

Rupture of the Right Hepatic Artery After Left Lobectomy of the Liver in Patients with Bile Duct Carcinoma

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Transcatheter arterial embolization (TAE) has been reported as the treatment of choice for rupture of the visceral artery. We experienced two clinical cases of rupture of the right hepatic artery after left lobectomy of the liver for radical resection of the bile duct carcinoma. In the first case, TAE was performed on the right hepatic artery twice under a condition of hemorrhagic shock. Consequently, hepatic ischemia developed into complete infarction of the remnant liver tissue in spite of control of bleeding from the rupture site. In the second case, TAE was successfully accomplished because of the patient's good general condition and sufficient collaterals to the remnant liver. Bile leakage from the hepaticojejunostomy was observed early in the postoperative course, and episodes of intermittent flow of blood through the abdominal drain were experienced in both cases. Injury to the exposed arterial wall by leaking bile after lymph-node dissection was considered to be a possible contributive factor of rupture. TAE following initial diagnostic arteriography should be performed at an early stage when there are several episodes of intraabdominal bleeding. However, hypovolemic shock from massive hemorrhage and poor arterial collaterals due to the primary surgical procedure unfavorably affected the prognosis of a patient undergoing TAE.

Key words : rupture of the hepatic artery, transcatheter arterial embolization (TAE)

Introduction

Recently, clinical cases of rupture of the splanchnic artery associated with complications after gastric, pancreatic and hepatobiliary surgery have been reported¹⁻³⁾. In almost all cases, intestinal leakage including pancreatic juice activated by enterokinase resulting from anastomotic insufficiency after total gastrectomy or pancreatoduodenectomy with lymph-node dissection digested the adjacent exposed arterial wall and led to serious intra-abdominal hemorrhage. In these situations, transcatheter arterial embolization (TAE) is an effective way to control massive bleeding^{1,3-5)}. In cases of rupture of the right

hepatic artery after left lobectomy of the liver with combined resection of the extrahepatic bile duct and lymph-node dissection for bile duct carcinoma, however, TAE on the right hepatic artery causes a total interruption of arterial flow to the remnant liver and thus presents a high risk factor for infarction. We report two relevant cases with different outcomes following TAE.

Case Reports

Case 1

A 66-year-old man underwent surgery on June 6, 1992 for the bile duct carcinoma located in the left hepatic duct and extending to the common bile duct. The whole liver was mobilized from the diaphragm in preparation for the surgical procedure, which included left lobectomy, caudate lobectomy of the liver and pancreatoduodenectomy with lymph-node dissection. From the 2nd postoperative day, bile began to leak from site of hepaticojejunostomy in the right lobe of the liver. On the 26th day after surgery, a small quantity of blood passed through the abdominal drain located behind the stoma of hepaticojejunostomy and spontaneously stopped within 6 hours. Similar episodes occurred on the 28th and 29th postoperative days. On the 32nd day, he suddenly fell into a state of hemorrhagic shock. The emergency (interventional) angiography showed an extravasation of contrast media from the distal site of right hepatic artery and a small pseudoaneurysm of proximal site of it. At the first TAE, the ruptured artery was embolized by coils up to the proximal area of the site of extravasation (Fig. 1). But a second TAE was required one hour later because bleeding recurred (Fig. 2). Additional coils were placed between the distal and proximal portion of the bleeding point by passing the guidewire and coaxial catheter through the predeposited coils in the proximal coils. Complete hemostasis was accomplished by the second TAE, but the hepatic function deteriorated to a



Fig. 1-a



Fig. 1-b

Fig. 1 (a) (Selective) celiac arteriography on the 32nd day after surgery in case 1 shows an extravasation of contrast media (arrow head) and a pseudoaneurysm on the proximal side of the right hepatic artery (arrow) (b) Just celiac arteriography after the first TAE in case 1

