The Role of Endovascular Intervention in Post Liver Hemorrhagic Blunt Trauma

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ABSTRACT

The liver is the most commonly injured organ in blunt abdominal trauma, and liver trauma is the leading cause of death in abdominal injuries. Liver trauma is associated with high morbidity and mortality, hence the diagnosis and clinical assessment of hepatic trauma play an important role in the management of abdominal liver trauma. Although it is only suitable for patients with stable hemodynamic status, computed tomography (CT scan) is the gold standard for evaluating patients with blunt abdominal trauma, because it can acquire high quality images quickly. For these stable patients, nonsurgical management or endovascular intervention has become the treatment of choice in the majority of liver injuries.

Keywords: *blunt liver trauma, CTscan, non-surgical management, endovascular intervention*

ABSTRAK

Hepar adalah organ yang paling sering mengalami cedera pada trauma abdomen tumpul, dan trauma hepar adalah penyebab kematian tertinggi pada cedera abdomen. Trauma hepar berhubungan dengan morbitiditas dan mortalitas yang tinggi, sehingga diagnosis dan penilaian klinis trauma hepar memainkan peran yang penting dalam tatalaksana trauma hepar abdomen. Walaupun hanya sesuai pada pasien dengan status hemodinamik yang stabil, computed tomography (CT) scan adalah baku emas untuk pemeriksaan pasien dengan trauma abdomen tumpul, karena dapat mengakuisisi citra berkualitas tinggi dengan cepat. Untuk pasien-pasien yang stabil ini, tatalaksana non-bedah atau intervensi endovaskular telah menjadi terapi pilihan pada sebagian besar cedera hepar.

Kata kunci: *trauma hepar, CT scan, tatalaksana non-bedah, intervensi endovaskular*

INTRODUCTION

The liver is one of the most commonly injured organs in blunt abdominal trauma, and liver trauma comprises 15% to 20% of all blunt injuries to the abdominal viscera.[1–3] Liver trauma is also the leading cause of death in abdominal injuries, and blunt liver trauma is still associated with significant morbidity and mortality.[1,4,5,6]

Hepatic artery pseudoaneurysm may occur secondary to liver trauma, as well as infection, inflammation, malignancy, laparoscopic cholecystectomy, biliary drainage, liver biopsy, and liver transplantation.[7–9] In

contrast to a true aneurysm, which is contained within the intimal, medial, and adventitial layers of the arterial wall, a pseudoaneurysm lacks the two innermost layers, rendering it more vulnerable to rupture.[7,10] Hepatic artery pseudoaneurysm may be an incidental finding; however, it may present with hemobilia, hemoperitoneum, hematemesis, anemia, hypovolemia, jaundice, and abdominal pain.[7,9,10] Imaging modalities for hepatic artery pseudoaneurysm include computed tomography (CT) scan, ultrasonography, and magnetic resonance imaging (MRI).[7,9] Surgery has been the first-choice treatment for hepatic artery pseudoaneurysm initially; however, at the present time interventional radiology and endovascular intervention procedures are also used to manage targeted vascular injuries.[11–13]

We present a case of post-traumatic pseudoaneurysm of the left hepatic artery which was diagnosed with digital substraction angiography and was successfully treated with angioembolization.

CASE REPORT

A 39-year-old male with a history of blunt abdominal trauma incurred during a traffic accident five months prior was admitted to the hospital with prolonged melena and hematemesis that had lasted for one week. On examination, he was alert, and his vital signs showed a blood pressure of 90/60 mmHg, pulse rate of 90 beats/min, and temperature of 36.4 °C. The physical examination found subconjunctival anemia and epigastric pain, and a digital rectal exam presented with melena and blood. The laboratory findings included a transient decline in hemoglobin to 4.1 g/L and elevated alanine aminotransferase (268 U/L) and aspartate transaminase (123 U/L) levels. The patient had no history of liver disease and was on no medication. He was diagnosed with suspected small intestinal bleeding. An endoscopic examination (Figure 1A) found a hiatal hernia and erosive cardia gastritis, and a colonoscopy examination (Figure 1B) was normal other than an internal grade I hemorrhoid and residual melena in the terminal ileum.

