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## Hepatic arterial pseudoaneurysm: a rare complication of blunt abdominal trauma in children

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**Abstract** We report a child who developed a hepatic artery pseudoaneurysm following blunt hepatic injury. This is a rare complication of hepatic trauma in children. The imaging evaluation and clinical management of hepatic artery pseudoaneurysms are presented.

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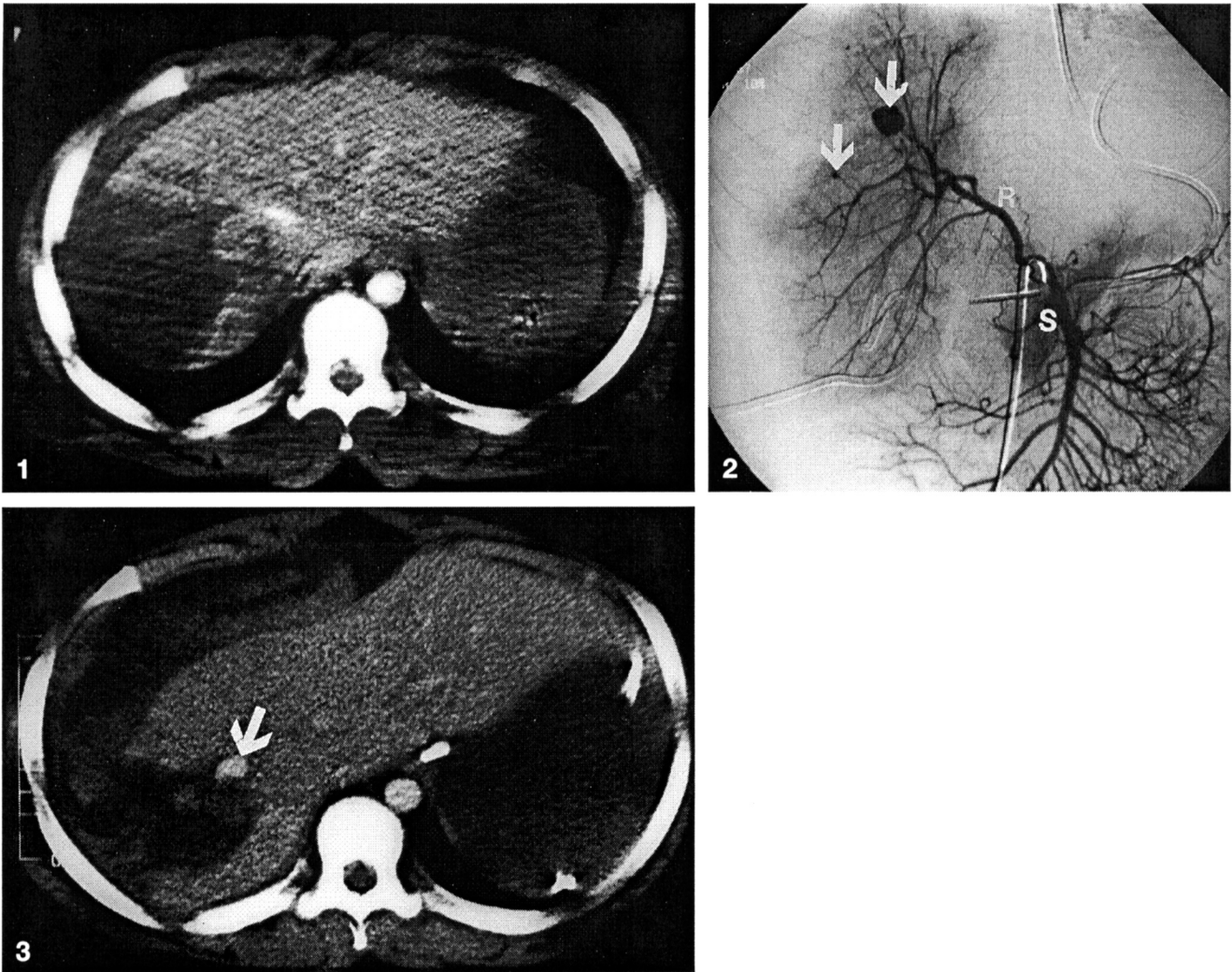
### Introduction

The vast majority of children with hepatic injury following blunt abdominal trauma are successfully managed nonoperatively [1, 2]. Although the liver is the most commonly injured solid viscus in children following blunt abdominal trauma, delayed hemorrhage requiring laparotomy is rarely noted regardless of the extent of injury [1, 2]. In one series that included over 100 children with hepatic injury initially managed nonoperatively, only one child required delayed operative intervention [2]. One rare complication that may result in delayed hemorrhage is a hepatic artery pseudoaneurysm [3, 4]. In this report we describe the evolution of a hepatic artery pseudoaneurysm following a complex hepatic injury. The imaging evaluation and clinical management of hepatic artery pseudoaneurysms are presented.