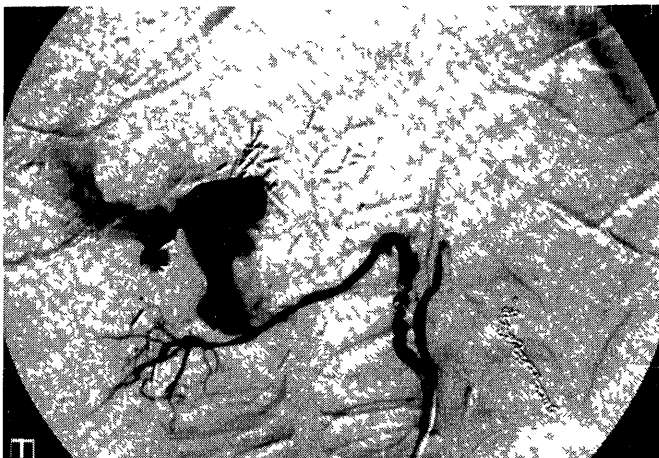


Fig. 2-a

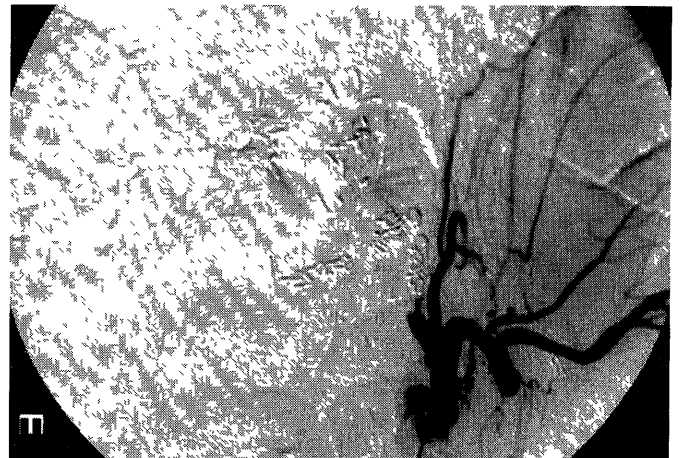


Fig. 2-b

Fig. 2 (a) Digital subtraction angiography (DSA) reveals recurrent bleeding from the rupture site after the first TAE in case 1 (b) DSA after the second TAE in case 1 shows complete control of hemorrhage

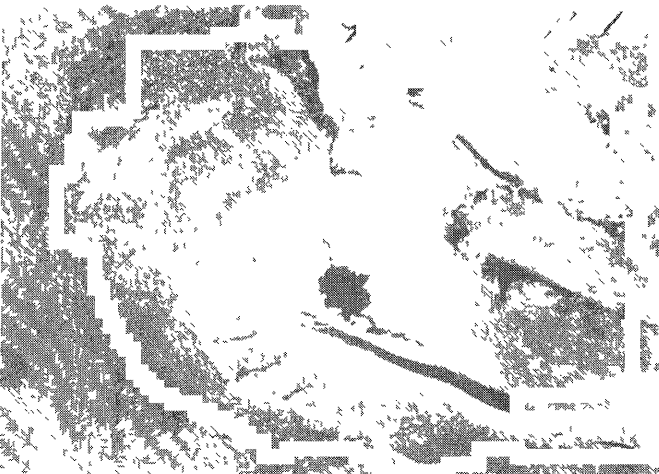


Fig. 3 Elastic fibers of the media at the rupture site of the right hepatic artery are microscopically destroyed in the EVG stain

critical level, and the patient died of hepatic failure on the 37th day after surgery in spite of plasma exchange and continuous hemodiafiltration

At autopsy, rupture of the right hepatic artery due to vanishing of the media and complete infarction of the remnant liver tissue were confirmed microscopically (Fig 3) The small pseudoaneurysm observed in the angiogram was histologically equivalent to the rupture of the artery.