Due to the presence of melena and an increase in his serial liver function tests, the patient was now suspected of having bleeding in another organ. The patient was diagnosed with hemobilia with a suspected cause of blunt abdominal/liver trauma. A CT scan of the abdomen/pelvis without contrast showed hypodense lesions that were partially enhanced post-contrast, displaying an oval in the hepatic IV segment (Figure 2). The differential diagnosis was a hematoma with a laceration lesion. Other findings included mild dilation of the intrahepatic biliary system, gall bladder sludge, hepatomegaly, and ascites. The other abdominal organs appeared within normal ranges. Abdominal CT angiography with intravenous (IV) contrast showed there was no dissection, occlusion, or thrombus in the abdominal aorta. The patient next underwent hepatic artery digital subtraction angiography.

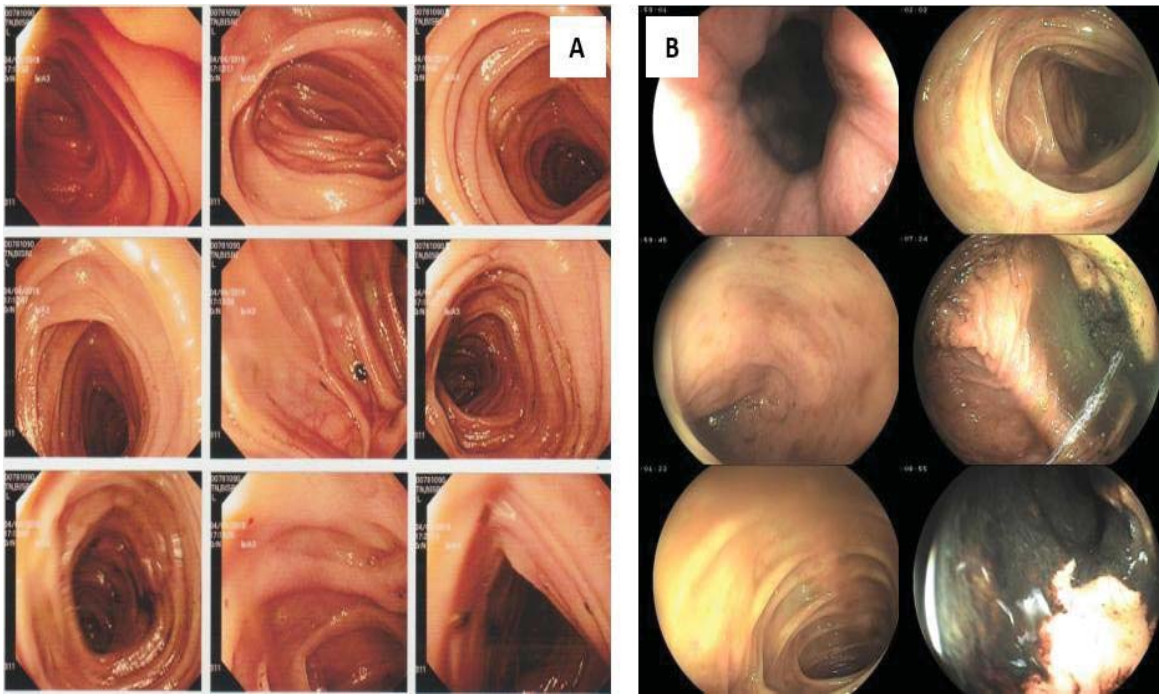

Figure 1. (A) Colonoscopy examination showed a hiatal hernia and erosive cardia gastritis, (B) Colonoscopy examination showed an internal grade I hemorrhoid, normal endoscopy, and melena residue in the terminal ileum

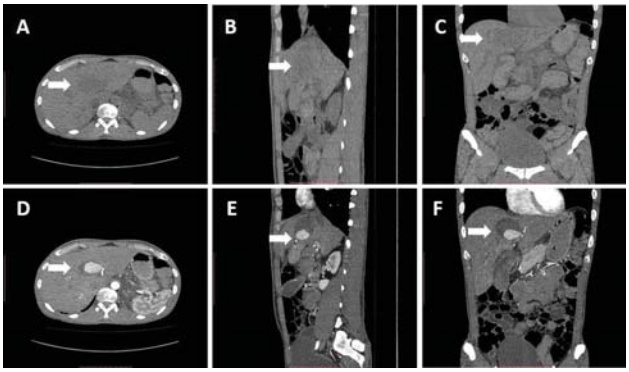

Figure 2. (A) Axial, (B) sagittal, and (C) coronal views from multi-slice computed tomography (MSCT) of the abdomen/pelvis show a non-enhanced extended hematoma in the middle segment of the left lobe of the liver. MSCT (D) axial, (E) sagittal, and (F) coronal views post-contrast show the passage of contrast into the arterial system and the liver injury (white arrows) as a pseudoaneurysm.

