Autogenous vein graft from iliac artery to splenic artery for celiac occlusion in pancreaticoduodenectomy

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Abstract
This is a report of two patients with bile duct cancer and periampullary cancer with celiac axis occlusion who underwent pylorus-preserving pancreaticoduodenectomy and pancreaticoduodenectomy, respectively. Preoperative arteriography demonstrated complete obstruction of the celiac axis. The arterial blood flow to the liver, spleen, and stomach was sustained through the pancreaticoduodenal arcades and collaterals from the superior mesenteric artery. Therefore, reconstruction of the celiac axis circulation was required before division of the gastroduodenal artery. An autograft of the saphenous vein was placed between the iliac artery and the splenic artery, and subsequently pancreaticoduodenectomy was performed. The patients’ postoperative courses were uneventful. Postoperative arteriography demonstrated patency of the grafts. When occlusion of the celiac axis exists, a bypass from the iliac artery to the splenic artery using a saphenous vein graft, may be safely and easily performed at the time of pancreaticoduodenal resection.

Key words Celiac occlusion · Pancreaticoduodenectomy · Vein graft

Introduction
Pancreaticoduodenectomy has been performed for neoplasms of the pancreas and periampullary lesions. In order to perform lymph-node resection during pancreaticoduodenectomy, the gastroduodenal artery must be divided. Recently, the incidence of celiac occlusion has increased because the most common cause of this condition is proximal atherosclerosis. Visceral ischemia may contribute to anastomotic dehiscence and liver failure during pancreaticoduodenectomy. Patients who have celiac occlusion require some form of revascularization for arterial blood supply to the liver, spleen, and stomach before division of the gastroduodenal artery. We report two patients in whom we used autogenous venous bypass grafts from the iliac artery to the splenic artery for celiac occlusion in pancreaticoduodenectomy.

Case reports

Patient 1
A 61-year-old Japanese man was referred to Jichi Medical School, Omiya Medical Center, with a 1-month history of anemia. Past history revealed subtotal gastrectomy with Billroth-I type reconstruction for peptic ulcer. Workup included an abdominal ultrasound study, computed tomography (CT) scan, and percutaneous transhepatic cholangiogram. Imaging studies showed a 5-cm mass obstructing the distal common bile duct. A diagnosis of papilla of Vater carcinoma T4N1M0 stage IV with celiac occlusion was made. Preoperative arteriography demonstrated absence of the celiac trunk (Fig. 1). The hepatic and splenic arterial blood flows were supplied via the gastroduodenal artery through the anterior and posterior pancreaticoduodenal arcades, and the arc of Buhler arose from the proximal superior mesenteric artery. The patient underwent surgery. At exploration, a 5-cm × 6-cm mass was found in the head of the pancreas. There was no evidence of regional lymph-node or distant metastases. After confirming that the tumor was resectable, we dissected the head of the pancreas from the retroperitoneal inferior vena cava and aorta. No macroscopic cancer invasion was seen in the superior mesenteric artery. Following cholecystectomy with removal of the bile duct below the bifurcation, the common hepatic, proper hepatic, gastroduodenal, and splenic arteries were isolated. When the gastroduodenal artery was clamped, pulsation of the common hepatic artery was very faint, suggesting that

Offprint requests to: H. Okamoto
Received: May 6, 2002 / Accepted: December 17, 2002
collateral flow was insufficient. With declamping of the gastroduodenal artery, the pulsation recovered. Before a radical pancreaticoduodenectomy was performed, a bypass graft for the preservation of the hepatic and splenic arterial flow was absolutely necessary. The splenic artery was mobilized from the tail of the pancreas, and then ligated and divided to perform a splenectomy. A portion of the greater saphenous vein, 30 cm in length, was taken from the patient’s left thigh and grafted between the left common iliac artery and the splenic artery. The side near one end of the saphenous vein was anastomosed to the side of the splenic artery, and the other end was anastomosed to the side of the left common iliac artery. The hepatic and splenic arterial flows were reestablished. Subsequently, a radical pancreaticoduodenectomy, splenectomy, and total gastrectomy were performed. Reconstruction of the alimentary tract was performed in the fashion of Child and Roux-en-Y. Histological examination showed a papillary adenocarcinoma. The patient’s post-operative course was uneventful. Angiography carried out 3 weeks after the operation demonstrated excellent patency of the venous graft and the hepatic and splenic arteries (Fig. 2).