Case 2

A 71-year-old man underwent left lobectomy, caudate lobectomy of the liver and radical resection of the extrahepatic bile duct for hilar bile duct carcinoma on August 26, 1992. These procedures excluded mobilization of the liver. Bile leakage from the hepaticojejunostomy continued for about two weeks from the 5th day after

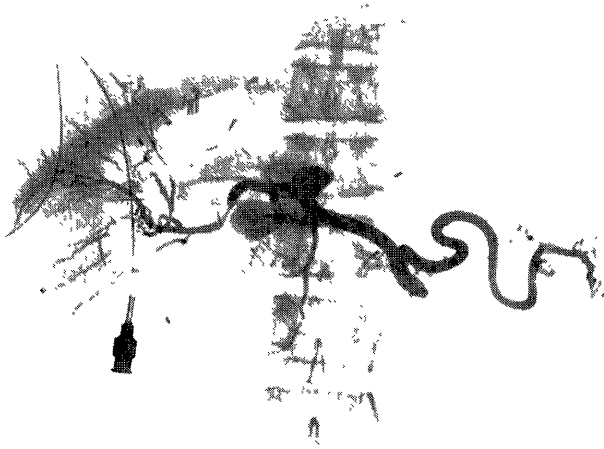


Fig. 4-a

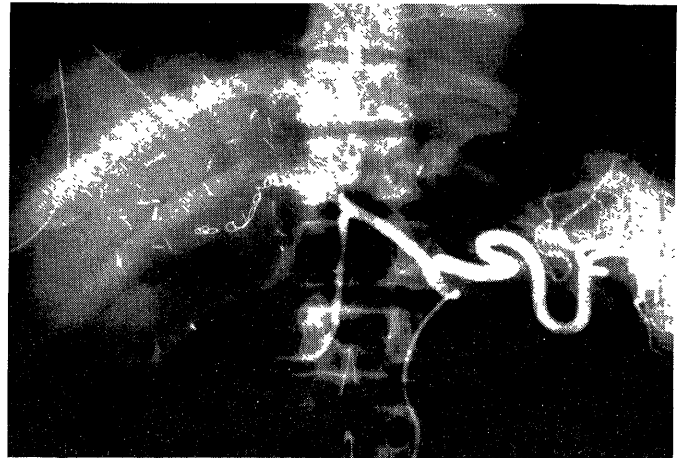


Fig. 4-b

Fig. 4 (a) (Selective) celiac arteriography on the 41st day after surgery in case 2 shows rupture of the right hepatic artery. (b) (Selective) celiac arteriography after TAE in case 2 shows complete hemostasis.

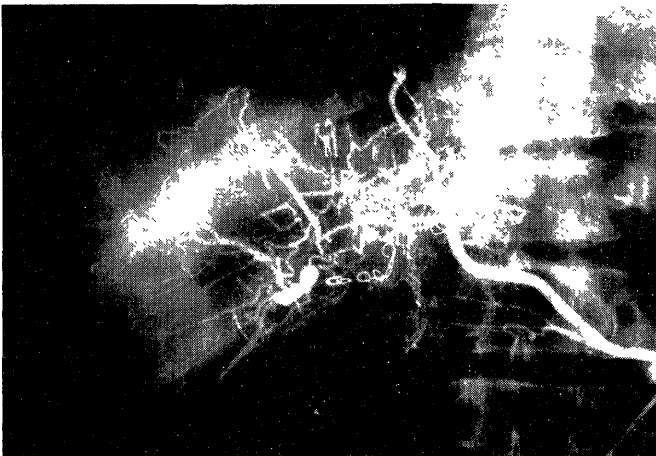


Fig. 5 Right subphrenic arteriography on the 26th day after TAE in case 2 reveals arterial blood flow to the remnant liver via the right subphrenic artery.

surgery. Oozing of bloody discharge through the abdominal drain was recognized on the 20th, 21st and 26th day. On the 41st day, immediate interventional angiography was performed because of a similar episode and revealed rupture of the right hepatic artery. TAE was performed with coils and microcoils through the rupture site to the peripheral side of the intrahepatic artery (Fig. 4). The intraabdominal bleeding was satisfactorily controlled and the patient's general status remained stable during and after TAE. On the 26th day after TAE, celiac angiography revealed arterial blood flow to the remnant liver via the right subphrenic artery (Fig. 5). The patient was discharged on the 82nd day after primary surgery.