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### Case report

A 12-year-old boy fell down two flights of stairs. On arrival at the emergency room he was complaining of abdominal pain and tenderness with tachycardia and tachypnea. He was hemodynamically stable. Abdominal CT, performed with intravenously administered contrast material [3 ml/kg of 43% iohalamate meglumine (Conray-43, Mallinckrodt, St. Louis)], demonstrated a grade-4 hepatic injury (Fig. 1). Additionally, there was absent perfusion to the right kidney. The child was taken to the operating room where he underwent an exploratory laparotomy and removal of an ischemic right kidney. The postoperative course was complicated by fever and leukocytosis. A follow-up abdominal CT demonstrated an infected hematoma in the right renal fossa, which was drained percutaneously. Two weeks following the initial injury the child became hypotensive and the hematocrit decreased from 28 to 21. After stabilization, a follow-up CT demonstrated an enhancing, focal, rounded vascular lesion in the posterior segment of the right hepatic lobe with an associated large subcapsular hematoma (Fig. 2). An ultrasound examination demonstrated turbulent flow within the focal vascular lesion indicative of a pseudoaneurysm. The patient was then transported to the angiography suite where an arteriogram demonstrated two pseudoaneurysms originating from a replaced right hepatic artery originating from the superior mesenteric artery (Fig. 3).



**Fig.1** Initial CT scan performed on admission following blunt trauma. CT scan through the upper abdomen demonstrates a complex laceration of the right hepatic lobe with associated intrahepatic hematoma

**Fig.2** Hepatic arteriogram performed 2 weeks after the initial injury. Image obtained during the arterial phase following a superior mesenteric artery (SMA) arteriogram shows two pseudoaneurysms originating from the right hepatic artery (arrows). The larger of the two pseudoaneurysms is more proximal. Note that the replaced right hepatic artery originates from the SMA (R right hepatic artery, S SMA)

**Fig.3** Follow-up CT scan 2 weeks after the initial injury. CT scan through the upper abdomen shows a focal, rounded, enhancing lesion (arrow) in the posterior segment of the right hepatic lobe. Also note the large hepatic subcapsular hematoma

The more proximal of the two was larger, measuring approximately 1 cm in diameter. Attempts at selecting the vessel for coil embolization were unsuccessful, and the patient underwent a second laparotomy and right hepatic lobectomy. He remained hemodynamically stable postoperatively without any further complications.

## Discussion

A pseudoaneurysm is a pulsatile hematoma that results from leakage of blood through a tear or disruption of the arterial wall. Thus, blood is contained only by hepatic parenchyma or surrounding hematoma. Large pseudoaneurysms such as the one presented may be identified at CT. The identification at CT of a focally enhancing region of high attenuation (> 90 HU) contiguous with a vascular structure should be considered highly suspicious for a pseudoaneurysm. In the past, arteriography has been the gold standard for the diagnosis of a pseudoaneurysm. The diagnosis of a pseudoaneurysm at arteriography is predicated on the demonstration of extravasation from the arterial lumen and communication with a perivascular collection of contrast media that persists into the venous phase. Recently, MRI has also been shown to depict the presence and extent of pseudoaneurysms accurately. Doppler sonography is another modality that may provide a fast, non-invasive

method to confirm the diagnosis by demonstrating turbulent flow within a focally dilated vascular structure.

Potential complications of a hepatic artery pseudoaneurysm include rupture and associated hemorrhage or enteric fistulization [3, 5, 6]. Four prior cases of traumatic hepatic artery pseudoaneurysm in children have been reported [3, 4]. Two of these were successfully treated with transarterial catheter embolization, while the other two were complicated by aneurysm rupture and required surgery [3, 4]. Owing to the high risk of rupture, catheter embolization or surgery is advocated as treatment choices when a hepatic pseudoaneurysm is detected. In the case presented, significant hemorrhage resulted following the pseudoaneurysm rupture, leading to a large subcapsular hepatic hematoma and hemodynamic instability. The patient was successfully treated with a right hepatic lobectomy.

The potential contributing role of associated infection in pseudoaneurysm development in the present case is unclear. The patient presented did have a infect-

ed hematoma located immediately below the liver that was drained percutaneously approximately 2 weeks prior to detection of the pseudoaneurysm. Combined hepatic abscess and arterial pseudoaneurysm have been previously reported in adults [7, 8]. One reported case was seen following abdominal injury [7]. It was postulated in that case that hepatic vessels initially damaged by trauma may have been further weakened by the inflammatory response accompanying infection. Thus, it may be that infection may have played a role in our case as well.

Delayed hemodynamic deterioration is unusual following isolated blunt abdominal trauma in children. The development of delayed hemorrhage following known hepatic injury should raise the question of possible hepatic artery pseudoaneurysm. Since CT is typically the imaging modality of choice in the evaluation of injured children, it is important to recognize the CT appearance of this potentially life-threatening condition so that treatment can be pursued without delay.

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