# Asymptomatic aneurysm of the hepatic artery Management options

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## Abstract

**Hepatic aneurysms are rare. The majority of patients present acutely with aneurysm rupture, with an attended high mortality. Diagnosis is difficult and often delayed, owing to the non-specific symptoms and lack of clinical findings. We present three cases of hepatic artery aneurysm diagnosed in a pauci- or asymptomatic stage, illustrating the different therapeutic options described when these aneurysms are diagnosed in this stage : expectant management, embolization, or surgery.** (Acta gastroenterol. belg., **2003**, 66, **298-302**).

**Key words** : aneurysms, hepatic artery.

## Introduction

Hepatic artery aneurysms (HAA) are rare findings. However, they constitute the second most common site of aneurysms in the gastrointestinal area. Twenty per cent of those aneurysms originate from the hepatic artery (1), aneurysms of the splenic artery being the most common site.

The patients are usually male, with an age between the 5th and 6th decade.

An aneurysm of the hepatic artery usually presents with acute rupture, meaning that the patient is in shock (2). However, there is increase of recognition of clinically silent hepatic artery aneurysms due to the increased use of abdominal CT and US in the diagnosis of abdominal pathology (3). Such aneurysms are often a coincidental finding.

As the number of asymptomatic hepatic artery aneurysms is undetermined, it is difficult to establish the exact incidence (4). The "Quincke's triad" is present in only 33% of the cases (1,4,5,6). This triad consists of atypical upper abdominal pain, jaundice and gastrointestinal haemorrhage. Upper abdominal pain and gastrointestinal bleeding are present in 46% of the cases. Jaundice, either due to extrinsic compression or to biliary obstruction caused by haemobilia, is present in 41% of the cases (1,7).

We describe 3 patients with nearly asymptomatic HAA, illustrating the diagnostic tools and management options in this situation.

## Case Reports

The first patient is 62-year-old man presenting in November 1998 with atypical upper abdominal pains. He underwent an abdominal ultrasound and CT scan showing an atheromatous dilated hepatic artery of 12 mm in diameter (Fig. 1). Selective coeliac angiography confirmed an aneurysmatic dilatation of the common hepatic artery over 10 cm, extending to the proximal right branch. Retrospectively, the aneurysm was already present at previous CT scans performed in 1994 and 1996 for atypical abdominal pains. As the lesion was not of a large size and there was no tendency to increase in volume over 4 years, no therapeutic act was performed and the patient is simply followed by ultrasound and CT scan. He was seen in December 2000. He remained asymptomatic, the aneurysm still measured 12 mm.

The 2nd patient is a 34-year-old man suffering from von Willebrand's disease. In the past he underwent multiple upper abdominal surgeries for recurrent dramatic gastric bleeding, leading eventually to total gastrectomy with Roux-en-Y anastomosis, caudal pancreatectomy and splenectomy. In June 1999 hepatitis C virus infection was diagnosed, probably due to the multiple blood transfusions. An abdominal ultrasound revealed an aneurysm of the common hepatic artery with a size of 14 mm, confirmed at CT scan. Selective coeliac angiography showed a multilobular ectasia with a size of 2-3 cm at the dorsal side of the proximal common hepatic artery (Fig. 2). The lesion was considered as a pseudoaneurysm due to laceration during previous surgery. Taking into consideration the young age of the patient, the higher risk of bleeding in the presence of von Willebrand's disease, the location of the lesion, and the predicted difficulties of surgical insulation of the lesion because of previous surgery, endovascular therapy was performed. Due to a kinking of the proximal common hepatic artery, it was not possible to embolize the lesion using 4F catheter. A superselective 3F SP-catheter (Terumo Europe, Heverlee, Belgium) was placed just distally of the aneurysm neck, followed by distal and proximal embolization using "platinum flower" micro-

