

Biliary

Diagnosis and treatment of portal biliopathy

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Background: Portal biliopathy producing intrahepatic and extrahepatic biliary ductal abnormalities from portal hypertension, particularly with extrahepatic portal vein obstruction (EHPVO) is common. A majority of these patients are asymptomatic, but occasionally there is symptomatic biliary obstruction, and cholangitis and choledocholithiasis.

Objective: To explore the principles of diagnosis and treatment of portal biliopathy.

Data sources: To review the literature of portal biliopathy.

Conclusions: Endoscopic sphincterotomy, stone extraction and supportive drainage could effectively relieve cholangitis when jaundice is associated with common bile duct stones. Definitive decompressive portal-system vein shunting operation and choledcho-jejunostomy are sometimes required when biliary obstruction is recurrent and progressive.

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Key words: portal biliopathy; extrahepatic portal vein obstruction; diagnosis; treatment; shunt

Introduction

The first patient with symptomatic biliary obstruction due to extrahepatic portal vein obstruction (EHPVO) was reported by Fraser in 1944.^[1] Biliary obstruction due to compression of “cavernous transformation” of the portal vein could be relieved by decompressing portal pressure (proximal splenorenal shunting). However, the conception of portal biliopathy was put forward by Sarin et al.^[2] Up to 1998, Chaudhary et al.^[3] suggested the treatment criteria for portal biliopathy.

Etiology and Pathogenesis

EHPVO, a common cause of portal hypertension, accounts for one-third of varied etiological factors for the hypertension. In Dilawari's^[4] 521 cases

of portal hypertension, three main types were identified: EHPVO in 40% cases, cirrhosis in 41%, and non-cirrhotic portal fibrosis in 18%. Idiopathic or primary EHPVO is possibly due to omphalitis, umbilical vein catheterization, intraabdominal sepsis, abdominal trauma, congenital abnormalities, liver cirrhosis, Behcet's disease, hepatocarcinoma, myeloproliferative disorders, local tumor invasion, chronic pancreatitis, and portal thrombosis. Portal vein thrombosis may extend into the intrahepatic portal venous branches, giving rise to combined extrahepatic and intrahepatic portal venous obstruction.

Following thrombosis of the portal vein, several new collaterals develop to bypass the obstruction, and produce “cavernous transformation” of the portal vein or form a “portal cavernoma”. The same process leads to the formation of collaterals around the bile ducts. The bile duct, thin and pliable, allows protrusion of the varicose paracholedochal veins into the lumen, resulting in an appearance resembling that of esophageal varices.

Venous drainage of the extrahepatic bile duct is mostly by the veins that ascend along its course.^[5] They form epicholedochal venous plexus (Saint) and paracholedochal venous plexus (Petren). The former forms a fine reticular venous plexus on the common bile duct (CBD) and hepatic ducts, and is in intimate contact with their outer surface. The veins of this plexus vary in size, but normally are not larger than 1 mm. The paracholedochal veins parallel to the CBD are connected to the gastric veins, pancreaticoduodenal veins, portal veins, and liver directly. Fol-

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lowing portal thrombosis, varices of the plexus alter the normal smooth intraluminal surface of CBD and produce fine irregular mural changes. Changes of portal biliopathy on ERCP are protean. Biliary abnormalities are most prominent in the common bile duct. They include irregularities, localized saccular dilation, and filling defects suggestive of CBD calculi, linear or curved filling defects. Some of these changes are similar to those in sclerosing cholangitis, pseudosclerosing cholangitis or pseudo-cholangiocarcinoma sign. These changes resulted from the compression of paracholedochal varices and the presence of the varices of epicholedochal venous plexus cause symptomatic biliary obstruction, cholangitis, and choledocholithiasis.

