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Pseudoaneurysms Following Orthotopic Liver Transplantation: Clinical and Radiologic Manifestations

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A PSEUDOANEURYSM (PA) is an uncommon complication after orthotopic liver transplantation (OLT).[1] Because of the potential for rupture, early detection and treatment are crucial to patient survival. PAs usually occur at arterial anastomoses, often because of infection. Rarely they may occur following needle biopsy or transhepatic catheter insertion. Since PAs may be asymptomatic, they are often detected on radiologic studies performed for other reasons. Diagnosis of PAs requires a high index of suspicion. In this study, we report the clinical and radiologic findings in 12 OLT recipients with PAs.

PATIENTS AND METHODS

From January 1981 through June 1988, 1583 OLTs were performed in 1229 patients. This study is a retrospective analysis of 12 of these patients (seven adults and five children) who developed PAs postoperatively.

Nine patients were evaluated by computed tomography (CT). Scans were obtained at contiguous 1 cm intervals through the entire abdomen following the administration of oral and intravenous contrast material. Intravenous contrast material was not given in patients with poor renal function. Six patients were evaluated with duplex (pulsed Doppler and real-time) sonography. All 12 patients underwent angiographic evaluation.

Allograft revascularization followed standard surgical techniques. In eight patients, the donor celiac axis was anastomosed to the recipient common hepatic artery. In two patients, a donor iliac artery homograft was used as an interposition graft between the recipient abdominal aorta and the donor celiac axis. In two other patients, the donor aorta with the attached allograft blood supply was used as an arterial conduit from the recipient abdominal aorta.

RESULTS

Clinical

In six (50%) patients, the PAs were asymptomatic and detected incidentally during imaging evaluation for other reasons, including abdominal abscess, bile leak, and allograft dysfunction. Four patients presented with gastrointestinal (GI) tract bleeding. In one of the four, bleeding was caused by an arterioenteric fistula. A small mycotic PA of the ligated donor gastroduodenal artery eroded into the Roux limb of jejunum. In the other three patients, GI tract bleeding was due to hemobilia (Fig 1). In one of these, hemobilia occurred after removal of a transhepatic catheter that had been placed for balloon dilatation of a choledochojejunostomy stricture. One patient with a PA of the proximal anastomosis of an iliac artery homograft presented with back pain, which prompted CT (Fig 2). One patient presented with a falling hematocrit after liver biopsy. CT showed an intrahepatic hematoma and possible PA, confirmed angiographically.

Radiologic

The locations of the 12 PAs were equally divided between anastomotic and nonanastomotic sites. Two of the six anastomotic PAs were mycotic. Of the six nonanastomotic PAs, two were mycotic, two were caused by liver biopsy, one was due to transhepatic catheter placement, and one was of undetermined etiology. Diagnosis was made between two and 12 weeks posttransplantation in patients without biopsy-caused PAs.

In all 12 cases, the PAs were demonstrated by angiography (Fig 1).

Six of the nine CT scans showed the PA, four at an anastomosis (Fig 2) and two at nonanastomotic sites. CT did not show the PA in three cases. In these cases, angiography showed small PAs in the pancreaticoduodenal arteries in the first, PAs of both the ligated stump of the donor gastroduodenal artery and the celiac-hepatic artery anastomosis in the second (Fig 1), and a small right hepatic artery biopsy-caused PA in the third case. In all three cases, intravenous contrast enhancement was either not used or suboptimal due to nonbolus technique. CT did not show these PAs probably because of their small size or poor enhancement. However, in two of these three patients, CT showed recent hemorrhage, which prompted angiographic evaluation, documenting PAs in both.

Two of the six duplex sonograms suggested a diagnosis of PA, leading to angiography. In four patients, the diagnosis of PA was not established by sonography. In two of the four cases with anastomotic PAs, the area of the proximal anastomosis of the aortic conduit graft was not included in the field of study; thus, the PA was not imaged. In the other two cases, sonography showed fluid collections corresponding in location to the PA. However, these collections were not evaluated by Doppler, and therefore the diagnosis of PA was not established.

