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Right hepatic vein injury after blunt abdominal trauma in a 12-year-old boy – case report

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Summary

Background:

Blunt abdominal trauma in children is one of the most frequent causes of hospitalization. We present a rare case of traumatic liver injury.

Case report:

A 12-year-old boy was admitted to the Surgery Department after a bicycle fall and handlebar impact injury to the right infracostal area. At admission he was stable, with no abnormalities, except for a subcutaneous hematoma found in the injured area. Abdominal ultrasound examination revealed free intraperitoneal fluid. Computed tomography (CT) revealed irregular branching laceration of the right superior hepatic segments with extension into the hepatic veins. No active extravasation of contrast material was seen. On the next day, because of the deterioration of the patient's condition, CT examination was repeated and revealed focal extravasation of contrast material in the portal hilum, posterior to the gallbladder. An injury of the right hepatic vein was found on laparotomy.

Conclusions:

Hepatic vein injury is a rare but very serious complication after blunt liver trauma and it is an indication for surgical treatment.

Diagnostic imaging is essential for therapeutic decisions, but its value is sometimes limited. The precise analysis of injury mechanism and localization may be very helpful.

CT is currently the modality of choice for the evaluation of blunt liver trauma. If an active bleeding is suspected the delayed scans seem to be recommended.

Key words:

Hepatic vein injury • children • blunt liver trauma • CT

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Background

Blunt abdominal trauma in children is one of the most frequent injuries and causes of hospitalization in pediatric departments. The liver is, after the spleen, the organ most frequently affected by blunt multiorgan traumas – in 4-10% of cases according to the available literature data [1]. We present a rare case of traumatic liver injury.

Case report

A 12-year-old boy was admitted to the Surgery Department after a bicycle fall and handlebar impact injury to the right infracostal area.

The general condition of the patient on admission was stable, with no abnormalities found on physical, except for a subcutaneous hematoma ca. 5cm in diameter on the right side of the epigastrium.

In laboratory tests performed ca. 3 h after the trauma, the hemoglobin level (HGB) was 11.4 g/dl, hematocrit (HCT) 33.7%. Chest X-ray revealed normal contours of the lungs and the heart with no signs of trauma-related abnormalities in the ribs, or fluid presence in the pleural cavities.

Because of slight deterioration of the patient's condition, abdominal ultrasound examination was performed, which revealed the presence of free, hypoechoic intraperitoneal



Figure 1. Ultrasound abdominal examination – intraperitoneal free fluid in Marison's pouch.

fluid around the spleen and the liver, in the portal hilum and in the vesicorectal pouch (fig. 1).

The site of the injury could not be determined, there were no evident abnormalities in the parenchymatous organs.

It was decided to perform computed tomography (CT) of the abdominal cavity. The patient's condition was still fairly good, he reported epigastric pain with no peritoneal signs.

Computed tomography was performed using a single-row helical CT scanner, with reconstructions of 5 mm thick slices, in the native phase and after intravenous administration of 60 ml iodopromide. It revealed irregular, non-contrast-enhanced branching laceration of the right superior hepatic segments of 2 x 6 cm dimensions, extending towards the hepatic veins confluence (fig. 2).

Intraperitoneal free fluid (clotted blood) seen around the liver, spleen, in the portal hilum and the pelvis minor showed no significant contrast enhancement (the average attenuation – value was 46 Hounsfield units (HU) before, and 60 HU after contrast administration (fig. 3).

No active extravasation of contrast material out of either venous or arterial vessels was seen.



Figure 3. Contrast-enhanced CT scan – hepatic laceration and intraperitoneal free fluid with attenuation values of clotted blood – 46 HU.

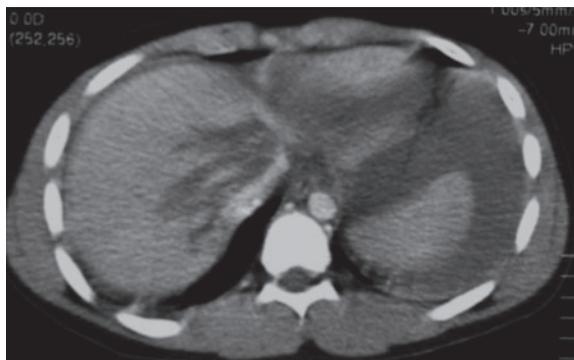


Figure 2. Contrast-enhanced CT scan – a stellate fracture of the right superior segments of the liver with extension into the hepatic veins; "bear claw" lacerations.

Liver damage markers, GOT and GPT, were markedly elevated – 209 U/L and 332 U/L, respectively.

On the next day, because of deterioration of the patient's condition and anemization (further blood tests, performed ca. 8 and 19 h after the trauma - HGB 9.8 and 8.7 g/dl, HCT 28.9 and 26% - normal values 11.0-17.2 g/dl and 30.0-50.0%, respectively), and the discrepancy between the imaging results and the clinical condition, CT examination was repeated. It was performed after administration of 60 ml iodopromide bolus with reconstructions of 5 mm thick slices. In addition to the abnormalities seen on the previous scan, it revealed focal extravasation of contrast material with elevated attenuation values (ca. 180 HU) in the portal hilum, posterior to the gallbladder (fig. 4).

An injury of the extrahepatic segment of the right hepatic vein (fig. 5) was found and repaired on laparotomy.

The postoperative course was uneventful. The patients, after further 14 days of hospitalization, was discharged home in good condition.

Discussion

Computed tomography (CT) is the imaging modality of choice in diagnostics of blunt abdominal traumas. The



Figure 4. Contrast-enhanced CT, delayed scan – high-attenuation (180 HU) contrast material in portal hilum, posterior to the gallbladder.