Clinical features and biliary abnormalities

Chaudhary et al^[3] reported 9 patients with portal biliopathy out of 210 patients with EHPVO. Their mean age was 21 years (range 18–36). Five patients had gastrointestinal bleeding which was treated successfully by endoscopic sclerotherapy, and 4 patients had grade I - II esophageal varices without bleeding. Eight patients presented with jaundice, 2 had abdominal pain, and one had recurrent attacks of cholangitis. The levels of serum bilirubin (range 2.2–9.6 mg/dl) and alkaline phosphatase (range 310–1100 μ) were increased in all 9 patients. Ultrasonography showed normal echogenicity of the liver; the portal vein could not be seen in any patient and was replaced by anechoic tubular structures. In 6 patients, the bile duct could not be identified. Dilatation of the bile duct in the region of the porta hepatis was seen in 3 patients, 2 of whom had multiple calculi, with the duct being surrounded by multiple tortuous collaterals. The gallbladder distended in 3 patients had multiple overlying collaterals but no gallstones. Endoscopic retrograde cholangiopancreatography (ERCP) showed irregularity of the outline of the bile duct in all patients. Seven patients had a strictured common bile duct and one had multiple calculi proximal to the stricture. An-

other patient with multiple calculi but demonstrable stricture had undergone endoscopic sphincterotomy for removal of bile duct stones previously. Vleggaar et al^[5] reported four patients with portal vein thrombosis who presented with symptoms or signs of biliary obstruction. Cholangiography demonstrated smooth indentations of the common bile duct caused by external compression by collateral veins.

Khuroo et al^[6] prospectively reported 21 consecutive patients with extrahepatic portal venous obstruction for evidence of biliary tract disease. Of the 21 patients, 13 were children younger than 15 years. They experienced gastrointestinal bleeding necessitating multiple blood transfusions and emergency variceal sclerotherapy. Two patients underwent splenectomy with devascularization, one patient splenectomy with splenorenal shunt and one patient devascularization. Of the 21 patients, 3 had clinical manifestations of biliary disease. The 3 patients were adults with extrahepatic bile duct obstruction noted as cholestasis (2 patients) and cholangitis (1). Two of the 3 patients died after biliary surgery, and one of the two had had surgery to relieve biliary obstruction because of the development of cholangitis, septicemia, and endotoxic shock. Laparotomy showed that the porta hepatis had been replaced by a fibrotic mass containing multiple tortuous collateral veins. Biliary exploration led to exsanguination and death due to hypovolemic shock. In the remaining 18 patients, 5 had icterus on clinical examination. Most of the patients had an elevated level of serum alkaline phosphatase. The levels of serum bilirubin were elevated in 14 patients. Ultrasonography revealed enlarged spleens in 18 of the 21 patients (mean diameter, 13.0 ± 3.5 cm). The splenic vein was patent or dilated in all patients, and multiple collateral veins were seen in the splenic hilum and around the pancreas and left kidney. The portal vein could not be visualized in 18 patients, and the porta hepatis in all these patients showed diamond-shape bands of high-level echoes (portal cavernoma). In 3 patients, the wall of the portal vein was thickened with an irregular lumen and multiple tubular anechoic structures around it. Hepatobiliary ultrasound also

Table 1. Cholangiographic findings in the 21 patients

Abnormalities	Number of patients	
	Common bile duct	Hepatic duct
Strictures	11	2
Single	9	1
Multiple	2	1
Short	4	1
Long	7	1
Caliber irregularity (23.8%)	3	2
Upstream dilatation (42.8%)	9	2
Ectasia (9.5%)	1	2
Varices (14.3%)	3	–
Displacement (9.5%)	2	1
Angulation (4.7%)	1	–
“Pruning” (9.5%)	–	2
Normal	5	13

revealed distended gall bladders in 2 patients and gall-stones in 1. The common bile duct could not be visualized in any of the patients because of high-level echoes in the porta hepatis and multiple anechoic tubular structures that distorted normal anatomical relationships and concealed the bile duct. Hepatic ducts were dilated in 2 patients viewed as having cholestasis. In the remaining 19 patients, hepatic ducts were of normal size. The findings of ERCP in the 21 patients are shown in Table 1.