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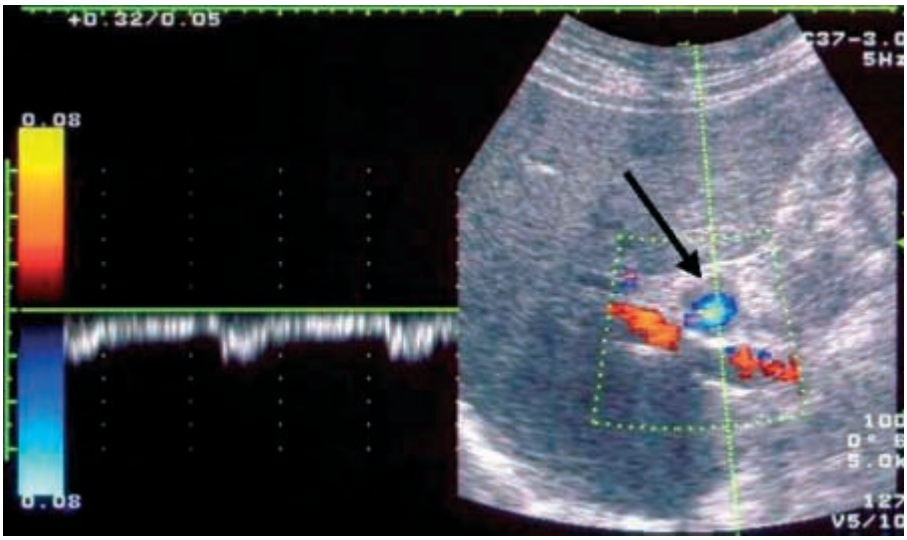


Fig. 1. — (Patient 1) : Pulsed-colour-Doppler ultrasound through the liver hilum showing a cross section of a dilated vessel with mural thrombus and arterial signal (arrow).

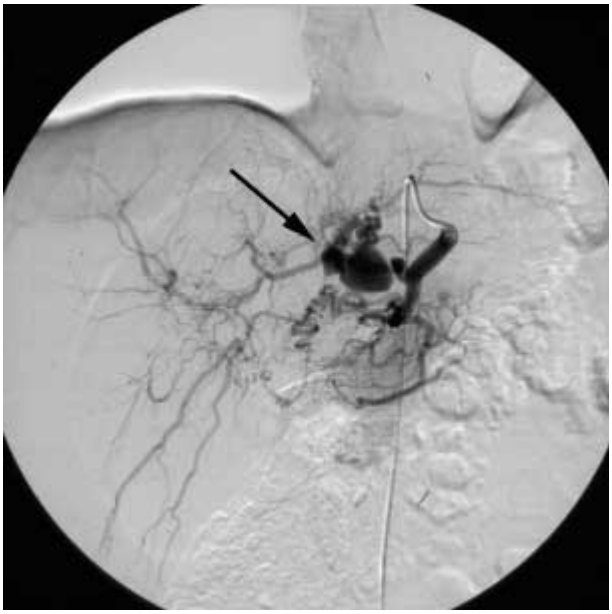

Fig. 2. — (Patient 2) : Selective coeliac angiography demonstrating a saccular pseudo-aneurysm of the hepatic artery (arrow).

Fig. 3. — (Patient 2) : Selective coeliac angiography after embolization of the pseudo-aneurysm (arrow).

coils (Target, Boston Scientific Corporation, Natick, USA). The aneurysm was not filled with coils because of the size and number of coils needed to achieve complete occlusion. After the procedure, refilling of the intrahepatic branches was seen through collaterals from the gastroduodenal artery (Fig. 3).

The 3rd patient is a 69-year-old man suffering from preterminal renal insufficiency due to cytostatic treatment for a prostate carcinoma 10 years before. In September 2000 he underwent an abdominal ultrasound for screening for possible renal transplantation. Blanc CT-scan for evaluation of renal and urological disease revealed a mass loaded onto the cephalic portion of the duodenum, and atherosclerotic lesions of the abdominal aorta (Fig. 4). Pulsed-Doppler ultrasound subsequently revealed a hepatic artery aneurysm of fusiform shape, with a maximal diameter of 26 mm and a free lumen of 16 mm due to partial thrombosis (Fig. 5). The aneurysmal sac absorbed the gastroduodenal artery but not the splenic artery nor the bifurcation of the hepatic artery.