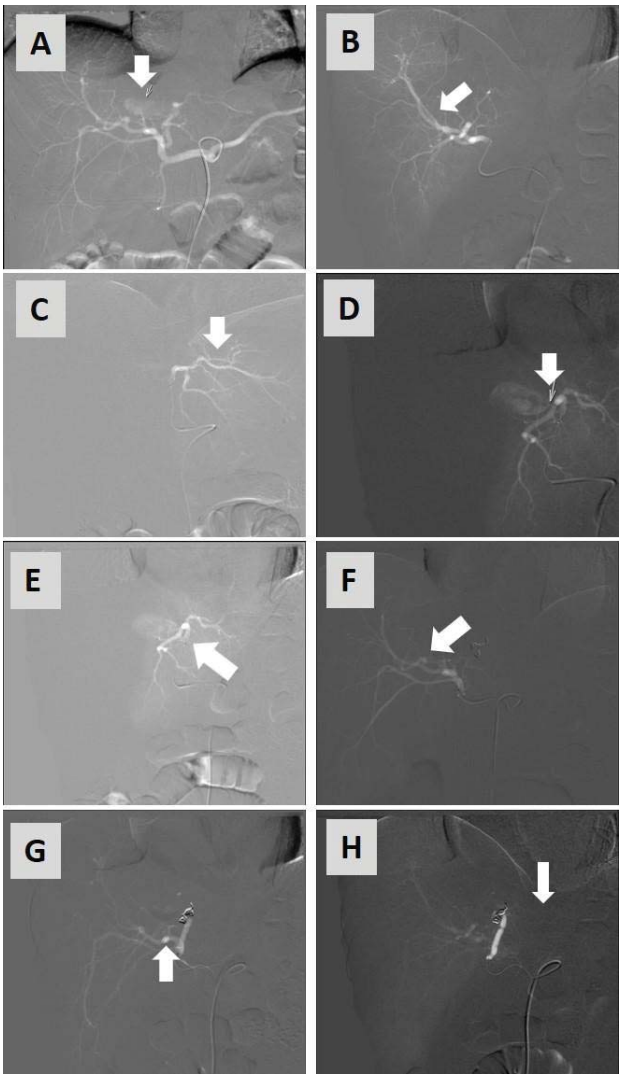

Figure 3. (A) Angiographic image of the hepatic artery shows a pseudoaneurysm (arrow). (B) No pseudoaneurysms were found in the right hepatic artery or the (C) A2 and A3 segments of the left hepatic artery. (D and E) An angiogram of the left hepatic artery confirmed the location of a pseudoaneurysm arising from branches in the A4 segment. (F) The status post-deployment of coils in the A4 segment of the left hepatic artery or medial hepatic artery shows the pseudoaneurysm is completely occluded (white arrow). (G) Images show the right hepatic artery and (H) A2 and A3 segments of the left hepatic artery are intact (white arrows).

Using a right transfemoral approach, the coeliac artery trunk was catheterized with a 5F catheter (Yashiro catheter, Terumo). The angiogram (Figure 3) of the left hepatic artery confirmed the location of a pseudoaneurysm (2.5 × 3.6 × 1.8 cm). Using a selective angiogram, it was catheterized with a Renegade 2.8 Fr HI-FLO that was advanced over a 0.016 microwire (Fathom). The A4 segment of the left hepatic artery was embolized with a Renegade STC 18 microcatheter, Transend EX 0.014 guidewire, and multiple 0.18 micro coils (VortX, Interlock). Post-embolization imaging showed a completely occluded pseudoaneurysm without contrast extravasation. The patient was followed up for one week, in which time his hemoglobin recovered (11.2 g/L), no symptoms of recurrent bleeding occurred, and his general condition was good.