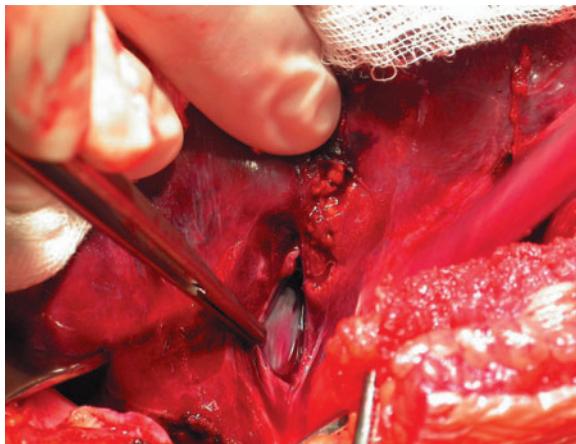


Figure 5. Intraoperative view – right hepatic vein injury.

sensitivity of this method is estimated to reach 99% and specificity 96.8% (2). Increased availability of helical CT equipment has played an important role in the change in management of blunt liver trauma patients. Conservative treatment can be implemented in most hemodynamically stable patients with the success rate reaching 80% [3].

Traumatic lesions of the liver observed in CT include interstitial ruptures, subcapsular or intrahepatic hematomas – in the liver parenchyma or at the rupture site, active bleeding, abnormalities seen in the portal hilum as areas of decreased attenuation, and injuries of the hepatic veins in the perihepatic segments [4, 5].

Hepatic vein injuries are rare, but they belong to the most dangerous traumas. In one of the largest prospective studies of patients with liver traumas, the frequency of hepatic vein injuries reached 13%. The mortality of patients with hepatic vein injuries was almost twice higher than the general mortality in the study group - 61% and 31%, respectively [6].

Therefore, it is very important to detect active hemorrhages or trauma-related abnormalities of the large hepatic vessels, which affects the decisions concerning management of the patient.

Active extravasations are presented on CT as well-delimited or diffuse areas with elevated attenuation value in the early phase after contrast administration. In scans performed with multi-row CT scanners a stream jet of

contrast can be observed, which is rare in case of single-row scanners [7, 8].

In the reported case, the first CT performed with a single-row scanner in two phases, no contrast blood extravasations were observed. In the subsequent scan, performed only after contrast bolus administration, the delayed phase visualized a diffuse area with elevated attenuation values in the portal hilum posteriorly to the gallbladder.

Neither of these scans allowed to determine the bleeding site. The equipment type – a single-row CT scanner and the mode of contrast administration seem to be here the most important limitations. No native phase in the second CT does not allow to differentiate unequivocally the nature of the area with elevated attenuation value, which might also correspond to contrast-enhanced bile in the gallbladder, forming a bile-contrast level.

CT could indicate indirectly the severity of the trauma by its localization to the region of confluence of the hepatic veins and by its shape – parallel or stellate branching lines, described in the literature as „bear claw” lacerations. Most fatal complications associated with blunt liver traumas in children are due to such injuries of the liver parenchyma in the posterolateral portion of the right lobe, involving the hepatic veins [9].

The type of the trauma turned out to be an important clinical factor in the reported case. The analysis of circumstances and mechanisms of injuries due to bicycle accidents, carried out by Winston F.K. et al. allowed to identify two mechanisms leading to serious injuries. One of them is a relatively insignificant trauma – a bicycle fall with direct handlebar impact [10]. Such traumas frequently require surgical treatment (in almost one third of cases in the studied group) and longer hospitalization [11].

Conclusions

Hepatic vein injury is a life-threatening condition and an indication for surgical treatment.

Diagnostic imaging is essential for therapeutic decisions, but its value is sometimes limited. The analysis of injury mechanism and localization may be very helpful.

CT is currently the modality of choice for the evaluation of blunt liver trauma. If an active hemorrhage is suspected the delayed phase scans are recommended.

References:

1. Matthes G, Stengel D, Seifert J et al. Blunt liver injuries in polytrauma: results from cohort study with the regular use of whole-body helical computed tomography. *World J Surg* 2003; 27: 1124-1130.
2. Kinnunen J, Kivioja A, Poussa K, Laasonen EM. Emergency CT in blunt abdominal trauma of multiple injury patients. *Acta Radiologica* 1994; 35: 319-22.
3. Fang JF, Wong YC, Lin BC. The CT risk factors for the need of operative treatment in initially hemodynamically stable patients after blunt hepatic trauma. *J Trauma* 2006; 61: 547-53.
4. Romano L, Giovine S, Guido G et al. Hepatic trauma: CT findings and considerations based on our experience in emergency diagnostic imaging. *EJR* 2004; 50: 59-66.
5. Yoon W, Jeong Y, Kim JK et al. CT in Blunt Liver Trauma. *Radiographics* 2005; 25: 87-104.
6. Hollands MJ, Little JM. Hepatic venous injury after blunt abdominal trauma. *Surgery* 1990; 107: 149-52.
7. Taylor GA, Kaufman RA, Sivit CJ. Active hemorrhage in children after thoracoabdominal trauma: clinical and CT features. *AJR* 1994; 162: 401-404.
8. Willmann JK, Justus ER, Platz A. Multidetector CT: Detection of active hemorrhage in patients with blunt abdominal trauma. *AJR* 2002; 179: 437-444.
9. Coln D, Crighton J, Schorn L. Successful management of hepatic vein injury from blunt trauma in children. *Am J Surg* 1980; 140: 858-64.
10. Winston FK, Shaw KN, Kreshak AA. Hidden spears: handlebars as injury hazards to children. *Pediatrics* 1998; 102: 596-601.
11. Nadler EP, Potoka DA, Shultz BL. The high morbidity associated with handlebar injuries in children. *J Trauma* 2005; 58: 1171-4.