Although asymptomatic, surgical correction was advised due to the urging need for haemodialysis with its obligatory intermittent anticoagulation. Resection of the aneurysm was carried out with a saphenous vein

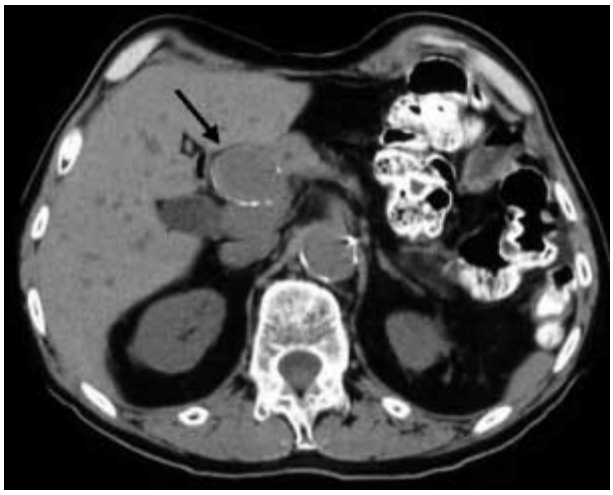

Fig. 4. — (Patient 3) : Blanc CT scan showing a hypodense mass lesion with calcified wall (arrow) anterior to the duodenum.

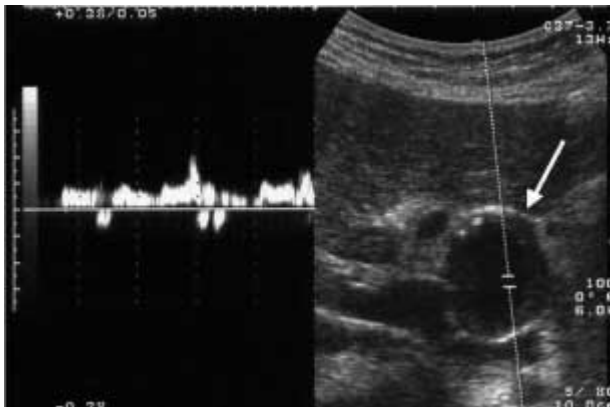

Fig. 5. — (Patient 3) : Pulsed-Doppler ultrasound through the liver hilum, showing a cross section of a dilated hepatic artery with mural thrombus and calcifications of the wall (arrow). The arterial signal is deformed.

Table 1. — **Aetiology of hepatic artery aneurysms (bold being most frequent)** (2,3,6,9,15)

1. **Atherosclerosis**
2. **Iatrogenic** :
   liver biopsy, post liver transplantation, surgery (e.g. post-cholecystectomy), intrahepatic arterial chemotherapy
3. **Trauma**
4. Connective tissue disorders (Marfan, Ehlers-Danlos, periarteritis nodosa)
5. Infectious (mycotic)
6. Cystic media necrosis
7. Fibromuscular dysplasia
8. Infection of the biliary tree
9. Pancreatitis (digestive enzymes)
10. Mixed causes : liver transplantation + mycotic

interposition end-to-end between the two arterial stumps. The gastroduodenal artery was easily reimplanted onto a side branch of the saphenous vein. The postoperative recovery was regular, without any alteration of the hepatic function, except for a modest (2-3 times) increase of transaminases for 72 hours.

## Discussion

Aneurysms of the hepatic artery are rare. It is, however, the second most common site of aneurysms in the gastrointestinal area.

There are a lot of aetiologic factors, but the most common are atherosclerosis, iatrogenic and trauma. The other causes are less frequent (Table 1).

