

JBR-BTR, 2010, 93: 189-192.

POST-TRAUMATIC HEPATIC ARTERIAL PSEUDOANEURYSM AND ARTERIO-PORTAL SHUNT

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The authors report the case of a 21-year-old man who suffered from a blunt abdominal trauma. Initial imaging revealed a liver laceration at the right lobe, a perirenal hematoma of the right kidney and a hematoma of the right adrenal gland. Follow-up MDCT-scan on day 10 after admission showed at the arterial-phase contrast-enhanced study perfusion alterations and two hepatic pseudoaneurysms. The diagnosis of pseudoaneurysm was confirmed and treated angiographically with superselective coil embolization. A follow-up CT-scan on day 17 showed at a non-treated area an arterioportal shunt and a wedge-shaped transient hepatic parenchymal enhancement. This was confirmed angiographically and subsequently treated with coil embolization.

Key-words: Liver, angiography – Aneurysm, hepatic.

A liver hematoma is a common finding after blunt abdominal trauma. Radiological follow-up is important to demonstrate its resorption or to detect its possible complications. Multidetector computed tomography (MDCT) is the imaging technique of choice for hepatic trauma and has had an enormous impact on the detection and management of liver injuries. A triphasic scan should be performed. On noncontrast scans hematomas appear hyperdense or hypodense relative to normal hepatic parenchyma depending on the nature, as clotted (40-70 HU) or unclotted blood (20-40 HU). Active hemorrhage is identified as contrast extravasation on arterial phase contrast-enhanced CT. Delayed contrast images in the late venous phase after 2 minutes show the persistence of high density with active bleeding compared to the density of surrounding vessels and a washout of contrast attenuation in pseudoaneurysms showing the same density as surrounding vessels. Hepatic arterial pseudoaneurysms as well as arterioportal shunts are rare but potentially life-threatening complications. We briefly discuss the imaging findings, the endovascular management and the outcome of both entities in the setting of blunt abdominal trauma.

Case report

A 21-year-old man was admitted at our hospital after falling from a bridge. He suffered from persistent

pain in the right upper quadrant. Clinical examination showed a tender abdomen. Initial monophasic MDCT-scan revealed a liver laceration at the right lobe, a perirenal hematoma of the right kidney and a hematoma of the right adrenal gland (Fig. 1A). Free abdominal fluid with high attenuation values (45 HU) confirmed a haemoperitoneum. The patient was referred to the intensive care unit for observation and since he remained haemodynamically stable, he was further treated conservatively. Follow-up MDCT-scan on day 10 after admission showed at the late arterial-phase perfusion alterations in the right liver lobe as well as two focal round hyperdense lesions in the area of the liver laceration (Fig. 1B-C), making the diagnosis of post-traumatic pseudoaneurysms of the hepatic artery very likely. The diagnosis of one pseudoaneurysm was confirmed angiographically (Fig. 1D) and was successfully embolized by superselective coiling (Fig. 1E), using four Cook Nester microcoils (2x 10 mm-14 cm and 2x 8 mm-14 cm coils). Initial arteriographic control by the endovascular catheter showed a complete embolization of the pseudoaneurysm, with preservation of other intrahepatic branches. The second lesion could not be confirmed angiographically, probably due to vascular spasms. A follow-up CT-scan on day 17 (Fig. 2A) revealed a persistent and even more prominent wedge-shaped, early transient segmental parenchymal enhance-

ment of the posterior part of the right liver lobe due to a shunt between a branch of the right hepatic artery and the right portal vein. The arterioportal shunt was confirmed angiographically (Fig. 2B) and treated successfully (Fig. 2C) by means of superselective embolization with multiple Hilal coils (multiple 3 mm-3 cm and 2x 4 mm-2 cm coils). The patient left the hospital symptom-free the day after and a follow-up CT-scan two months later showed a complete recovery.

Discussion

In the past decade, there has been a shift from routine surgical to non-surgical management of blunt liver injuries (1). The general use of MDCT in the diagnosis and management of blunt liver trauma is mainly responsible for this change. CT can accurately diagnose parenchymal injuries and exclude surgical lesions such as bowel or pancreatic injuries. Previous studies showed that 86% of liver injuries stopped bleeding by the time of surgery and that up to 67% of all exploratory celiotomies performed for blunt abdominal trauma were non-therapeutic (2). Therefore, nonsurgical management has become the standard care in haemodynamically stable patients with blunt liver trauma. The nonsurgical approach requires fewer blood transfusions, patients have less abdominal sepsis and a better survival rate (1).

