treatment to treat HPA, with a success rate achieving 70–100 % [13–15]. These endovascular interventions can be unsuccessful if the PSA is fed by collateral vessels, and subsequent endovascular or percutaneous interventions may be required [10,11,15].

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The literature on the management of persistent pseudoanuerysms is limited. We present a case of a young female who developed a post-traumatic HPA requiring multiple interventions and hospital readmissions.

Case presentation

On a December morning in West Palm Beach, Florida, a 21 year-old female with no significant past medical history was involved in an motor vehicle collision. She remained hemodynamically stable with a Glascow-Coma-Scale score of 15. She complained of mild right-sided abdominal tenderness. Computed tomography (CT) revealed a Grade 4 liver laceration in hepatic lobes 7 and 8, with intralobular areas of hemorrhage and active extravasation into the right paracolic gutter (Figs. 1–2), as well as an acute nondisplaced nasal bone fracture, small bibasilar pneumothorax, and an ascending colon hematoma.

She underwent non-operative management of her liver injury. Angiography revealed active extravasation from the mid-right hepatic artery branch which was embolized with coils. She required four units of packed red blood cells and four units of fresh frozen plasma during the day of admission. Her nasal bone fracture, bibasilar pneumothorax, and colon hematoma required no intervention. She underwent planned laparoscopic evacuation of 2.5 L of hemoperitoneum on hospital day two, and a 10 French Blake drain was placed in the right upper quadrant.

On hospital day 6, bilious fluid was draining from her Blake drain. She was evaluated by gastroenterology for a bile leak; however, the patient refused endoscopic retrograde cholangiopancreatography. On hospital-day 14, the patient had multiple episodes of melena, and a computed tomography angiography (CTA) revealed a 10 × 9 × 8 mm pseudoaneurysm in segment 8 of the liver (Fig. 3). She underwent repeat angiography with coil embolization of the anterior division of the right hepatic artery and gel-foam embolization of the middle hepatic artery. On hospital day 26, CTA revealed a persistent HPA of the anterior segment of the right hepatic lobe now measuring 4 mm in diameter. Her pain subsided, the HPA remained stable on repeat imaging, and she was discharged with plans for outpatient imaging and follow-up.

Four days after discharge she was readmitted for hematemesis and hemorrhagic shock. Four units of packed red blood cells were transfused. She underwent an emergent esophagogastroduodenoscopy which revealed no active hemorrhage. CTA showed a persistent 6 mm hepatic pseudoaneurysm without signs of bleeding (Fig. 4).

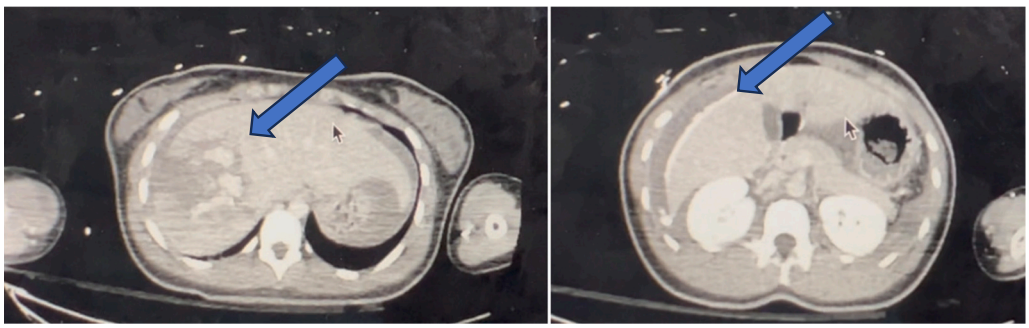
Repeat angiography did not reveal an arteriobiliary fistula. The HPA was fed by collaterals from the right hepatic artery which were embolized with micro-coils. CTA four days later revealed a persistent pseudoaneurysm that was 6 mm in diameter. CT-guided percutaneous thrombin injection was performed into the pseudoaneurysm. The HPA increased in size to 9.5 mm on a follow-up CTA (Fig. 5). She underwent repeat angiography with embolization of the right hepatic artery branches. The HPA resolved and the patient was discharged one week later with plans for outpatient follow-up.

She was readmitted a second time with ongoing melena. After initial workup she underwent esophagogastroduodenoscopy with no identifiable source of bleeding. The persistent HPA was visualized 10 mm in size, and she underwent percutaneous injection of cyanoacrylate injection into the pseudoaneurysm. The HPA was resolved on repeat CTA, and the patient was eventually discharged. She was followed in the outpatient setting without additional complications. In summary, she required five endovascular interventions with angiography, three endoscopic procedures, two percutaneous injections, and two readmissions to the hospital.