In 97 patients with EHPVO, Webb and Sherlock^[7] found that 13 patients showed jaundice, 6 hyperbilirubinemia associated with gastrointestinal bleeding, 5 permanently elevated serum bilirubin level, and 2 intermittently elevated serum bilirubin level.

In a study of ERCP for 20 patients with EHPVO, Dilawari and his colleague^[4] found various abnormalities in the biliary tract suggestive of sclerosing cholangitis. Nineteen of the 20 patients had no history of biliary disease. Only one patient experienced biliary colic, with a bilirubin concentration of 1.6 mg and an alkaline phosphatase activity of 219 IU, apart from two small stones in the bile duct. Eighteen of the 20 patients showed abnormalities at the mid portion of the main bile duct and indentations suggestive of external compression by choledochal varices. Of the 20 pa-

tients, 5 had localized stricture in the main bile duct, 1 normal bile duct with two small stones inside, and 1 stricture and irregularity in the lower portion of the bile duct. All patients showed such abnormalities in the left hepatic duct and its branches as focal stricture, dilatation, irregular wall, and clustering of the intrahepatic branches, all of which are suggestive of sclerosing cholangitis. Severe abnormalities were seen in 11 of the 20 patients (55%) and moderate ones in 9 patients (45%). The mean maximum diameter of the left hepatic duct was 6.5 mm (SD \pm 3.0), which was significantly different from that of controls. The abnormalities in the right hepatic duct were less severe than those in the left hepatic duct. Except 4 of the 20 patients had inadequate filling of the right hepatic duct, 16 showed changes with a mean maximum diameter of 4.7 mm (SD \pm 2.3), severe (3 patients), moderate (6), and normal (7). Because of the natural tortuosity of the cystic duct and odd mixing of contrast with the bile of the gallbladder, it was difficult to assess mild from moderate abnormalities. None of the patients had stones in the gallbladder.

Bayrautar et al^[8] reported 17 patients with pseudo sign of cholangiocarcinoma secondary to portal hypertension due to cavernous transformation of the portal vein. In a total of 832 patients with portal hypertension of different entities, cavernous transformation of the portal vein was noted in 17, of whom 16 received ERCP showing stricture, irregularity, undulation and nodular extrinsic defects caused by compression of thrombosis of the portal vein and collateral vessels, mimicking cholangiocarcinoma spreading along the common bile duct. The diameters of the right and left hepatic and common hepatic ducts were larger than that of the common bile duct in each patient. Most patients had the involvement of the distal portion of the common hepatic duct, but no evidence of ampullary and biliary tract neoplasm. Moreover, by ERCP no abnormal changes were observed in 6 patients with portal hypertension due to biopsy-proven liver cirrhosis. Endoscopy examination for all the 17 patients showed duodenal varices mostly located in the greater curvature of the descending duodenum (5 patients).

Table 2. Abnormalities shown by ERCP in patients with portal hypertension (%)

Changes	EHPVO (n=47)	NCPF (n=10)	Cirrhosis (n=12)
Abnormal cholangiogram	41 (87.3)	4 (40)	4 (30)
Extrahepatic duct	41 (87.3)	4 (40)	3 (25)
Left hepatic duct	34 (72.1)	2 (20)	2 (16.7)
Right hepatic duct	26 (55.3)	1 (10)	1 (8.3)
IHBR	6 (12.8)	1 (10)	2 (16.7)
	Dilated	Pruned	Pruned
CBD stones	8 (19)	0	0

IHBR: intrahepatic biliary radicle; EHPVO: extrahepatic portal vein obstruction; NCPF: noncirrhosis portal fibrosis.

Splenectomy for 6 patients showed massive collaterals and thrombosed veins at the porta hepatis and inferior portion of the liver, which compress the common bile ducts (Table 2).

