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Portal Vein Stenting for Portal Vein Stenosis After Pancreatoduodenectomy: A Case Report

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ABSTRACT

Portal vein stenosis, which results in serious clinical conditions such as gastrointestinal variceal bleeding and liver failure, is caused by hepatobiliary pancreatic cancer or major postoperative complications after hepatobiliary pancreatic surgery. In recent years, portal vein stenting under interventional radiology has been applied as a more useful treatment method for portal vein stenosis than invasive surgery. We herein report the successful use of a vascular stent for portal vein stenosis after pancreatoduodenectomy. A 66-year-old man with distal cholangiocarcinoma underwent subtotal stomach-preserving pancreatoduodenectomy with resection of the portal vein because of direct invasion to the main portal vein at our hospital. The portal vein was reconstructed without a venous graft. He developed jejunal bleeding near the pancreatojejunostomy on postoperative day (POD) 2. Although embolization of the responsible vessel achieved hemostasis, an intraoperatively inserted drainage tube was needed for a long period of time postoperatively because the embolized afferent jejunum was perforated. He was discharged on POD 39 after removal of the drainage tube. On POD 282, he was readmitted with melena and severe fatigue. Computed tomography revealed an obstruction of the reconstructed portal vein and varices at the hepaticojejunostomy site. We diagnosed variceal bleeding and performed percutaneous transhepatic stenting in the obstructed portal vein. The patient was discharged in good clinical condition on day 15 after stenting. In conclusion, portal vein stenting is a useful and less invasive therapy for portal vein stenosis.

Key words hepatobiliary pancreatic surgery; portal vein stenosis; vascular stent

Severe portal vein stenosis is caused by hepatobiliary pancreatic malignancies¹ or major postoperative complications after hepatobiliary pancreatic surgery.² As a result, portal vein stenosis causes serious clinical conditions such as gastrointestinal variceal bleeding and liver failure. Some recent reports have described the usefulness of portal vein stenting for postoperative portal vein

stenosis.^{2,3} In Japan, however this treatment has been approved as a clinical trial not a standard therapy.

We herein report a case of successful percutaneous transhepatic portal stenting for portal vein stenosis with variceal bleeding at the hepaticojejunostomy site after pancreatoduodenectomy (PD).

PATIENT REPORT

A 66-year-old man visited another hospital with a chief complaint of jaundice. He was diagnosed with distal cholangiocarcinoma and underwent endoscopic retrograde biliary drainage for obstructive jaundice. He was referred to our hospital to undergo curative resection for distal cholangiocarcinoma. He underwent subtotal stomach-preserving PD with resection of the portal vein because the tumor had invaded the main portal vein. The portal vein was directly anastomosed using 5–0 nonabsorbable sutures without a venous graft because of short segment resection of portal vein with 10 mm in length. Histological examination revealed well-differentiated adenocarcinoma invading the pancreas; however, pathological examination revealed no invasion into the portal vein and no lymph node metastases. According to the seventh edition of the TNM staging system of the International Union Against Cancer, the patient's disease was finally diagnosed as distal cholangiocarcinoma, T3, N1, M0, Stage IIA. On postoperative day (POD) 2, He suddenly vomited a large amount of blood. Computed tomography (CT) revealed active bleeding from the vasa recta of the afferent jejunal loop on the mesenteric side near the pancreatojejunostomy (Fig. 1). Emergency interventional radiology with arterial embolization to the vasa recta was successfully performed for hemostasis (Figs. 2A and B). However, the drainage tube that had been inserted intraoperatively was required for a long period of time because part of the afferent jejunum was perforated due to necrosis. The

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Abbreviations: CT, computed tomography; PD, pancreatoduodenectomy; POD, postoperative day