Patient 2
A 57-year-old Japanese man was referred to Jichi Medical School, Omiya Medical Center, with a 2-week history of dark urine and itching. An abdominal ultrasound study, CT scan, and endoscopic retrograde cholangiopancreatography revealed dilatation of the common bile duct, but no evidence of a tumor. In order to alleviate the obstructive jaundice, endoscopic nasobiliary drainage was performed. Cytologic examination of the bile did not show malignant cells. Exploration revealed a localized carcinoma of the distal common bile duct. Preoperative arteriography demonstrated complete obstruction of the celiac axis (Fig. 3). The common hepatic artery was supplied by the collateral circulation that originated from the superior mesenteric artery. A diagnosis of cholangiocarcinoma T1N0M0 stage I with celiac occlusion was made. The patient underwent surgery. The pulsation of the common hepatic artery disappeared when the gastroduodenal artery was clamped. Before pylorus-preserving pancreaticoduodenectomy was performed, preservation of the hepatic, splenic, and left gastric arterial flow by a bypass graft was absolutely necessary. The splenic artery was mobilized from the tail of the pancreas. A
portion of the greater saphenous vein, 30 cm in length, was taken from the patient’s left thigh and grafted between the left external iliac artery and the splenic artery. The anastomosis to the left external iliac artery was end-to-side, and the anastomosis to the splenic artery was end-to-side. The blood flow in the saphenous vein graft was 200 ml/min, as measured by ultrasonic transit-time flowmetry. A pylorus-preserving pancreaticoduodenectomy was performed. Histological examination showed moderately differentiated adenocarcinoma of the common bile duct. The patient’s postoperative course was uneventful. Angiography 1 month after the operation demonstrated excellent patency of the venous graft and the hepatic, splenic, and left gastric arteries (Fig. 4).

Discussion

The causes of complications in pancreaticoduodenectomy are mainly related to leakage at the site of the pancreaticojejunal anastomosis. It is important to ensure the adequacy of the blood supply to the pancreaticojejunal anastomosis. Recently, celiac axis occlusion has been reported in 12.5–49.7% of patients during angiography. In such cases the arterial blood supply to the common hepatic, splenic, and left gastric arteries is usually sustained from the superior mesenteric artery via the pancreaticoduodenal arcades or the dorsal pancreatic artery. In order to perform en-bloc resection of cancer of the head of the pancreas or distal common bile duct cancer in patients with celiac occlusion, dissection of these collateral pathways and restoration of celiac circulation is absolutely necessary. Currently there are three methods of revascularizing the celiac axis: arterial reimplantation by anastomosing a branch of the superior mesenteric artery to the celiac axis, and bypass grafting with either prosthetic materials or autogenous saphenous vein graft. Thompson and colleagues achieved arterial reimplantation in two patients in whom the dissected splenic artery was anastomosed with the superior mesenteric artery following total pancreatectomy and pancreaticoduodenectomy. Stabilini and colleagues have reported pancreaticoduodenectomy with prosthetic graft materials for celiac axis bypass. Manabe and colleagues have reported celiac revascularization in a patient with ductal carcinoma of the head of the pancreas; this was completed with a saphenous vein graft between the common hepatic artery and the aorta. Miyata and colleagues have reported a saphenous vein graft between the common hepatic artery and the infrarenal aorta during pancreaticoduodenectomy for periampullary cancer. Yano and colleagues have reported a saphenous vein graft from the aorta to the gastroduodenal artery during pylorus-preserving pancreaticoduodenectomy for ampullary carcinoma. In our patients with bile duct cancer/
periampullary cancer, we created a bypass graft, using a saphenous vein graft between the iliac artery and the splenic artery during pancreaticoduodenectomy. Reassuring pulsation of arteries was immediately established. Postoperative angiography showed sufficient flow patterns, as well as satisfactory function of celiac organs. This procedure permitted potentially curative resection in two patients in whom resection might not have been possible otherwise. In addition, we were able to avoid potentially serious ischemic complications that might have resulted from acutely interrupting collateral blood flow to the upper abdominal viscera. If infection occurs at the vessel anastomosis, the bypass grafting with prosthetic materials might take a bad course. In this procedure, the field of vessel anastomosis is apart from that of the pancreaticojejunal anastomosis, and an autograft is used. We consider that this procedure is superior to arterial reimplantation or bypass grafting with prosthetic materials in order to perform pancreaticoduodenectomy safely and easily in patients with celiac occlusion.

References