DISCUSSION

The liver weighs around 1500 g in an adult and is located in the right upper quadrant of the abdomen, under the diaphragm.[3] Because of its location and large size, blunt trauma to the abdomen often affects the liver, especially the right lobe,[2,3,14] and liver injury is the common cause of death in such trauma.[4,15] Injuries to the organ can include lacerations, subcapsular or intraparenchymal hematomas, and contusions.[11] Nonoperative management can help with spontaneous recovery and can include observation, arteriography, and embolization.[16] Surgery is required for patients presenting with hemodynamic instability or those who fail nonoperative management.[14]

CT scan, ultrasonography, and MRI play important roles in determining the presence or absence of blunt liver trauma.[16] Kumar et al. showed that solid organ injuries can be diagnosed using CT scans,[12,17] which also offer the ability to detect active bleeding.[17] In hemodynamically stable patients with blunt trauma, the CT scan is the standard imaging modality that can depict a detailed delineation of a solid organ and injuries to the retroperitoneal space.[15,16] Importantly, CT examinations are fast and widely available, and with the appropriate scanning protocol, they can provide good resolution images with multi-planar reconstruction.[17] The sensitivity of CT scans for diagnosing liver injuries is high, 92% to 97%, with a specificity of 98.7%.[2] However, CT scans are contraindicated in pregnant women, especially in the first trimester, and children, due to the higher sensitivity of their organs to radiation and because their longer life expectancy increases the risk of organ injury (related to

the long latency that comes with radiation exposure).[15]

Ahmed et al. and Baptista et al. reported that while ultrasonography is a highly operator-dependent procedure, it is versatile, non-invasive, and requires no ionizing radiation.[15] The initial trauma evaluation in this case was performed with the focused assessment by ultrasound for trauma protocol. However, retroperitoneal injuries and hollow viscus injuries can be missed by ultrasound evaluations. The sensitivity of this examination is 63% to 100%, and the specificity is 95% to 100%.[2,15] MRI may be a useful alternative for hemodynamically stable patients and those with suspected bile ductal injuries that cannot undergo the CT scan procedure (e.g., an IV contrast allergy).[4] Although compared to CT scanning, MRI plays a limited role in evaluating blunt abdominal trauma, in theory, it can be used as a follow-up method for monitoring. Due to its non-radiation properties, this would be advantageous, especially for children and pregnant women.[12]

When equipped with CT and modern, minimally invasive percutaneous intervention techniques such as angioembolization,[5] nonsurgical management can be performed on hemodynamically stable blunt liver trauma patients with a success rate exceeding 80% to 90%.[18] However, nonsurgical management can be classified as a safe procedure only if the facilities are equipped with experienced interventional radiologists, advanced imaging modalities, intensive care unit availability, and other supporting factors. Although nonsurgical management carries the risk of misdiagnosing hollow visceral injuries or delayed bleeding, depending on the patients and technical or medical factors, surgical management can also be associated with surgery-associated side effects. In clinical practice, the decision on whether to perform surgical or nonsurgical management depends more on the patient's hemodynamic stability than on the severity of the injuries.[18]

Nonsurgical management also has several benefits when considered in terms of lower hospital costs, faster hospital discharges, the lack of need for nontherapeutic celiotomies (including cost and morbidity), fewer intra-abdominal complications, and reduced transfusion needs. It also has a better mortality outcome when compared to surgical management.[19] According to the new guidelines for the management of blunt liver trauma, laparotomy is only indicated if the patient is hemodynamically unstable and has signs of peritonitis.[19,20] Surgical and nonsurgical (e.g., endovascular intervention) management have the same recovery objectives in trauma cases, which are reducing massive bleeding and saving lives.[13]

The complications from blunt liver trauma include hepatic artery pseudoaneurysms, which have a high risk for rupture and hemorrhage. To decrease mortality, their early diagnosis and treatment are important. Nonsurgical management in this case of blunt liver injury in a hemodynamically stable patient was successful and relied on imaging modalities such as CT scans to play an important role in his assessments. The transcatheter arterial embolization performed is a noninvasive and effective treatment option that prevents the risk of severe hemorrhage with hepatic artery pseudoaneurysms. Better diagnostic and intensive care management have progressively led to the acceptance of nonsurgical management, which has resulted in decreased mortality rates.

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