Unusual presentation of more common disease/injury

Isolated hepatic artery injury in blunt abdominal trauma presenting as upper gastrointestinal bleeding: treatment with transcatheter embolisation

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Summary

Liver injury in blunt abdominal trauma is common. However, not often does blunt trauma cause injury to the anatomical structures of the porta hepatis. Isolated injury of the hepatic artery has been rarely reported in the literature. Such injury may be lethal and requires immediate diagnosis and management. This report describes an unusual case of blunt abdominal trauma resulting in hepatic and gastroduodenal artery dissection, with pseudoaneurysm formation complicated by active upper gastrointestinal bleeding. The injury was managed by transcatheter embolisation. Awareness of this diagnosis should facilitate management of similar trauma cases.

CASE PRESENTATION

A 26-year-old previously healthy man was brought to the emergency department (ED) after being involved in a street fight during which he experienced a blunt abdominal trauma 30 min prior to presentation. He had no medical history except for a splenic laceration caused by a recent blunt abdominal trauma, for which he had splenectomy 6 weeks prior to presentation. Medical personnel at the scene of the incident reported an episode of haematemesis. However, en route to the hospital the patient was alert, oriented and haemodynamically stable. On arrival to the ED, he had another episode of massive haematemesis and was noted to be tachycardic, with a heart rate of 100 beats per min and a blood pressure of 70/30 mm Hg. His blood pressure responded to crystalloid resuscitation. The patient reported right upper quadrant and epigastric pain with several episodes of haematemesis. After patient stabilisation, a detailed physical examination revealed abrasions over the right lower rib cage. His abdomen was soft, slightly distended, with absence of significant tenderness or rigidity.

INVESTIGATIONS

Laboratory workup revealed a white blood cell count of 13 600/cu.mm, a haemoglobin level of 9.3 g/dl, a haematocrit of 28.0% and a normal coagulation profile. Given his response to initial crystalloid bolus and the patient's presentation with active upper gastrointestinal bleed, a contrast-enhanced CT of the chest, abdomen and pelvis was performed. His CT scan revealed contrast extravasation within the duodenum consistent with active upper gastrointestinal bleeding (figure 1). There was also a 4×4 cm haematoma in the porta hepatis showing a central area of contrast extravasation and exerting mass effect on the portal vein posteriorly and the proximal duodenum anteriorly (figure 1). The haematoma was associated with occlusion of the hepatic artery proper. The proximal hepatic and the gastroduodenal arteries were narrowed with a low-density crescent, suggestive of arterial dissection associated with pseudoaneurysm formation at the level of the haematoma. Coronal reconstruction showed a rupture into the duodenum at this level (figure 1B). The neck of the pseudoaneurysm was identified as well as a small track from the pseudoaneurysm to the duodenal wall. A small patent right

Figure 1 (A) Contrast-enhanced axial CT image, showing the pseudoaneurysm and surrounding haematoma in the porta hepatis (asterix). The proximal hepatic artery is narrow and continuous with the pseudoaneurysm (arrowhead). (B) Coronal and (C) sagittal reconstructed images illustrate close proximity of pseudoaneurysm with the duodenal wall, exerting mass effect on it, with contrast extravasation within the duodenum (arrow). Track from pseudoaneurysm into duodenal lumen is seen (oblique arrow).

Figure 2 (A) Selective caeliac angiography before embolisation demonstrates luminal narrowing and irregularity of distal common hepatic and proximal gastroduodenal arteries suggestive of dissection (oblique arrow). Note the filling of segmental right hepatic artery from collaterals (open arrow) and the filling of the left hepatic artery originating directly from the left gastric artery (horizontal big arrow). (B) Postembolisation selective caeliac angiography confirms complete occlusion of the common hepatic artery.

hepatic artery was visualised in the liver hilum presumably filling from collaterals. No haemoperitoneum, liver or splenic laceration was present. There was no contrast within the gall-bladder and the common bile duct to indicate haemobilia secondary to bile duct injury.

DIFFERENTIAL DIAGNOSIS

Given the presentation and the CT findings, an initial diagnosis of right hepatic artery and gastroduodenal artery dissection with pseudoaneurysm rupture into the duodenum was made and the patient was immediately transported to the angiography suite.

TREATMENT

Selective angiography of the coeliac trunk (figure 2A) was performed and demonstrated a thinned right hepatic artery with a spiral contour extending to the proximal gastroduodenal artery. An abrupt stop of the contrast media column was seen at the level of the hepatic artery proper, diagnostic of traumatic dissection. A small collateral branch was noted arising from the gastroduodenal artery, supplying the distal portion of the right hepatic lobe. In addition, a patent left hepatic artery was present arising from the left gastric artery. No contrast extravasation was present at the time of angiography. Superior mesenteric artery angiography with delayed venous phase imaging demonstrated adequate flow within the portal vein without evidence of contrast extravasation. The patient continued to have haematemesis during the procedure. Decision was made to embolise the hepatic artery proximal to the site of transection, taking into consideration the recurrent haematemesis, the presence of contrast extravasation on the CT examination and the adequate perfusion to the left and right hepatic lobes.

