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**Liver transplantation as a rescue surgery after failure of embolization of a giant hepatic artery pseudoaneurysm**

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**ABSTRACT**

We present the case of a male diagnosed with a giant hepatic artery aneurysm, which first presented with pain and hemorrhage due to a partial rupture of the aneurysm. After discarding treatment with a stent or surgery due to the wide extension, we chose to embolize the hepatic artery with coils. However, the progress was unfavorable after the procedure, with the appearance of liver failure that was resolved by an urgent liver transplantation.

Giant hepatic artery pseudoaneurysms are an infrequent entity and their management is a great challenge. The diagnosis is usually delayed due to non-specific clinical signs and the life of the patient may be threatened in the case of rupture. Thus, endovascular or surgical treatment is recommended. Aneurysm embolization or ligation has been described in the literature as a valid treatment option in cases where

revascularization by stent or bypass is not possible, as it preserves the viability of the liver due to the portal flow and collateral arteries. However, in the case of the failure of these treatments, liver transplantation is a rescue option.

**Key words:** Aneurysm. Pseudoaneurysm. Hemoperitoneum. Transarterial embolization. Liver transplantation.

## INTRODUCTION

Giant hepatic artery pseudoaneurysms are an infrequent entity and their management is a great challenge (1). The diagnosis is usually delayed due to non-specific clinical signs and the life of the patient may be threatened in the case of rupture. Thus, endovascular or surgical treatment is recommended (2,3). In cases in which revascularization by stent-graft or bypass is not possible, aneurysm embolization or ligation has been described as a valid treatment option. This approach preserves the viability of the liver thanks to the portal flow and collateral arteries (4-6). We present the case of a male diagnosed with a giant aneurysm of the hepatic artery (HA), which first presented with pain and hemorrhage due to a rupture. After discarding treatment with a stent or surgery due to a wide extension, embolization of the HA with coils was performed. The evolution was unfavorable, with liver failure and finally an orthotopic liver transplantation (OLT) was performed as a definitive treatment.

## CASE REPORT

A 45-year-old male presented to the emergency department with intense abdominal pain. The blood test showed 8.3 mg/dl of hemoglobin, 23.8% of hematocrit and  $16.3 \times 10^3/\text{mm}^3$  leucocytes. The computed tomography (CT) angiography showed a 6x4 cm pseudoaneurysm from the origin of the common hepatic artery (HA) to the proper HA (Fig. 1 A and B), with a hematoma in the lesser omentum. The right and left HA were permeable and had a normal diameter (Fig. 1C) with revascularization of gastroduodenal artery (GDA) from the superior mesenteric artery (SMA). The hepatobiliary and liver transplant unit decided to embolize it, despite the risk of hepatic ischemia. Five, 6 and 7 mm Terumo® hydrocoils were used for the distal

embolization of the right and left HA and their confluence. The proximal segment was embolized with a 16 x 10 mm Cera® type vascular occluder, including the celiac trunk and the origin of the splenic and left gastric arteries (Fig. 1D). After the procedure, the patient had a fulminant hepatic failure and therefore, an OLT was performed. An ischemic liver and gallbladder were found during the surgical procedure (Fig. 2A), together with 3 liters of hemoperitoneum. The common and proper HA pseudoaneurysm started at the origin and extended to the right and left HA (Fig. 2 B-D). The OLT was performed according to the piggyback technique, with an arterial anastomosis between the donor celiac trunk and the ostium of the recipient celiac trunk. The patient presented hypertransaminasemia and hyperbilirubinemia during the immediate postoperative period, which was suggestive of early graft dysfunction. The transaminases and bilirubin levels improved after starting treatment with prostaglandin E. The patient was discharged on the 25<sup>th</sup> post-operative day without any incidents. Currently, there are no complications after a one-year of follow-up.

## **DISCUSSION**

HA aneurysms and those of the splenic artery are the most frequent visceral artery aneurysms (7). The major risk factors are atherosclerosis, abdominal trauma, OLT, connective tissue diseases and hyperflow situations (pregnancy and portal hypertension, etc.) (8). There are no specific clinical signs and symptoms. From over 400 cases of hepatic aneurysms described in the literature, 80% started as an aneurysmal rupture, with an associated mortality of 20% (9,10). Although the diagnosis is usually incidental, Doppler ultrasound and vascular reconstruction using CT angiography are useful for diagnosis and also allow surgery to be planned (1).

The main indications for treatment are a symptomatic aneurysm, size greater than 2.5 cm, rapid growth (greater than 0.5 cm/year), diagnosis during pregnancy, patients undergoing OLT and pseudoaneurysms in all cases. Some retrospective studies suggest that the risk of rupture is low in those that do not exceed 2.5 cm and high those with an average size of 4.5 cm (2). The treatment must be individualized according to the characteristics of each patient, the anatomical location and the clinical presentation. There are two approaches, endovascular and surgical, none of which are superior (2,8).

