CASE REPORT

Portal Vein Reconstruction Using an Autologous Splenic Vein Graft at the Superior Mesenteric and Portal Vein Confluence during Pancreaticoduodenectomy

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ABSTRACT

Context We report the case-report regarding a patient with cancer of the pancreatic uncinated process who undertook vascular reconstruction of the portal vein using an autologous splenic vein graft at the superior mesenteric and portal vein confluence during pancreaticoduodenectomy. **Case report** A seventy-six-year-old woman was found to have pancreatic head cancer when abdominal computed tomography (CT) was performed for urinary occult blood. CT revealed a large tumor with poor contrast effect in the uncinated process of the pancreas, the patency of the main trunk of the portal vein (PV) and the splenic vein (SPV), and the total occlusion of the superior mesenteric vein. The patient underwent resection of PV during PD and subsequent vascular reconstruction using an autologous SPV graft at the SMPV confluence. The postoperative course was uneventful. The postoperative left-sided portal hypertension due to non-reconstruction of the SPV was concerning; however, postoperative CT imaging showed no evidence of gastrointestinal congestion, splenomegaly, thrombus, or ascites. A follow-up CT imaging at the 15th postoperative month showed a patent splenic vein graft. **Conclusion** Splenic vein interposition grafting should be considered in a case of pancreaticoduodenectomy with resection of the SMPV confluence.

INTRODUCTION

Pancreatic cancer surgery combined with resection of the portal vein (PV) is usually undertaken in patients with borderline resectable pancreatic cancer. Since systemic reviews have demonstrated that resection of the superior mesenteric and portal vein (SMPV) combined with pancreaticoduodenectomy (PD) to be safe and feasible [1], aggressive en-bloc resections have been widely performed. However, there are some reported methodologies for vascular reconstruction after SMPV resection. Given that the length of SMPV resection is adequate to provide a tension-free anastomosis, vascular reconstruction of the resected PV is possible by a direct end-to-end anastomosis. In cases where resection length is long, vascular reconstruction using autologous vein graft is achievable [2, 3, 4]. Nonetheless, there have been only one report thus far describing the use of autologous splenic vein (SPV) grafts for the vascular reconstruction of the PV after gastroduodenopancreatectomy [5]; however, clear intraoperative findings, the long-term graft patency, and the existence of a local recurrence were not shown. We report the case-report regarding a patient with cancer of the pancreatic uncinated process who undertook vascular reconstruction of the PV using an autologous SPV graft at SMPV confluence during PD.

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Keywords Mesenteric Artery, Superior; Pancreas; Pancreaticoduodenectomy; Portal Vein
Abbreviations CT computed tomography; PD pancreaticoduodenectomy; PV portal vein; SMPV superior mesenteric and portal vein; SPV splenic vein
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CASE REPORT

A seventy-six-year-old woman was found to have pancreatic head cancer when abdominal computed tomography (CT) was performed for urinary occult blood. CT revealed a large tumor with poor contrast effect in the uncinated process of the pancreas (approximately 40 × 30 mm) **(Figure 1a, b, c)**. Magnetic Resonance cholangiopancreatography showed severe stenosis of the main pancreatic duct in the pancreatic head and dilatation of the entire distal side. Cytology of the pancreatic fluid by endoscopic retrograde cholangiopancreatography revealed adenocarcinoma of the pancreas. The portal phase in the abdominal CT imaging showed the patency of main trunk of the PV **(Figure 1d)** and the SV **(Figure 1e)**, no infiltration to major arteries, and the total occlusion of superior mesenteric vein (SMV) **(Figure 1f, g)**. According to NCCN guidelines, preoperative tumor staging was judged as borderline resectable. The patient underwent resection of the PV combined with PD **(Figure 2a)**. To prevent cross-clump of SMPV from inducing intestinal and mesenteric edema during vascular reconstruction, ANTHRON® Catheter was inserted from the ileocolic vein to the inferior vena cava **(Figure 2b)**. Then, resection of the inferior mesenteric vein and the SPV were performed. After cross-clump of the main trunk of the PV and the SMV, the PV was resected approximately 6 cm. A tension-free end-to-end anastomosis was attempted; however, the gap