The hepatic artery was embolised using 3×3 mm fibred coils (Cook, Bloomington, Indiana, USA). Postembolisation, selective angiography (figure 2B) confirmed complete occlusion of the artery. After the procedure, the patient was stable and was transferred to the intensive care unit for close

monitoring. He maintained his haemodynamic stability and had no further episodes of haematemesis.

OUTCOME AND FOLLOW-UP

On day 3 postprocedure, contrast-enhanced CT of the abdomen was performed. The liver demonstrated normal homogeneous attenuation, without any evidence of perfusion abnormality or infarction. He had normal liver enzymes and stable haemoglobin levels on follow-up laboratory studies. The patient was subsequently discharged home in a good condition at day 7 of an uncomplicated hospital course.

DISCUSSION

Liver injury in blunt abdominal trauma is common. However, injuries to the anatomical structures of the porta hepatis are rare and often have lethal consequences.^{1 2} The associated high mortality and morbidity make immediate diagnosis, accurate localization of the site of the injury and effective emergent management of the patient's condition crucial. Arterial injury in this small anatomical area after blunt abdominal injury includes pseudoaneurysm formation, and less commonly arterial occlusion or transection.^{3 4}

In a review of trauma cases from eight major trauma centers, 118 injuries to the porta hepatis were identified, representing only 0.07% of all trauma cases, and was associated with 51% mortality.² Blunt abdominal trauma was the least common mechanism accounting for only 31%. Injury of the hepatic artery was rare, occurring in only 28% of the injuries.² Bryant *et al*⁵ reported a case of traumatic proper hepatic artery occlusion and proposed several potential mechanisms of traumatic thrombosis, including intimal flap formation or intramural haematoma, low flow state secondary to hypotension and extramural compression by a surrounding haematoma. A theory regarding the mechanism of hepatic artery proper transection was presented also by Bunt *et al*, suggesting laceration of the more mobile proper hepatic artery relative to the fixed left hepatic artery. In our patient, the CT scan showed a large

haematoma in the porta hepatis with central contrast extravasation, representing a pseudoaneurysm. There was also narrowing of the proximal hepatic artery and the gastroduodenal artery suggestive of dissection. Angiography confirmed a pattern suggestive of dissection of the common hepatic artery extending into the gastroduodenal artery with an abrupt halt to the column of contrast at the level of the proper hepatic artery, most likely secondary to spasm or thrombosis. The haematoma resulted from the injured hepatic artery and could have generated significant back-pressure on the hepatic artery, resulting in diminished arterial flow and thrombosis. However, the persistent haematemesis necessitated embolisation of the proximal hepatic artery.

Traumatic injuries to the porta hepatis can be life-threatening and require immediate diagnosis and treatment. The management of such injuries requires an individualised approach depending on several factors. These factors include, but are not limited to, the haemodynamic status of the patient, the presence of concomitant injuries and the involvement of vital structures in the porta hepatis. Recently, conservative management of blunt hepatic injuries in haemodynamically stable patients has been the treatment of choice.^{5–7} Embolisation of hepatic artery injuries is a well-established management method, given the haemodynamic stability of the patient and the immediate availability of the angiography team.⁸ The existence of collateral flow from translobar, subcapsular, phrenicoabdominal and intercostal arteries is well documented.^{9–10} In addition, the oxygen extraction from an intact portal circulation can be increased to nearly 100% as a primary compensatory mechanism after a reduction in hepatic arterial oxygen delivery.^{11–12} In our case, the patient presented with blunt hepatic injury and haematemesis, which occurs in less than 3% of liver injuries. The patient was haemodynamically stable after resuscitation and had good portal circulation to the liver. Additionally, he had collateral circulation from a replaced left hepatic artery (Michels II), which decreases the possibility of liver necrosis. This arterial variant that was present in our case is uncommon; with Michel's II representing only 5.2% of the anatomic variations of the hepatic arteries.¹³ These factors rendered our patient a good candidate for embolisation. Moreover, it is crucial in the postembolisation period to maintain normal blood volume to support the developing collateral circulation through proper hydration.¹⁴

Competing interests None.

Patient consent Obtained.

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Learning points

- ▶ Liver injury in blunt abdominal trauma is common.
- ▶ Injuries to the anatomical structures of the porta hepatis are rare and often associated with high morbidity and mortality.
- ▶ Arterial injury in the porta hepatis includes pseudoaneurysm formation, arterial occlusion or transection.
- ▶ Prompt diagnosis and management is important.
- ▶ The status of the liver, preservation of the hepatic venous flow and documentation of sufficient collateral circulation are essential factors influencing survival after embolisation of the hepatic artery.

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