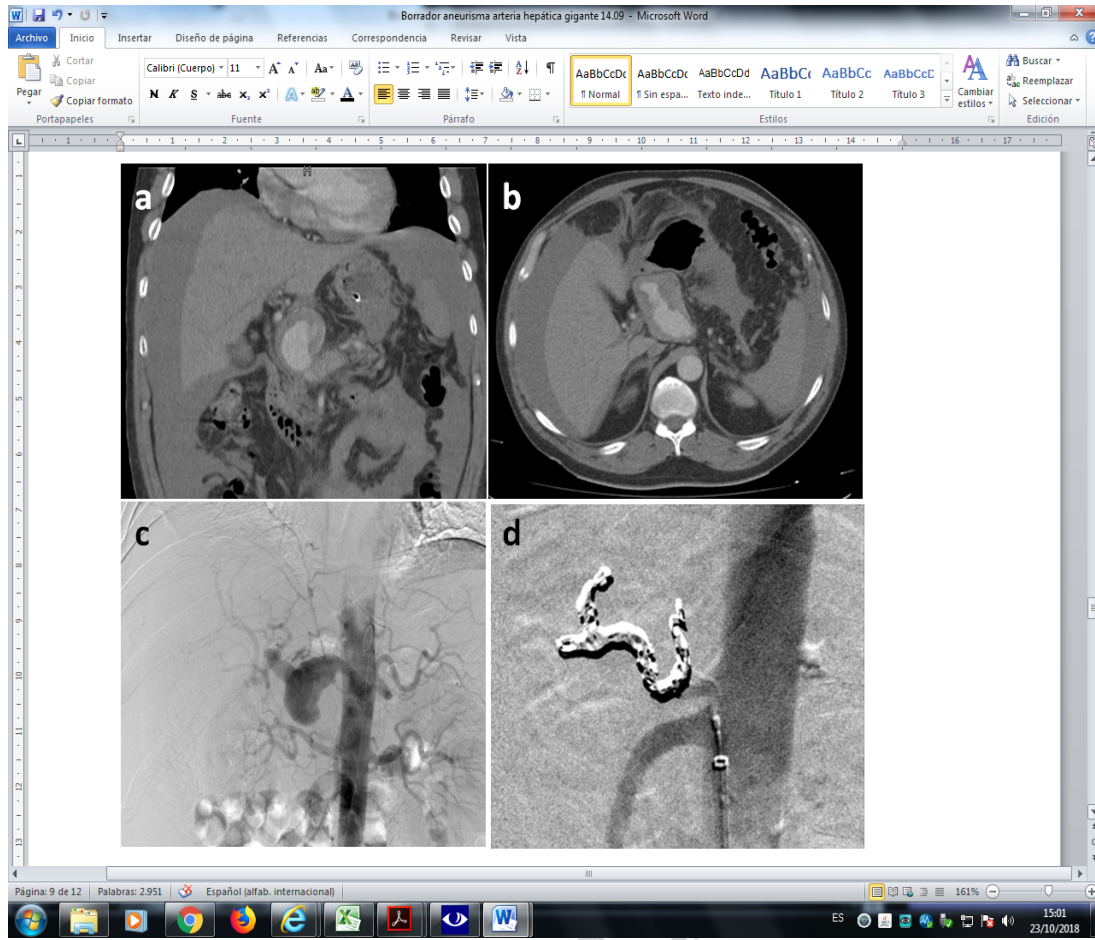
The endovascular approach (stent-graft, coils and their combination) is preferred for HA aneurysms instead of open surgery due to the 80% success rate and a lower morbidity and mortality. HA embolization or ligation is possible if there is portal flow or an adequate flow through the GDA. Stenting is preferable for patients with a previous hepatopathy or aneurysms that affect the proper HA (5-9). Table 1 shows a review of cases of patients with aneurysms treated by occlusion of the common HA. The placement of an endovascular stent-graft was proposed in our patient. However, it was not feasible due to the irregularity of the wall and because there was no normal portion of artery (> 5 mm) proximal and distal to the aneurysm. We opted for embolization with coils as several cases of embolization of HA have been described with favorable results such as hypertransaminasemia and self-limiting jaundice without hepatic dysfunction (1). However, in the present case, it was confirmed by intraoperative findings that one of the main reasons why the embolization failed was due to the compression of the aneurysm on the portal vein that prevented a correct hepatic perfusion. On the other hand, open procedures include ligation of the aneurysm with or without a bypass, hepatic resection and occasionally OLT (5-7). In this patient, a bypass was not feasible due to the extension of the aneurysm. The role of OLT in the treatment of aneurysms of the hepatic artery is marginal and there are few reports of cases that have required this procedure (5). The appearance of pseudoaneurysms in patients undergoing OLT for another reason are more well known, although infrequent. The management and treatment does not differ from visceral aneurysms of a different etiology (1).