Other clinical features

In Chaudhary's study,^[3] the patients of EHPVO at laparotomy were found liver appearance normal with thick, fibrotic hepatoduodenal ligament covered by multiple tortuouse veins. Their gallbladders were also covered by multiple collaterals but no gallstones were found. The collateral vein was mistaken as the common bile duct, which was difficult to visualize. Attempting to approach the bile duct might result in excessive bleeding.

In Khuroo's study,^[6] abdominal US was performed in all 21 patients. It revealed enlarged spleens (mean diameter 13 ± 3.5 cm) in 18 patients who had undergone abdominal US. The splenic vein was patent and dilated in all patients, and multiple collateral veins were seen in the splenic hilum and around the pancreas and left kidney. Dilawari^[4] reported that in all these patients, the splenic pump pressure was increased from 15 mmHg to 33.2 ± 5.9 mmHg (mean 20–44.6 mmHg). The severity of biliary changes was not correlated with the splenic pump pressure. The site of block was located at the splenoportovenous axis. Of the 17 patients, 3 suffered from distal portal vein thrombosis or thrombosis of the portal vein at the junction of the left and the right

portal veins, 8 complete portal vein thrombosis, 6 block at the splenoportal axis, and three of these had a spontaneous splenorenal shunt. Three patients had a thrombosed surgical splenorenal shunt. In 7 patients, arterial portography at venous phase revealed that the veins over the head of the pancreas drained into many tortuous worm-like veins extending to the portal veins in the liver.

Colonoscopic findings and rectal biopsy specimens showed nothing abnormal in the 21 patients, none of them had evidence of active or healed ulcerative colitis. They were negative for immune markers (antinuclear antibody, antimitochondrial antibody and smooth muscle antibody). One patient was positive for rheumatoid factor in a low titer.^[6]

Liver biopsy of all 21 patients revealed no evidence of cirrhosis or portal fibrosis, which could cause portal hypertension. In two patients with clinically manifested biliary disease liver biopsies revealed evidence of hepatocellular and intracanalicular cholestasis. None of the 21 patients demonstrated evidence of loss of ducts, portal triaditis, ductular proliferation or cirrhosis.^[6]

Treatment

At present, the management of portal biliopathy is selective and directed to symptomatic patients only. Bile duct stones or bile duct stones complicated by cholangitis can be safely removed by endoscopic sphincterotomy, during which cautions should be taken to prevent large venous collaterals in the ampullary and juxta-ampullary area from bleeding. In 7 reported patients, however, sphincterotomy did not cause any complications. The incidence of bile duct stone recurrence is high because the primary obstructive bile duct lesions persist. In the presence of symptomatic biliary obstruction not amenable to endoscopic therapy, portosystemic shunting is indicted. Biliary tract surgery in the presence of portal hypertension is fraught with the danger of massive blood loss because of unavoidable damage to abundant collaterals in EHPVO patients. The disease is uncommon

and easy to be ignored. Esophageal varices bleeding occurs with the symptoms and signs of portal hypertension, and is controlled by sclerotherapy. Emergency portasystemic shunt is rarely performed except splenotomy and devascularization in the treatment of acute bleeding of general portal hypertension because of the high incidence of portal systemic encephalopathy, which is considered to be caused by intrahepatic hypertension-cirrhosis before angiography. However, the incidence of recurrent bleeding is high after the operation. As to jaundice secondary to the dilated bile duct, the bile duct could be explored; however the porta hepatis and hepatoduodenal ligament could be covered by multiple collaterals. Direct approach to the common bile duct may lead to profuse bleeding because the bile duct is difficult to open and cholecystectomy is difficult to complete.

