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## Case Report

# Angiographic management of the left hepatic artery disruption following motor vehicle accident

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## ABSTRACT

Trauma is a leading cause of death in younger individuals. Blunt abdominal trauma has the potential to mask severe injuries—there can be serious organ or vascular injury underneath intact skin. Increasingly, there is a trend toward nonoperative management of blunt abdominal trauma. We report the case of a left hepatic artery transection managed in the interventional radiology suite.

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## Introduction

Accidents represent a leading cause of death in individuals younger than the age of 50 years and the fourth leading cause of death among all individuals following heart disease, cancer, and stroke. Blunt abdominal trauma accounts for as much as 80% of all abdominal trauma identified in the emergency department, and most blunt abdominal trauma are due to motor vehicle accidents [1,2].

Vascular insult in blunt abdominal trauma is recognized as a potentially lethal, difficult to manage injury. Patients sustaining vascular trauma often arrive to the emergency department in the state of shock secondary to massive blood loss [3]. These injuries are often not obvious and can result in occult massive hemorrhage as well as associated organ

ischemia [4]. With abdominal trauma, mesenteric vessels are most frequently injured within the abdominal cavity [4]. Mesenteric injuries can be associated with intestinal ischemia, intraperitoneal hemorrhage, or retroperitoneal hemorrhage, which can cause further injury to abdominal organs [5]. Transcatheter arterial embolization can be considered a treatment modality for mesenteric bleeding and has been shown to be as effective as open surgery in controlling intestinal hemorrhage [6].

Other causes of vascular injury after blunt abdominal trauma include arterial aneurysm of the gastroduodenal and hepatic arteries after trauma [7,8]. Main trunk vascular transection or disruption may also occur. Most of these disruptions involve the superior mesenteric artery, and one instance involved the left gastric artery [9,10]. However, these injuries

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were typically managed by vascular or trauma surgery. We report the case of an individual who presented with a proximal left hepatic artery transection following a motor vehicle accident, which was managed in the Interventional Radiology Suite.

### Case summary

A 50 years old presented to the emergency department following a T-Bone motor vehicle accident. Following pulmonary stabilization, contrast-enhanced computed tomography (CT) imaging revealed a subtle grade 1/grade 2 contusion present at the superior pole of the spleen, with no definitive active hemorrhage visible. Perisplenic and perihepatic fluids were also noted. The patient's systolic blood pressure was measured to be in the 80s. Continued hemorrhage from splenic lacerations was suspected, and the decision was made to transport the patient to the interventional radiology suite for angiography and intervention.

Femoral access was achieved using a micropuncture access set with ultrasound guidance. A 5 French sheath was placed, and angiography was performed using a 5 French Imager II Cobra Catheter (Boston Scientific, Marlborough, MA). Celiac artery angiography revealed a small arteriovenous fistula in the inferior pole of the spleen. A splenic arteriogram confirmed this finding. A Direxion Bern Tip microcatheter Transend (Boston Scientific, Marlborough, MA) guided with a Transend microwire (Boston Scientific, Marlborough, MA) was advanced into a lower pole second-order splenic artery branch. Subsequent arteriogram revealed vascular irregularity, filling the laceration site, as well as revisualization of the arteriovenous fistula described. The second-order branch was then embolized using a 6 mm × 15 cm interlock coil (Boston Scientific, Marlborough, MA). Another irregular vessel, likely in spasm, may have been contributing to further bleeding and was selected and embolized using a 2-mm Hilal Embolization Microcoil (Cook Medical, Bloomington, IN).

The patient remained hypotensive, so the decision was made to repeat the celiac arteriogram using the cobra catheter. This arteriogram demonstrated a vascular cutoff sign at the origin of the left hepatic artery, a branch of the gastrohepatic trunk, with no contrast extravasation (Fig. 1). Additionally, the left hepatic artery was found to be supplied by collaterals originating from the left gastric artery. The left gastric artery was then selected using a microcatheter, and arteriogram demonstrated the same vascular cutoff sign (Fig. 2), also without contrast extravasation. The gastrohepatic trunk was then selected using the microcatheter. Arteriogram was performed and demonstrated brisk contrast extravasation into the abdomen. The proximal left hepatic artery was then embolized using a 5 mm × 15 cm Interlock Detachable Coil (Boston Scientific, Marlborough, MA). Repeat angiography demonstrated persistent filling of the contrast extravasation (Fig. 3), likely from the left gastric collaterals. Subsequently, the proximal gastrohepatic trunk was embolized to its origin (Fig. 4) using two 8 mm × 15 cm Interlock Detachable Coils (Boston Scientific, Marlborough, MA).