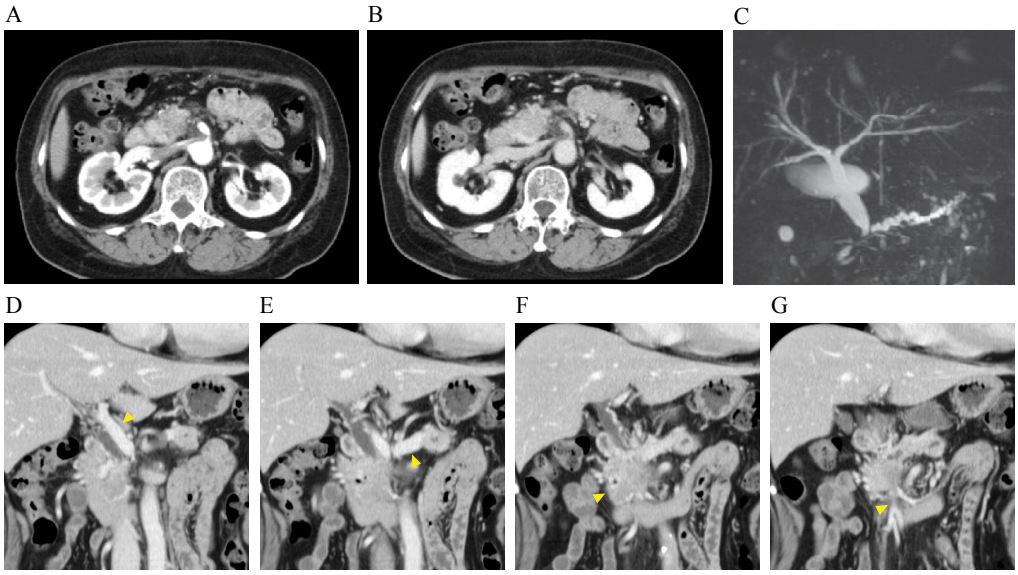

Figure 1. Preoperative image assessments.

Arterial phase (a). and portal phase (b). in Computed tomography (CT) imaging. (c). Magnetic resonance Cholangiopancreatography. (d). Coronal views in CT imaging showed patency of portal vein (PV) and (e). splenic vein (SPV) and (f). tumor of 40×30 mm with sparse contrast enhancement in the uncinate process of the pancreas (shown as yellow triangles). (g). Superior mesenteric vein had stenosis (shown as a yellow triangle).

CT computed tomography; PV portal vein; SPV splenic vein

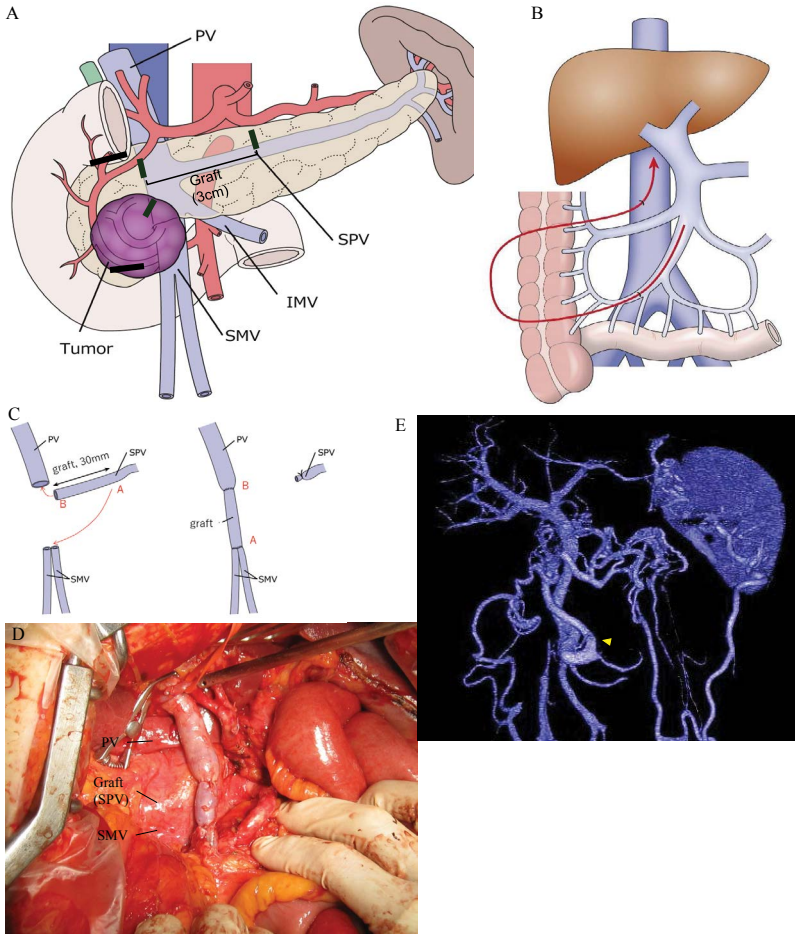

Figure 2. Surgical plan, intraoperative findings and postoperative evaluation.

Dissection of the portal tract and (a). catheter-bypass between superior mesenteric portal vein (PV) and (b). inferior vena cava. (c). The autologous SPV graft was interposed into the PV defect and continuously anastomosed with #5-0 polypropylene sutures. (d). Autologous SPV graft was interposed between PV and SMV. (e). Three-dimensional CT fifteen months after operation showed patency of reconstructed SPV graft (shown as a yellow triangle).