Hepatic lacerations and subcapsular or intraparenchymal hematomas are the most common type of parenchymal liver injury. Less common, active hemorrhage and major hepatic venous injuries can be seen following blunt liver trauma; both of these lesions can be life-threatening and require immediate treatment. Periportal low attenuation and a flat

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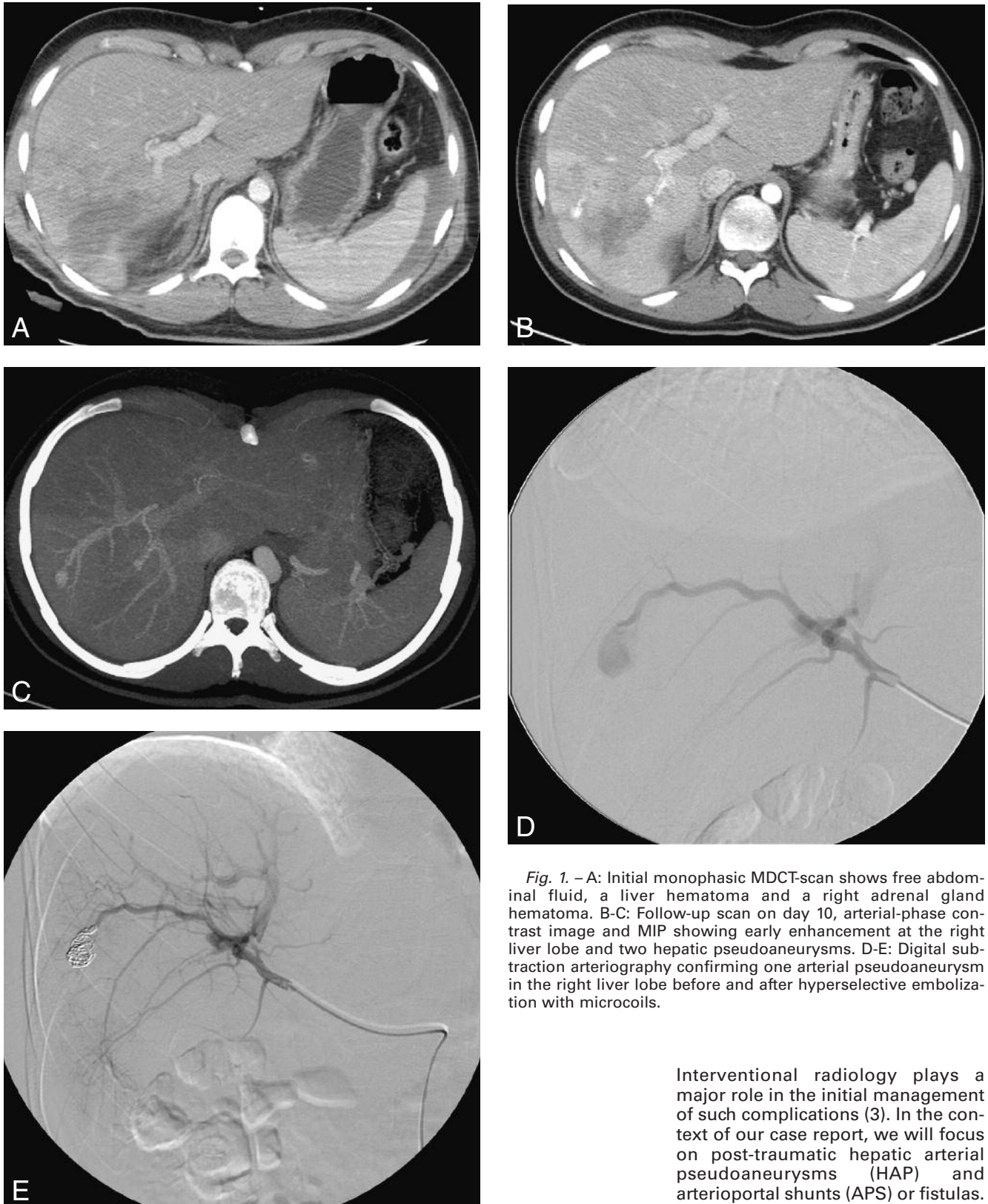


Fig. 1. – A: Initial monophasic MDCT-scan shows free abdominal fluid, a liver hematoma and a right adrenal gland hematoma. B-C: Follow-up scan on day 10, arterial-phase contrast image and MIP showing early enhancement at the right liver lobe and two hepatic pseudoaneurysms. D-E: Digital subtraction arteriography confirming one arterial pseudoaneurysm in the right liver lobe before and after hyperselective embolization with microcoils.