Following Interventional Radiology embolization, the patient's blood pressure stabilized, and the patient was transferred to the intensive care unit. Operative surgical management



**Fig. 1 – Angiography from the celiac trunk showing vessel cutoff sign (arrow).**

for abdominal trauma proved not to be necessary in subsequent days, and the patient was discharged to rehabilitation facility approximately 2 weeks following hospital admission.

### Discussion

There has been a trend toward nonoperative management of abdominal trauma, and interventional radiology has been at the forefront of this change. Embolization can achieve hemostasis and salvage organs with fewer risks than open or laparoscopic surgery. This in turn reduces the resuscitation period, transfusion requirements, and recovery time [11]. One of the principles behind interventional radiology interventions is to control endovascular hemorrhage by occluding vessels and stop bleeding without physiological stress of surgery [12]. Traditional methods for repairing damaged vessels include resection, ligation, or bypass surgery [7].

Blunt abdominal trauma often requires further investigation and primarily relies on the use of diagnostic adjuncts since external clinical examination can miss further injuries [13]. CT imaging is highly sensitive and specific for detecting internal vascular injury [14]. One of the main findings is arterial blush,



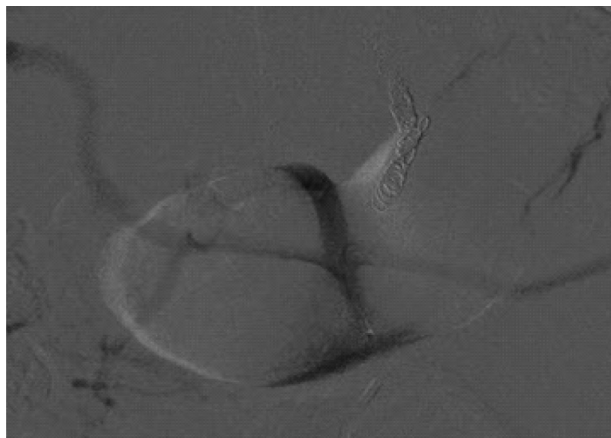
**Fig. 2 – Angiography from the left gastric artery showing vessel transection (arrow).**



**Fig. 3 – Angiography from the left gastric artery after the left hepatic artery embolization, showing continued extravasation (arrow).**

which represents arterial contrast extravasation and indicates injury. However, it is recognized that multidetector CT imaging cannot detect all vascular injuries, and angiography may still be necessary [11]. Most preventable death in blunt abdominal trauma occurred as a result of unrecognized hemorrhage, and associated hypovolemia and/or hypovolemic shock can contribute to multiorgan failure [12]. In some cases, jumping to exploratory laparotomy, considered the gold standard in hemodynamically unstable abdominal trauma patients, can result in delayed diagnosis of vascular insult [12].

One of the considerations that must be made in abdominal hemorrhage is collateral circulation, which may facilitate organ sparing when embolizing main vessels [15]. In addition, extensive collateral networks can provide distal circulation to areas of vascular injury, resulting in continued bleeding after embolization [15]. In our patient, collateral supply was found between the left gastric artery and the left hepatic artery. It is recommended to utilize both distal and proximal embolization in order to avoid distal reconstitution of injured vessels [15]. In our patient, we had to embolize the proximal gastrohepatic trunk to its origin due to collateral circulation to the left hepatic artery.



**Fig. 4 – Angiography from the celiac trunk after coiling of the gastrohepatic trunk, no longer showing contrast extravasation.**

This case illustrates that unnoticed or unrealized vascular injury in abdominal trauma can result in hemodynamic instability. Vascular injury causing this patient's hemodynamic instability was unidentified on CT imaging, since CT imaging only revealed the splenic injury and nonspecific collections of peritoneal fluid. Further angiographic exploration revealed the area of vascular trauma, which was embolized, resulting in hemodynamic stability. This case highlights the importance of angiographic exploration in hemodynamically unstable patients. Nonoperative management was utilized to control active intra-abdominal hemorrhage, not identified on CT imaging. This case confirms that CT imaging may not fully reveal the extent of vascular injury; however, it can be used to guide intervention or operation.

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