It should be recognized that portal biliopathy is caused by portal hypertension secondary to EHPVO. Biliary obstruction is caused by multiple varices in the hepatoduodenal segment or around portal, epicholedochal, and paracholedochal venous plexus. Biliary surgery should always be preceded by portocaval shunt. Because the liver function of EHPVO patients is relatively better, the shunt could be tolerated even under emergency conditions. Hepatic function damage and gastrointestinal varices bleeding secondary to portal biliopathy could be relieved to prevent aggravation due to the shunt. If biliary diseases resulted from portal hypertension are not clearly recognized, their management might be difficult. Portocaval shunt may relieve the causes of biliary obstruction secondary to collaterals and biliary varices. After shunt operation, changes of portal biliopathy are shown to regress in most patients. In some patients, bile duct changes persist with symptoms. If these changes are well established, surgery is probably of little consequence in reverting them. A second stage surgery is necessary in the form of hepaticojejunostomy to relieve biliary obstruction.

Choudhuri et al^[9] presented a patient with upper digestive tract bleeding and jaundice. On admission, EHPVO was demonstrated. The patient developed acute cholangitis, necessitating an emergency operation after four days of unsuccessful

conservative treatment with antibiotics. The gallbladder contained purulent bile, but no stones; tube choledochostomy was performed. Cholangitis and jaundice subsided markedly, but 11 days later the patient suddenly had a bout of massive hematemesis. Emergency splenectomy and proximal splenorenal shunt were performed. The narrowed segment of the common bile duct widened to a diameter of 4 mm 2 weeks later. The serum level of alkaline phosphatase was normal and esophageal varices disappeared. Nine months later, the patient continued to be asymptomatic.

In Chaudhary et al's 9 patients with portal biliopathy, 7 underwent splenectomy and splenorenal shunt.^[3] Regression of jaundice and a fall in the serum levels of bilirubin and alkaline phosphatase were seen in 5 patients within 3-7 weeks of surgery. In 2 patients, jaundice and raised levels serum of alkaline phosphates levels persisted despite a patent splenorenal shunt confirmed by endoscopic evidence of regression in grading of esophageal varices and ultrasonography showing disappearance of the pericholedochal collaterals. Doppler ultrasonography also confirmed a patent shunt, and repeat ERCP in these patients showed persistent stricture in the common bile duct. After six months of portasystemic shunt, re-exploration in these two patients revealed minimal varices in the hepatoduodenal ligament, and access to the bile duct was easy. A fibrous stricture was present in the mid common bile duct and a Roux-en-Y hepaticojejunostomy was carried out, jaundice being relieved and liver function being normal in both patients within 2 weeks of surgery.

In Khuroo et al's 21 consecutive patients with EHPVO for evidence of biliary tract disease,^[6] 4 patients were subjected to surgery: splenectomy with devascularization (2), splenectomy with splenorenal shunt (1) and devascularization (1). The remaining patients receive sclerotherapy for esophageal varices. But only shunt was effective.

Dilawari and his colleague^[4] reported 20 consecutive patients with EHPVO. Nineteen of the 20 patients received sclerotherapy for esophageal varices. Esophageal varices disappeared in 17 patients who had received 5 sessions of sclero-

therapy on average, and varices persisted in 2 patients who had received only two or three sessions of sclerotherapy respectively. The mean interval between disappearance of varices and ERCP was 22.3 months. Varices was either absent or thrombosed in the 17 patients in whom obliteration had been achieved, while it was large (grade III-IV) in 3 patients.

In 17 patients reported by Bayrautar et al,^[8] 6 underwent splenectomy for either hypersplenism or excessive bleeding from esophageal varices. Their follow-up results were not reported. Recent literature has suggested that biliary changes could be relieved by TIPS. Both endoscopic sclerotherapy and portasystemic shunt are effective, but the latter is definitive. The two methods could resolve esophageal varices bleeding, but shunt could relieve varices, conversely, sclerotherapy might make paracholedochal varices severe, even aggravate portal biliopathy.

A patient with portal biliopathy was successfully treated at our institute in January 1998. This patient was the first one who had been diagnosed as having portal biliopathy and received definitive treatment in China. The disease should be differentiated from hypertension secondary to biliary disease.

Competing interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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