

## Traumatic Hepatic Artery Pseudo-Aneurysm with Fistula to the Hepatic Vein

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**Key words:** liver trauma, arteriovenous fistula, embolization

*IMAJ 2004;6:496-497*

Hepatic artery pseudo-aneurysm is a rare complication of abdominal trauma. In most reported cases blunt mechanism was identified, with penetrating injury described in only a few patients. The diagnosis of this pathology is frequently delayed. Traumatic arteriovenous fistula is rarely encountered and generally involves an arterial to portal venous system connection. We report a case in which a traumatic hepatic artery-hepatic vein fistula was discovered by sonography.

### Patient Description

A 19 year old male brought himself to the emergency center after he was stabbed in the left subcostal region. Primary assessment revealed the patient to be hemody-

namically stable with no other injuries. The wound was explored under local anesthesia, revealing intraabdominal penetration and the patient was transferred to the operating room for abdominal exploration. A diagnostic laparoscopy demonstrated a large amount of blood in the peritoneal cavity. The bleeding site was not identified and it was then decided to convert surgery to formal laparotomy. On exploration, the bleeding was seen to originate from the abdominal wall at the penetration site and from the left lateral segment of the liver. This bleeding was controlled by means of hepatorrhaphy.

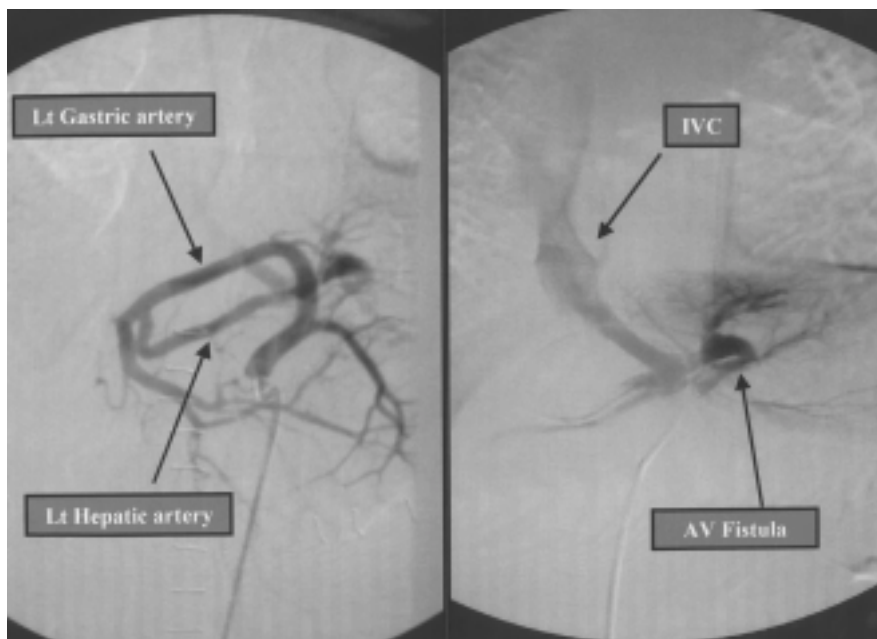
The postoperative course was uneventful except for a temperature of 38.0°C on day 3 after surgery. Owing to continuous

fever with no obvious source, sonography was performed to exclude biloma or intraparenchymal hematoma. Sonography revealed an abnormal vascular structure in the area of the injury. Computed tomography scan showed a replaced left hepatic artery originating from the left gastric artery. A traumatic pseudo-aneurysm and an arteriovenous fistula to the left hepatic vein were observed.

Angiography confirmed the anatomy. Imaging of the left gastric artery showed the replaced left hepatic artery, with the pseudo-aneurysm and fistula to the left hepatic vein and rapid filling to the inferior vena cava and the right atrium [Figure]. Supra-selective catheterization and embolization with metal coils (stainless steel) resulted in occlusion of the arteriovenous fistula. The clinical course after the procedure was normal. A minor liver function test abnormality after the procedure resolved on follow-up examination.

### Comment

Patients with major hepatic injury remain at risk for a variety of complications after the initial injury. These include hepatic abscess, pseudo-aneurysm, and arteriovenous malformations that may result in bleeding. Most of the complications encountered after liver injury can be managed non-operatively [1]. In the present case, sonography was performed for postoperative fever workup. It is well known that traumatic pseudo-aneurysm of the hepatic artery can lead to catastrophic outcome. Delayed hemorrhage with free rupture occurring up to 2 weeks after the injury were described [2]. Hemobilia is another well-described complication [3]. Intrahepatic arteriovenous fistulas are uncommon complications



Angiography of the celiac trunk. The replaced left hepatic artery originates from the left gastric artery. In supra-selective catheterization the arteriovenous (AV) fistula with rapid filling of the inferior vena cava (IVC) is demonstrated.

following hepatic trauma. Large fistulas to the portal venous system can result in portal hypertension with variceal bleeding. Fistulas to the systemic venous system (hepatic vein) can lead to cardiovascular compromise with high output cardiac failure due to blood shunting [4].

There is increasing discussion in the literature about the role of imaging in the follow-up of trauma patients [5]. In hepatic trauma, ultrasound and CT follow-up imaging did not provide any additional information needed for patient management. It is therefore the authors' conclusion that in an asymptomatic patient with blunt hepatic trauma who is clinically stable, routine follow-up imaging studies are of limited value. Similar data are lacking for penetrating trauma and especially in patients who were surgically explored. Our protocol dictates that only in case of abnormality in the immediate post-trauma period, i.e., fever, anemia, or bleeding, is there a place for imaging studies of the

injured organ. In the presented case the postoperative fever mandated us to investigate for the presence of a biloma, infected hematoma, resolving hematoma or other missed injury. The sonographic imaging was performed during the process of excluding these options from the various etiologies of postoperative fever in this setting.

This case raises questions about the need for a routine sonographic follow-up in this group of patients. The answer probably should be negative. Should all arteriovenous fistulas of the liver be managed by angiography? Do some of the pseudoaneurysms of the liver spontaneously thrombose? Do we need, at all, follow-up imaging of the liver after penetrating injury? These questions have yet to be answered.

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*For estimating the intelligence of a ruler ... look at the men he has around him*

*Machiavelli (1468-1527), Italian political theorist who argued that all means are permissible in the realization of a secure and stable state. The adjective Machiavellian is used to describe the view that opportunist or amoral means justify political desirable ends*