IVC can also be seen as a direct complication of blunt liver trauma.

As more patients with complex liver injuries are treated nonsurgically, the prevalence of delayed complications at follow-up CT has

increased (5-23%) (2). These post-traumatic complications include delayed haemorrhage, abscess, post-traumatic pseudoaneurysm, haemobilia and biliary complications such as biloma and bile peritonitis.

Interventional radiology plays a major role in the initial management of such complications (3). In the context of our case report, we will focus on post-traumatic hepatic arterial pseudoaneurysms (HAP) and arterioportal shunts (APS) or fistulas.

HAP is a rare complication of blunt abdominal trauma with a reported prevalence of 1% (4). Symptoms can vary from a silent incidental finding to an acute life-threatening haemorrhage caused by rupture. On imaging studies it typically presents at early phase

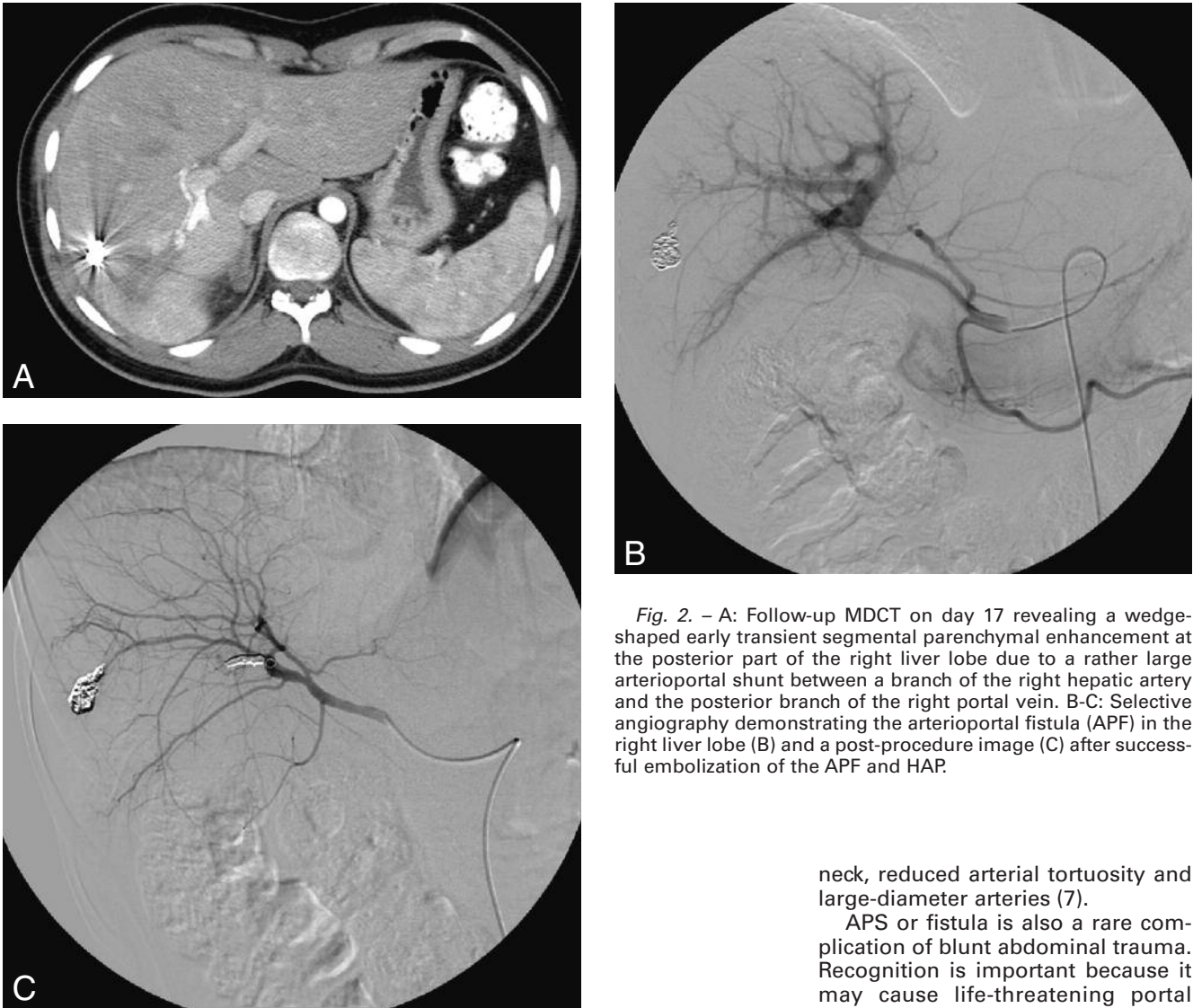


Fig. 2. – A: Follow-up MDCT on day 17 revealing a wedge-shaped early transient segmental parenchymal enhancement at the posterior part of the right liver lobe due to a rather large arterioportal shunt between a branch of the right hepatic artery and the posterior branch of the right portal vein. B-C: Selective angiography demonstrating the arterioportal fistula (APF) in the right liver lobe (B) and a post-procedure image (C) after successful embolization of the APF and HAP.

contrast-enhanced CT as a round, focal lesion with high attenuation that is almost identical to major arterial structures. Selective angiography was the gold standard for diagnosing HAP. Tobben et al. (5) reported a sensitivity for HAPs of 100%, 67% and 33% by SA, CT and duplex sonography. The sensitivity of the newer generation US and MDCT is higher so that these non-invasive techniques are today the first choice if HAP is suspected. SA may also reveal active bleeding and/or anatomic variants. Treatment of choice is hepatic artery embolization, which has a high success rate and can be performed immediately after diagnostic arteriography (6). The embolization should be as selective as possible in order to decrease the risk of ischemia and the risk of collateral/retrograde flow from branches distal to the point of embolization.