## **CONCLUSION**

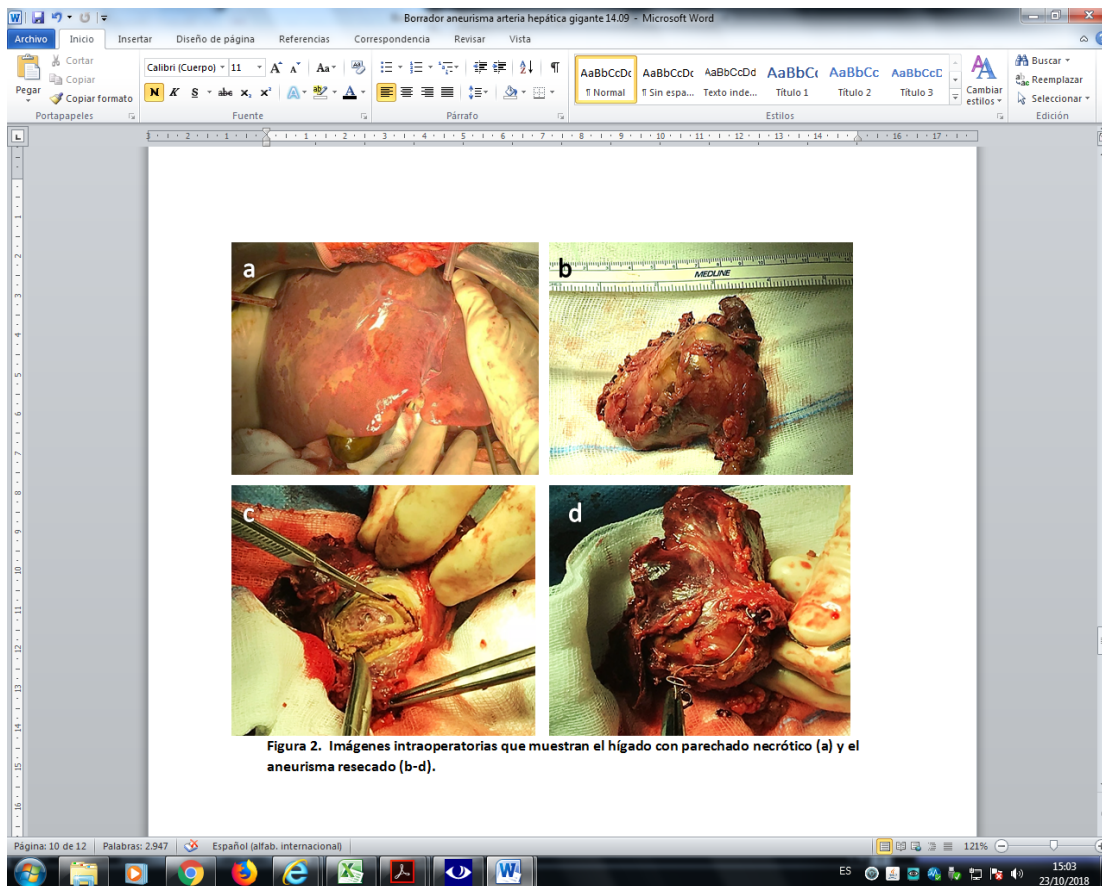
OLT represents a rescue option if the placement of a stent is not possible and HA embolization fails in cases of large pseudoaneurysms that encompass the HA from its origin to the bifurcation.

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**Fig. 1.** A pseudoaneurysm that originates in the common hepatic artery and extends to the proper hepatic artery (A and B). Permeable right and left hepatic arteries of a normal diameter (C). Transarterial embolization (D).



**Fig. 2.** Intraoperative images showing an ischemic liver and gallbladder (A); resected pseudoaneurysm (B-D); Terumo® hydrocoils inside the pseudoaneurysm.

**Table 1.** Results of hepatic artery occlusion in patients with hepatic aneurysms

Author	Year	n	
Jonsson et al. (1)	1980	1	
Dougherty et al. (2)	1993	1	
Tarazov et al. (3)	1998	1	
Sachdev et al. (4)	2006	9	
		2	
Huang et al. (5)	2007	3	
		1	
Christie et al. (6)	2008	1	
Pulli et al. (7)	2008	1	
Chirica et al. (8)	2008	4	



n: number of patients; ND: not available; F: female; M: male.

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