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SUCCESSFULLY PERFORMED PYLORUS PRESERVING PANCREATODUODENECTOMY FOR AMPULLARY CARCINOMA ASSOCIATED WITH CELIAC AXIS OCCLUSION

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Blood flow to the liver, spleen, stomach and pancreas must be preserved during and after pylorus preserving pancreatoduodenectomy (PPPD) in patients with celiac axis (CeA) occlusion. We report a patient with ampullary carcinoma and CeA occlusion in whom PPPD was successfully performed. Preoperative angiography demonstrated complete obstruction of the CeA. The territorial blood flow to the celiac organs was supplied by the superior mesenteric artery via the gastroduodenal artery (GDA). This required a bypass from the aorta to the GDA using a saphenous vein graft (SVG). A PPPD was performed after the bypass was created. The postoperative course was uneventful. Follow-up angiography showed patency of the SVG. In patients with CeA occlusion who requre PPPD, a bypass from the aorta to the GDA using SVG may be performed safely and easily.

Key words: pancreatoduodenectomy / saphenous vein graft / celiac axis occlusion

INTRODUCTION

Pancreatoduodenectomy (PD) has been performed for carcinoma of pancreas, bile duct, and papilla of Vater (1). Recently, the pylorus preserving pancreatoduodenectomy (PPPD) has been applied in the treatment of these malignant diseases (2-4). In order to perform an en bloc resection during PD or PPPD, the gastroduodenal artery (GDA) must be ligated and divided. In some patients, however, occlusion of the celiac axis (CeA)(5-9) prevents division of the GDA, on which the liver, spleen, stomach, and pancreas are dependent.

We report a patient with ampullary carcinoma and CeA occlusion in whom PPPD was successfully performed, after creating a bypass from the aorta to the GDA using a saphenous vein graft (SVG).

CASE REPORT

A 71-year-old woman was admitted with epigastralgia. Physical examination revealed mild tenderness in the epigastrium. The serum amylase concentration was elevated, but the total billirubin and tumor marker concentrations were within normal limits. Endoscopic examination demonstrated a tumor at the papilla of Vater. Histologic examination of a biopsy specimen revealed adenocarcinoma. Computed tomography and ultrasonography showed dilatation of the common bile duct and the pancre-

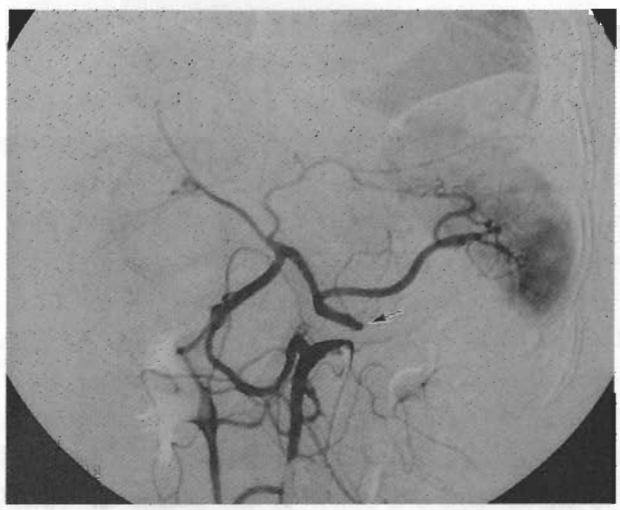

Fig. 1. Preoperative angiography demonstrating complete obstruction of the celiac axis (arrow). The blood flow to the liver, spleen, stomach, and pancreas was supplied by the the superior mesenteric artery via the gastroduodenal artery.

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Fig. 2. A bypass was created between the aorta and gastroduodenal artery using a saphenous vein graft (arrow).

atic duct but no evidence of the tumor. Preoperative angiography demonstrated complete obstruction of the CeA, with the territorial blood flow to the liver, spleen, stomach and pancreas supplied by the superior mesenteric artery (SMA) via the GDA (Fig. 1). A PPPD was performed 3 weeks after admission. A bypass was created between the infrarenal aorta and the stump of GDA using an SVG (Fig. 2). The proximal anastomosis to the aorta was end-to-side, and the distal anastomosis to the GDA was end-to-end. The length of the SVG was 6 cm. The ischemic time of the celiac organs was 16 minutes. The preoperative GDA blood flow was 580 mL/min. Blood flow in the proper hepatic artery was decreased to 20 mL/min while the GDA was clamped as measured by ultrasonic transit-time flowmetry (HT207, Transonic Systems Inc., Ithaca, NY. USA). The postoperative blood flow in the SVG was 420 mL/min (Table 1). Resected specimen showed a tumor at the papilla of Vater (Fig. 3). Histologic examination of the tumor revealed papillary adenocaicinoma. A curative resection was achieved. The postoperative recovery was uneventful. There was no evidence of liver dysfunction, splenic infarction, or anastomotic insufficiency. Postoperative angiography demonstrated patency of the SVG (Fig. 4).