DISCUSSION

The most common and most serious vascular complication in OLT recipients is hepatic artery thrombosis.[1] Uncommon vascular complications include hepatic artery stenosis, portal vein stenoses and thromboses, and inferior vena cava throm-

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Fig 1. Mycotic pseudoaneurysms at the hepatic artery anastomosis (arrows) and a large pseudoaneurysm of the ligated stump of the allograft gastroduodenal artery (arrowheads) demonstrated on hepatic arteriogram.

boses. Rare vascular complications include anastomotic, mycotic, and biopsy-related PAs.

PAs may be asymptomatic and detected incidentally during imaging evaluation for other reasons, as occurred in 50% of the patients reported herein. Diagnosis requires a high index of suspicion. Sites of vascular anastomoses must be examined closely for evidence of hematoma or abnormal contrast-enhancing areas on CT. Intravenous contrast is very helpful, and in three cases, small PAs may have been missed because contrast was not used or was used without bolus technique. In two patients, however, the diagnosis of PA was suggested without contrast because of the demonstration of a focal mass adjacent to the aortic anastomosis of an iliac interposition graft (Fig 2). On duplex sonography, any fluid collection in the vicinity of an arterial anastomosis must be evaluated by pulsed Doppler.

The ability to diagnose visceral artery aneurysms and PAs with CT and duplex sonography in nontransplant patients is well established. Duplex sonography is especially valuable, since flow within the PA can be demonstrated.[2] Detection of arterial flow is an indication for angiography. Duplex sonography played a diagnostic role in two of our patients, in whom unsuspected PAs were initially detected as incidental findings, leading to angiographic evaluation.

GI tract bleeding was the presenting symptom in four patients. In none of these cases did CT or duplex sonography demonstrate the PAs; however, recent subhepatic hemorrhage was identified on CT in one patient, leading to

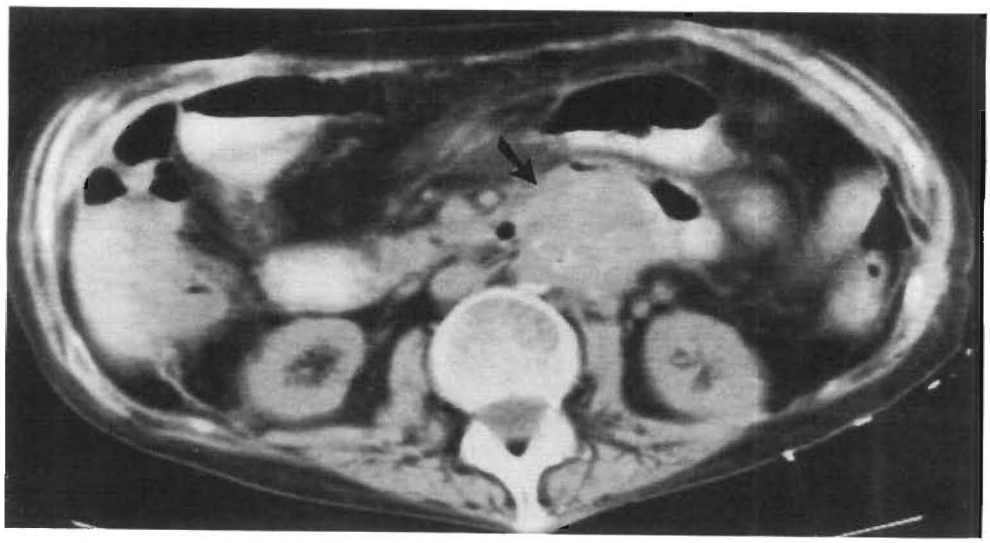

Fig 2. Large pseudoaneurysm (arrow) of the proximal anastomosis of an iliac artery homograft demonstrated on abdominal CT scan.

angiographic evaluation. In liver allograft recipients with hemobilia, or GI tract bleeding and negative endoscopy, angiography is indicated.[3] In three of the patients with GI tract bleeding, the PAs were small in caliber, making diagnosis by CT or duplex sonography difficult.

In OLT patients who have undergone liver biopsy and present with a decreasing hematocrit or an enlarging intrahepatic hematoma, the possibility of a biopsy-caused PA with hematoma must be considered. Hematoma and PA are known complications of liver biopsy.[4] Since biopsy-caused PAs may be small, they may not be seen on CT or duplex sonography. The presence of an expanding hematoma within the allograft liver following biopsy demands angiographic evaluation.

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