According to a literature survey, 80% of the HAA are extrahepatic, of which 63% originate from the common branch, 28% from the right hepatic artery (RHA) and 5% from the left hepatic artery (LHA). The remainder 4% are from the RHA and LHA simultaneous. 10-20% are intrahepatic, mostly pseudoaneurysms (1,5). A pseudoaneurysm is mostly caused by a trauma or an invasive medical procedure, thus iatrogenic. Pseudoaneurysms are mostly intrahepatic, so that it can be said that these two causes are mostly responsible for intrahepatic aneurysms. According to the literature 50% of HAA are posttraumatic false aneurysms, thus pseudoaneurysms. This trend is possibly related to the increased use of percutaneous diagnostic and therapeutic procedures. Also the increased use of imaging after blunt liver trauma has increased the diagnostic yield to detect these lesions (14). The difference between an aneurysm and a pseudoaneurysm can not always be made with imaging techniques. Threedimensional imaging techniques can be helpful.

The most feared complication of such aneurysm is rupture. In the last decade 65% of the reported HAA's had ruptured, and the mortality rate associated with rupture was 21% (8).

At present time there is no data available as threshold size for rupture of visceral artery aneurysm. Extrapolation from available data on risk of rupture of infrarenal abdominal aortic aneurysms can give approximative data (Table 2 ) (12,13).

Because the higher risk of rupture of a pseudoaneurysm, the difference between aneurysms and pseudoaneurysms is important for the diagnosis and the treatment (14).

A rupture can present in different ways. It can rupture into the peritoneal cavity, into the biliary tree causing haemobilia, into the gastrointestinal tract, into the portal venous system causing portal hypertension and into a pancreatic pseudocyst.

It should be noted that in 36% of cases simultaneously associated aneurysms are present, e.g. the splenic artery, the renal artery, the aorta, etc (9). This implicates that a patient with an aneurysm of the hepatic artery needs a complete vascular evaluation and a close follow-up !

Table 2. — **Risk of rupture hepatic artery aneurysm (extrapolation from available data on risk of rupture of infrarenal abdominal aortic aneurysms** 12,13)

| Infrarenal aorta<br>Normal size<br>– 16.8 ± 2.9 mm (male)<br>– 14.6 ± 1.9 mm (female)<br>Aneurysm :<br>≥ 40 mm (2-2.5 x normal) | 1 year incidence of rupture | Hepatic artery<br>Normal size : ca 4 mm<br><br><br>Aneurysm :<br>≥ 8-10 mm (= 2-2.5 x normal) |
|---|---|---|
| 55-59 mm (= 3.5 x normal)<br>60-69 mm (= 4 x normal)<br>> 70 mm (= 4-5 x normal) | 9.4 %<br>10.2 %<br>32.5 % | ≥ 14 mm (= 3.5 x normal)<br>16 mm (= 4 x normal)<br>18-20 mm (= 4-5 x normal) |

In an acute situation, including signs of rupture, there is usually no time for imaging, and urgent surgical intervention has to be performed. Sometimes there is time for a quick sonography. It is less clear what has to be done when a hepatic artery aneurysm is detected in a presymptomatic stage. In the subacute situations, an angiography is very useful because of its therapeutic option, i.e. coiling. Radiological diagnosis of hepatic artery aneurysms is difficult. Conventional ultrasound is frequently misleading because of a low index of suspicion. Colour Doppler reveals the vascular nature of the mass, but the exact site is rarely demonstrated. It can quickly verify whether the lesion is vascular and determine the location and size of a thrombus or dissection. It can also differentiate aneurysms from other vascular abnormalities (AV fistulas, malformations,…). Typically, acute haemoperitoneum appears on sonography as echogenic fluid in the peritoneal cavity. Finally, compared with CT, sonography offers two major advantages, namely, sonography does not require contrast medium and can be performed at bedside. It is also a less expensive procedure (16).