Table 1. The preoperative and postoperative blood flow measured by ultrasonic transit-time flowmetry (GDA: gastroduodenal artery, PHA: proper hepatic artery, CHA: common hepatic artery, SVG: saphenous vein graft)

	preoperative blood flow(mL/min)	postoperative blood flow(mL/min)
GDA(SVG)	580	(420)
PHA	310	290
CHA	470	240

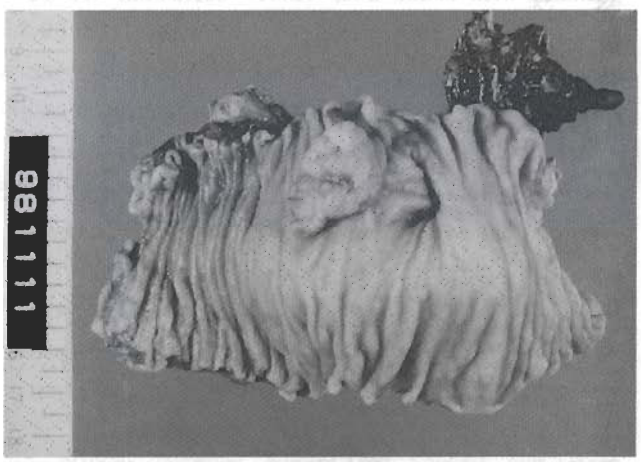

Fig. 3. Photomacrograph showing a tumor at the papilla of Vater.

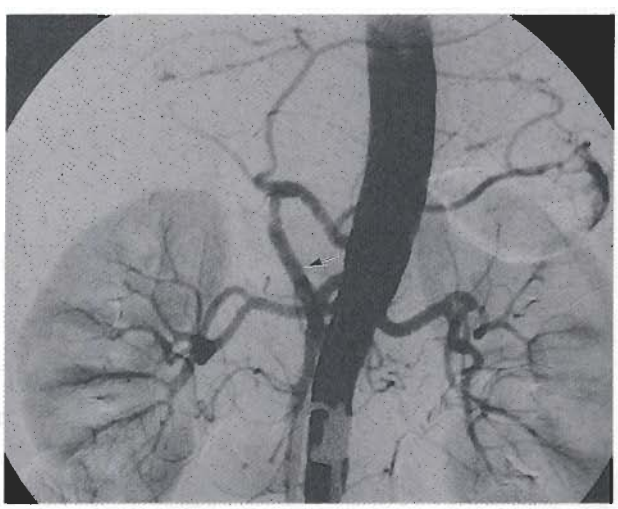

Fig. 4. Postoperative angiography demonstrating patency of the saphenous vein graft (arrow).

DISCUSSION

Occlusion of the CeA has been reported to occur due to arteriosclerosis, congenital disease, and celiac compression syndrome (5-9). In presence of CeA occlusion in patients undergoing PD or PPPD, blood flow to the celiac organs must be preserved. In patients undergoing PPPD, blood flow to the stomach and first portion of duodenum must be maintained in order to prevent the risk of peptic ulcer and duodeno-jejunal anastomotic insufficiency (2).

Prevention of ischemia of the celiac organs has been attempted by arterial reimplantation, reconstruction of the CeA and construction of a bypass graft. Reimplantation has been described by anastomosing a branch of the SMA to the CeA (10-12). Thompson *et al.* (10) has reported two patients in whom the splenic artery and SMA were anastomosed following total pancreatectomy and PD. Anastomoses between the GDA and posterior inferior pancreatoduodenal artery, common hepatic artery (CHA) and anterior inferior pancreatoduodenal artery (AIPDA), GDA and middle colic artery, and anterior superior pancreatoduodenal artery and AIPDA have also been reported (11-12). These procedures are technically difficult and may compromise the curative nature of resection. Fortner and Watoson. (8) and Kohler *et al.* (9) have reported devision of the median arcuate ligament in a patient with CeA compression syndrome who required a PD. Noguchi *et al.* (13) have reported percutaneous transluminal angioplasty for CeA stenosis caused by arteriosclerosis. However reconstruction of the CeA is also difficult if occlusion of the CeA occur due to arteriosclerosis.

On the other hand, the bypass can be created using a vein, artery, or synthetic graft material. Stabilini *et al.* (14) have reported PD with the use of synthetic graft for CeA bypass. The use of arterial grafts in this situation has not been reported and SVGs have been used in PD (7,15-18). In aorto-coronary bypass grafting, Lytle *et al.* (19) have reported a patency rate of 93% for internal mammary artery grafts studied 5 to 12 years postoperatively. In contrast, the long-term patency rate of SVGs is only 56%. Vein grafts are more readily available, can span longer gaps, and are easier to use, although long-term patency of artery grafts may be better for CeA bypass. We found that construction of a bypass graft using SVG was technically easy and safe.

Previously reported bypasses between the CHA and the suprarenal or the infrarenal aorta (7,15) using SVG were end-to-side in the distal anastomosis. These may result in energy losses due to significant flow disturbances. Thus the transition from the graft to the recipient vessel must be as smooth as possible. End-to-end anastomoses, therefore, most closely approximate the ideal (20). In our patient, an SVG was placed between the GDA stump and the infrarenal aorta in the end-to-end distal anastomosis through the defect left by resection of the duodenum and pancreatic head. This procedure may be also better after PD and PPPD because of the wide-open operative field. In addition, the GDA was not dissected until the final stages of the operation to prevent loss of blood flow to the celiac organs. Measurement of blood flow in the graft is useful for comparison purposes. In conclusion, patients with CeA occlusion who require PD or PPPD, a bypass from the aorta to the GDA using SVG may be performed safely and easily.

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