Discussion

The etiology of hepatic artery pseudoaneurysm has been listed in reports and medical text books as a lesion arising from severe cholecystitis and cholangitis with biliary stone, septic emboli, trauma, and iatrogenic injury including operative complications⁶⁻⁸⁾. The pseudoaneurysm associated with operative complications, which produces leakage of intestinal contents including activated pancreatic juice or infectious bile from anastomotic insufficiency, almost always leads to massive intra-abdominal bleeding during the postoperative course¹⁻³⁾. Not only pancreatic juice but also infectious bile leakage from insufficient anastomotic site is considered to be a risk factor for rupture of the visceral artery exposed as a result of lymph-node dissection during hepatobiliary surgery. The histopathological findings in our case 1 suggested that infectious bile invaded the hepatic arterial wall and completely destroyed the media consisting of elastic fibers. The pathology of the site of extravasation of contrast media and the pseudoaneurysm in the angiogram were the same as that of the ruptured artery. In case of rupture of the hepatic artery associated with operative complications, TAE has been reported as the treatment of choice because surgical management, ligation of the artery, excision of the rupture site and other procedures have been difficult to apply due to anatomical modification or severe inflammatory change around the primary operative site^{1, 3-5)}.

TAE is a minimally invasive procedure which can be easily done following diagnostic angiography. In order to obtain complete hemostasis, the embolus should be packed through the site of rupture to the peripheral side of the artery by the so-called sandwich method⁹⁾. When embolization is performed up to the proximal side of the rupture site, as in the first TAE of our case 1, there is

often uncontrolled bleeding due to back flow or collateral flow from the peripheral arterial bed.

Michels¹⁰ observed at least 26 possible routes of collateral arterial blood supply to the remnant liver aside from typical blood supply from the common hepatic trunk in a series of 200 cases of hepatic resection. Among these routes, the following four are clinically important: the subphrenic branch of the phrenic artery or internal mammary artery, the periductal arterial plexus, other collaterals via the hepatic hilum with the superior mesenteric artery, and the intrahepatic branch^{10,11}. Thus, in cases of rupture of the right hepatic artery after left lobectomy of the liver and resection of the extrahepatic bile duct with lymph-node dissection, blood supply from the periductal arterial plexus, from other collaterals via the hepatic hilum with the superior mesenteric artery, and from the intrahepatic branch cannot be expected. The subphrenic branch of the phrenic artery or internal mammary artery and arteries from the jejunal limb for hepaticojejunostomy may be the only pathway to the remnant liver late in the postoperative course. In our case 1 as opposed to case 2, the mobilization of the whole liver as a preparation for surgery severed these pathways, and TAE was performed under a condition of hemorrhagic shock which also drastically reduced portal blood flow. These factors are considered to present a high risk for hepatic infarction after TAE.

In our experience, the precursor of massive hemorrhage from rupture of the artery can be found in episodes of intermittent bleeding through the abdominal drain following bile leakage. In view of this fact, diagnostic arteriography should be performed at an early stage when there are several episodes of bleeding in the postoperative course¹⁻³. The prognosis of a patient undergoing TAE may be affected by factors such as the presence of hypovolemic

shock, organ failure¹² due to surgical complications, location and number of rupture sites, and blood flow from collaterals. We especially emphasize that hypovolemic shock from massive hemorrhage and poor arterial collaterals due to the primary surgical procedure unfavorably affect the prognosis of a patient undergoing TAE.

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