Mostly microcatheters and microcoils are used, but different materials have been used successfully over the years, including thrombin injection, covered stents, glue and gelfoam. Endovascular treatment options depend on lesion location and size (7). Embolization of the afferent artery can be used in pseudoaneurysms that arise from a single supplying artery without other collateral feeders, whereas in case of visceral arteries with well-established collateral supply, embolization of both proximal and distal branches to the pseudoaneurysm is mandatory in preventing backflow from the collateral circulation. A direct embolization delivering coils or glue into the sac can also be performed if the aneurysmal neck is narrow. Stent-graft placement represents another option to exclude the pseudoaneurysm in case of a wide

neck, reduced arterial tortuosity and large-diameter arteries (7).

APS or fistula is also a rare complication of blunt abdominal trauma. Recognition is important because it may cause life-threatening portal hypertension if left untreated. Post-traumatic APSs are usually large and single to few in number. The mechanism of arterioportal shunting is most likely a direct hepatic artery to portal vein communication. APS could be the only manifestation of blunt liver trauma. The clinical spectrum of presentation ranges from symptom-free individuals to patients with severe hypertension, but the overall prognosis is good. The characteristic imaging findings of APSs are a wedge-shaped transient hepatic parenchymal enhancement and a homogeneous high attenuation of the portal vein branches at the arterial phase, and isoattenuating or slightly hyperattenuating areas during the portal venous phase. Arteriography may be required to establish the angioarchitecture of the APS. Treatment of choice is (super)selective transarterial embolization. Recently, a classification with therapeutic implications has been proposed by Guzman et

al. (8). A detailed radiologic evaluation can lead to differentiate small peripheral intrahepatic APSs (type 1 – needle injuries) and large central APSs (type 2). Congenital APSs (type 3) are diffuse and intrahepatic and these are the most difficult to manage. Type 1 usually resolves spontaneously, whereas type 2 can cause severe complications including portal hypertension and hepatic parenchymal changes. Therefore, this latter type of APSs always needs treatment, preferably transcatheter embolization.

In conclusion, we can state that both HAP and APS are rare, but possible life-threatening and often late complications of blunt abdominal trauma. They show distinct imaging findings on MDCT and angiography. In most cases, they both can be

treated successfully by (super-)selective embolization.

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