IMV inferior mesenteric vein; PV portal vein; SMV superior mesenteric vein

between the end of PV and the SMV was too wide for a direct end-to-end anastomosis and there was concern that a longer segment of resection may cause critical stenosis of the anastomotic site. Nonetheless, the diameter of SMV was found to match that of SPV, and thus an autologous SPV (3 cm) was harvested from the resected specimen. The SPV graft needed to be as long as possible; however, attention needed to be paid to both the confirmation of a negative margin of SPV and mismatch due to the smaller vessel diameter on the peripheral side. After a negative margin of SPV was secured, the autologous SPV graft was interposed into the PV defect and continuously anastomosed with #5-0 polypropylene sutures **(Figure 2c)**. Anastomosis of the anterior wall was performed with over-and-over suturing, and that of the posterior wall was performed with the intraluminal technique. The left gastric vein, right gastric vein and right gastroepiploic vein were ligated. The left gastroepiploic vein, short gastric vein and posterior gastric vein were preserved.

Intraoperative findings showed sufficient patency of the SPV graft **(Figure 2d)**. The time of the cross-clump of PV was 45 minutes. During the clump, intestinal and mesenteric congestion were not confirmed. Postoperative course was uneventful. The postoperative left-sided portal hypertension due to non-reconstruction of the SPV was concerning; however, postoperative CT imaging showed no evidence of gastrointestinal congestion, splenomegaly, PV thrombus, or ascites. Additionally, upper gastrointestinal endoscopy revealed no gastroesophageal varices. The pathological report revealed a moderately differentiated pancreatic duct adenocarcinoma with cancer infiltration of the intima of SMV and no node involvement (pStage IVa, T4, N0, M0). Resection margins were negative (R0). She started rehabilitation and postoperative chemotherapy and was discharged. A follow-up 3-D reconstruction CT imaging and magnetic resonance imaging at the 15th postoperative month showed the patency of SPV graft **(Figure 2e)** and collateral veins, respectively.

DISCUSSION

Since 1951 when Moore et al. reported the first successful vascular reconstruction of SMPV [6], various therapeutic alternatives have been reported for repairing PV. Generally, end-to-end anastomosis for vascular reconstruction after PV resection is thought to be a simple procedure. However, one report on vascular reconstruction using end-to-end anastomosis with no grafts demonstrated that more than 70% of the cases with resection lengths of more than 31mm had severe stenosis or obstruction within one year after surgery [7]. In the current case, because the length of PV resection was approximately 60mm and tension-free anastomosis was difficult to perform, we considered vascular reconstruction using a graft. For SMPV reconstruction, autologous vein grafts over artificial grafts are typically used because gastrointestinal surgery is not aseptic and the risk of infection is high. The internal jugular, external iliac and left renal veins are most commonly used as the autologous vein graft [8]. However, the current study demonstrates that an autologous SPV graft may be similarly used in certain cases. While a few studies have reported the utility of autologous SPV graft during total pancreatectomy [2, 4], little has been reported on the use of autologous SPV grafts for vascular reconstruction of the PV in patients with cancer in the pancreatic uncinated process. A significant advantage of using an autologous SPV over other vein grafts is that additional skin incisions do not have to be performed to obtain the bypass grafts, and graft sampling in the same operative field of view is feasible. In this case, the intraoperative finding showing that the diameter of SMV matched that of SPV is one of the reasons why an autologous SPV graft was feasible. Additionally, this requires a negative margin of the resection vein. Nonetheless, postoperative findings indicating left-side portal hypertension due to non-reconstruction of SPV warrant further evaluation. There has been no consensus thus far on whether SPV should be reconstructed in a patient who underwent vascular resection for pancreatic cancer invading SMPV. Some institutions have adopted a policy of non-reconstruction of SPV [9, 10], while others have implemented a policy for the reconstruction of SPV owing to cases of gastrointestinal bleeding induced by stomach congestion [11]. Thus, the lack of consensus in policies may be due to the complications reported in these institutions. In these previous reports describing complications in patients who did not reconstruct SPV, it may be that stomach congestion, splenomegaly, and gastroesophageal varices developed owing to the lack of preservation of the left gastroepiploic vein, short gastric vein, and posterior gastric vein. This case with cancer infiltration near the confluence of SMV and SPV underwent the resection of this confluence; however, we did not have to reconstruct the SPV because collateral vessels such as the left gastroepiploic vein and short gastric vein were preserved. Additionally, venous blood flow is considered to return to SMV through the mesentery of the colon and small intestine after the resection of the confluence of the inferior mesenteric vein and SPV. Taken together, the current case demonstrates potential for the use of an autologous SPV graft without reconstruction of SPV for the vascular reconstruction of the PV in patients with cancer in the pancreatic uncinated process. In conclusion, the use of autologous SPV for vascular reconstruction of PV at SMPV confluence during PD should be considered due to its added benefits.

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Conflicts of Interest

The authors report no conflict of interest.

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