Discussion

The treatment for blunt liver trauma in hemodynamically stable patients is typically non-operative management, with a success rate of 85–94 % [16–18]. Delayed complications can occur days to months after trauma and can include HPA, abscesses, hemobilia, and biloma [13]. Hepatic pseudoaneurysms after blunt abdominal trauma are a potentially devastating complication that can result in rupture and death [10]. The incidence of HPA after liver trauma reported in the literature ranges from 1.2 to 6.1 % [4,11,12]. One of the largest retrospective studies which assessed 634 patients with blunt abdominal trauma revealed a PSA rate of 2.8 % [10].

HPA are most commonly found incidentally, however patients can present with symptoms such as hemobilia or hemorrhagic shock due to intra-abdominal rupture [2,4,7]. Diagnosis is made with contrast-enhanced computer tomography in the trauma setting, however, they can also be diagnosed with arteriography or Doppler Ultrasound [6]. There is debate amongst the trauma community



Figs. 1–2. The arrow on the left indicates intralobular areas of hemorrhage within the liver, and the arrow on the right shows active extravasation.

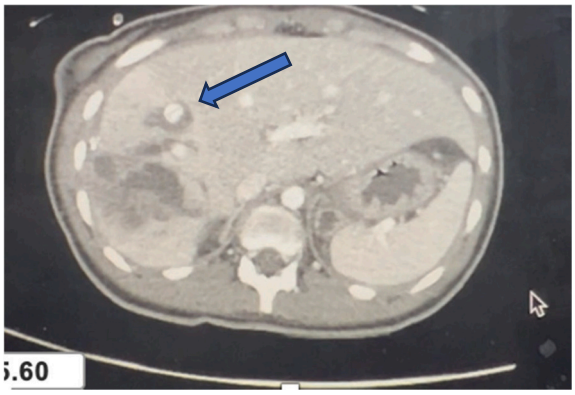


Fig. 3. Arrow shows a 10 × 9 × 8 mm hepatic pseudoaneurysm.

Fig. 4. Arrow depicts a persistent 6 mm hepatic pseudoaneurysm.

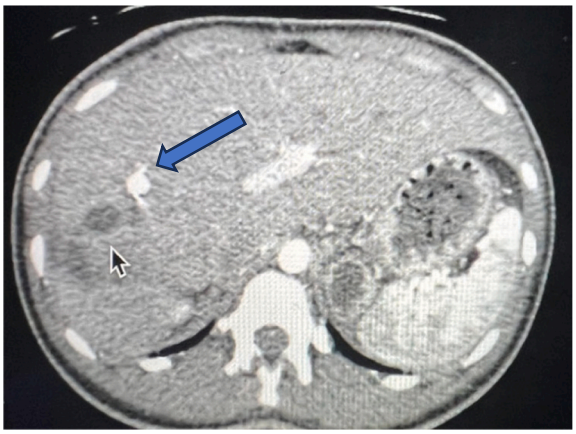


Fig. 5. Arrow shows the pseudoaneurysm increased in size to 9.5 mm.

regarding the need for routine imaging to assess for the development of HPA in post-traumatic hepatic liver injuries treated with non-operative management. A majority of patients with HPA are asymptomatic and would be discharged without treatment if no follow-up imaging is obtained [21].

The first-line treatment of HPA is angiography with endovascular embolization of the affected artery [13–15]. This is performed most-commonly by coil embolization of the afferent and efferent arterial segments and has a success rate of 70–100 %. Infrequently the pseudoaneurysm is fed by collateral vessels and the endovascular intervention may be unsuccessful. If this occurs, endovascular intervention with coil embolization should be attempted again [15]. Other minimally invasive treatment options that can be

considered include image guided percutaneous thrombin injection, endovascular placement of covered stents and injection of liquid agents such as fibrin glue [10,11].

HPA after blunt liver trauma are treated due to the life-threatening risk of rupture and hemorrhage [4,19,20]. Our patient required six endovascular interventions, three endoscopic procedures, and two re-admissions. She had an episode of hemobilia with hemorrhagic shock requiring transfusion of blood products. Eventually, her pseudoaneurysm resolved with injection of cyano-acrylate liquid injection. Although she avoided initial operative management, her hospital course can be considered a failure of conservative management of blunt hepatic trauma due to the accrued health care costs and resources used during her three-month hospital course.

The literature on the management persistent hepatic pseudoaneurysms that fail initial endovascular intervention is limited. The current management includes repeat angiography with coil embolization and to consider stents, fibrin glue, and image-guided percutaneous thrombin injection [10,11]. The trauma community would benefit from a better understanding of persistent post-traumatic hepatic pseudoaneurysms and their long-term sequelae. Do patients with clinically silent HPA that are stable in diameter require treatment, or can they be monitored in the outpatient setting with serial imaging? The need to repair a persistent HPA that are found incidentally and stable in size needs further investigation.

Conclusion

A post-traumatic HPA is a life-threatening complication that can occur after non-operative management of blunt liver injuries. If initial endovascular treatment is unsuccessful, repeat endovascular intervention should be performed, with consideration of covered stents, injection of liquid agents, and percutaneous thrombin injection. The need to repair a persistent HPA that are found incidentally and stable in diameter needs further investigation.

Declaration of competing interest

None.

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