CT scan allows accurate measurements of the diameter of an aneurysm. Recently, three-dimensional single slice spiral CT angiography was used in the diagnosis of hepatic artery aneurysms (17,18). This non-invasive technique was able to secure the diagnosis and to provide sufficient anatomical information for surgical planning. The multiplanar views were able to show intra- and extraluminal abnormalities, intimal calcifications, mural thrombus and, if necessary, the relationship of the aneurysm to the biliary tree. Multislice CT angiography has been shown to be useful in the evaluation of the aorta and most regional vascular beds, imaging vessels even smaller than 1 mm (19). The technique can be used in patients with stents or heavy calcifications, hard to evaluate with ultrasound or MRI. It is now becoming the investigation of choice when a hepatic aneurysm is suspected.

Three-dimensional gadolinium-enhanced MRI angiography has been shown to depict the hepatic vasculature (20,21), but its use has not been reported in hepatic artery aneurysms.

Classical angiography, however, is still necessary when endovascular therapy is considered.

Generally, there are three management options : expectant management, endovascular therapy, or surgery.

The conditions of an expectant management are aneurysms incidentally detected in the elderly, being of small size, where US or CT does not show any increase in volume or small, asymptomatic, intrahepatic aneurysms (10). According to the literature, the size of 2 cm has been accepted as the threshold to treat the aneurysm, even in absence of symptoms. So a diameter of aneurysms smaller than 2 cm can be determined as of "small size".

Our first patient is still simply being followed by US and CT-scan because the lesion is not of a large size and there was no tendency of increase in volume over 4 years.

In the other cases endovascular treatment or surgery were necessary.

For embolization, coils (possibly with gelfoam interspersed between the coils) are usually used to fill the aneurysm or to occlude the feeding artery proximally and distally to avoid collateral refill. Due to the risk of peripheral embolization, the use of glue or PVA-particles is contraindicated. In some cases, a covered stent can be placed over the neck of the aneurysm to achieve complete exclusion.

The indications for embolization are temporary control of bleeding by rupture before surgery, intrahepatic aneurysms, extrahepatic, small, saccular aneurysms with excellent collateral circulation, pseudoaneurysms with difficult surgery an in case of contra-indications for surgery such as advanced age or bleeding tendency (Table 3) (5).

Our 2nd patient underwent an endovascular therapy because of his young age, the higher risk of bleeding in the presence of von Willebrand's disease, the location of the lesion and the predicted difficulties of surgical insulation of the lesion because of previous surgical interventions.

The 3rd option is surgery, that can be used in good-risk patients, aneurysms with fusiform shape an in case of inadequate collateral circulation (Table 3). Our 3rd patient was treated surgically because of the high risk of bleeding during anti-coagulation for haemodialysis. Also the size and the location of the aneurysm were good indications for surgery. In general, it is advocated

Table 3. — **Indications for embolization or surgical intervention of hepatic artery aneurysms** (1,2,5,8,9)

| Embolization | Surgery |
|---|---|
| – Temporary control of bleeding by rupture before surgery<br>– Intrahepatic aneurysms<br>– Extrahepatic, small, saccular aneurysms<br>– Aneurysms with excellent collateral circulation<br>– Pseudoaneurysms with expected difficult surgery<br>– Contraindications for surgery e.g. advanced age, bleeding tendency | – Good-risk patients<br>– Aneurysms with fusiform shape<br>– Inadequate collateral circulation |

to treat hepatic artery aneurysms over 2 cm, even in absence of symptoms (11). The surgical techniques are simple banding, reconstruction with an autologous graft – as in our case – or prosthetic graft, or excision with terminoterminal reanastomosis (5).

In conclusion we present 3 cases of hepatic artery aneurysm diagnosed in pauci- or asymptomatic stage. There were non-specific symptoms and a lack of clinical findings. In case of upper abdominal pain beware of an aneurysm of the hepatic artery. US is a non-invasive technique for screening and for diagnosis. CT scan is used for confirmation of the diagnosis and allows making accurate measurements.

Angiography allows to certain the diagnosis, gives information on the anatomy and allows possible endovascular therapy.

The three management options, expectant management, embolization or surgery are illustrated and discussed.

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