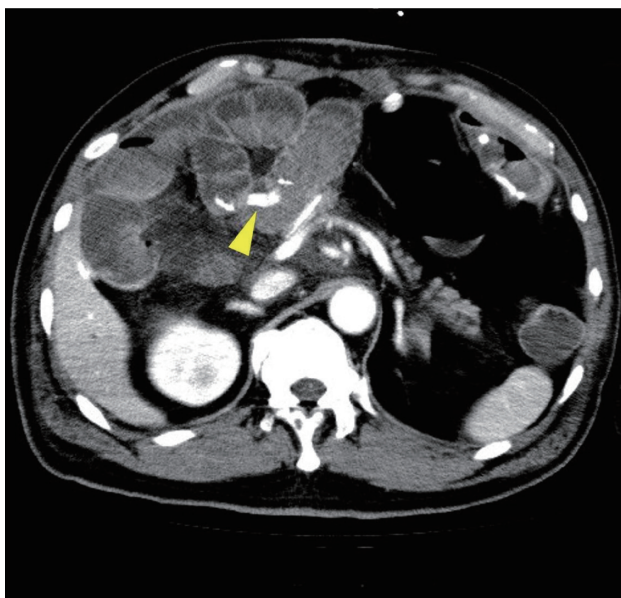
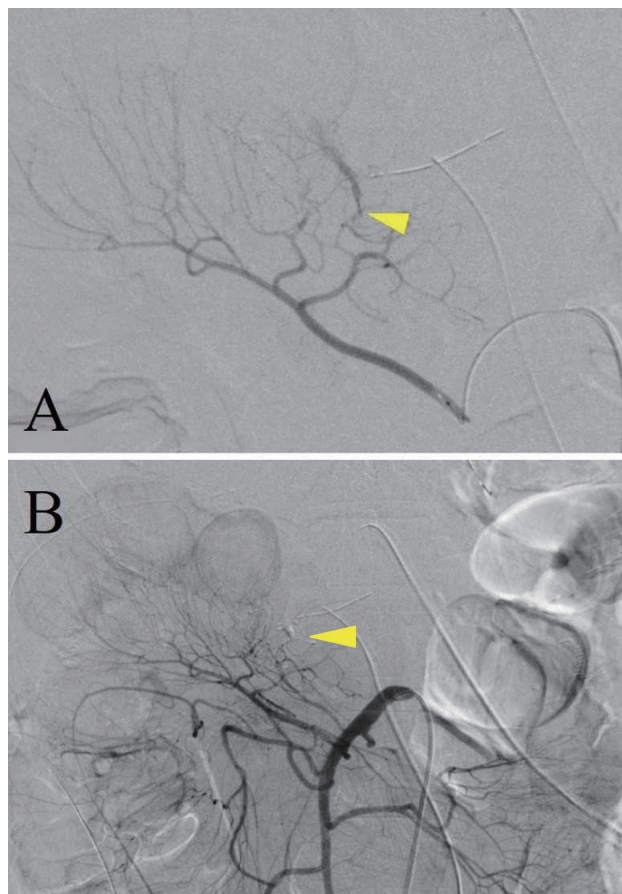


Fig. 1. Computed tomography indicates extravasation from the afferent loop on the mesenteric side near the pancreaticojejunostomy (arrowhead).

Fig. 2. Emergency interventional radiology for bleeding from the vasa recta of the afferent jejunal loop on the mesenteric side near the pancreaticojejunostomy. **(A)** Arterial angiography shows extravasation from the vasa recta in the jejunum near the pancreaticojejunostomy (arrowhead). **(B)** Bleeding is not shown by angiography after embolization (arrowhead).



patient was discharged on POD 39 after removal of the drainage tube. Although the first follow-up CT after discharge indicated that the reconstructed portal vein had been narrowed by granulation tissue around the portal vein (Fig. 3A), the patient was followed up because he was asymptomatic. On POD 82, he was readmitted to our hospital with severe fatigue because of a diagnosis of hepatic encephalopathy due to hyperammonemia. CT demonstrated severe stenosis of the portal vein and the appearance of small collateral vessels at the hepaticojejunostomy site (Fig. 3B). Because his clinical condition improved with prompt conservative therapy including drugs and nutritional management, he was discharged on POD 94 after the initial surgery. Varices at the hepaticojejunostomy site and fatty liver had gradually developed for 6 months postoperatively (Fig. 3C). He was then readmitted for melena and severe fatigue due to gastrointestinal bleeding and hyperammonemia on POD 282. CT revealed progression of the fatty liver caused by decreased portal flow as well as the development of varices at the hepaticojejunostomy site (Fig. 3D). Therefore, both to improve the recurrent symptoms caused by the decreased portal flow into the liver due to the obstructed portal vein and to prevent variceal bleeding, we per-

formed percutaneous transhepatic portal vein stenting using a vascular stent (S.M.A.R.T. CONTROL; Cordis, Tokyo, Japan), measuring 60 mm in length and 8mm in diameter, for stenotic portion with 20mm in length. In addition, embolization for the varices that had developed at the hepaticojejunostomy site was performed at the same time on POD 289 after the initial surgery, and portal venography revealed disappearance of the varices at the hepaticojejunostomy after stenting (Figs. 4A–D). No complications occurred during the patient’s clinical course. He was discharged 15 days after stenting (POD 303 after the initial surgery). Thereafter, follow-up CT performed every 4 months finds no recurrence of distal cholangiocarcinoma and re-stenosis at the site of portal stent placement. His serum concentration of ammonia has normalized and no rebleeding has been observed.

DISCUSSION

Although portal vein resection is generally performed in patients with hepatobiliary pancreatic malignancies invading the portal vein at high-volume centers,⁴ portal vein stenosis occurs after PD with an incidence of 2.4%.⁵ Severe portal vein stenosis causes life-threatening clinical conditions such as hepatic encephalopathy due

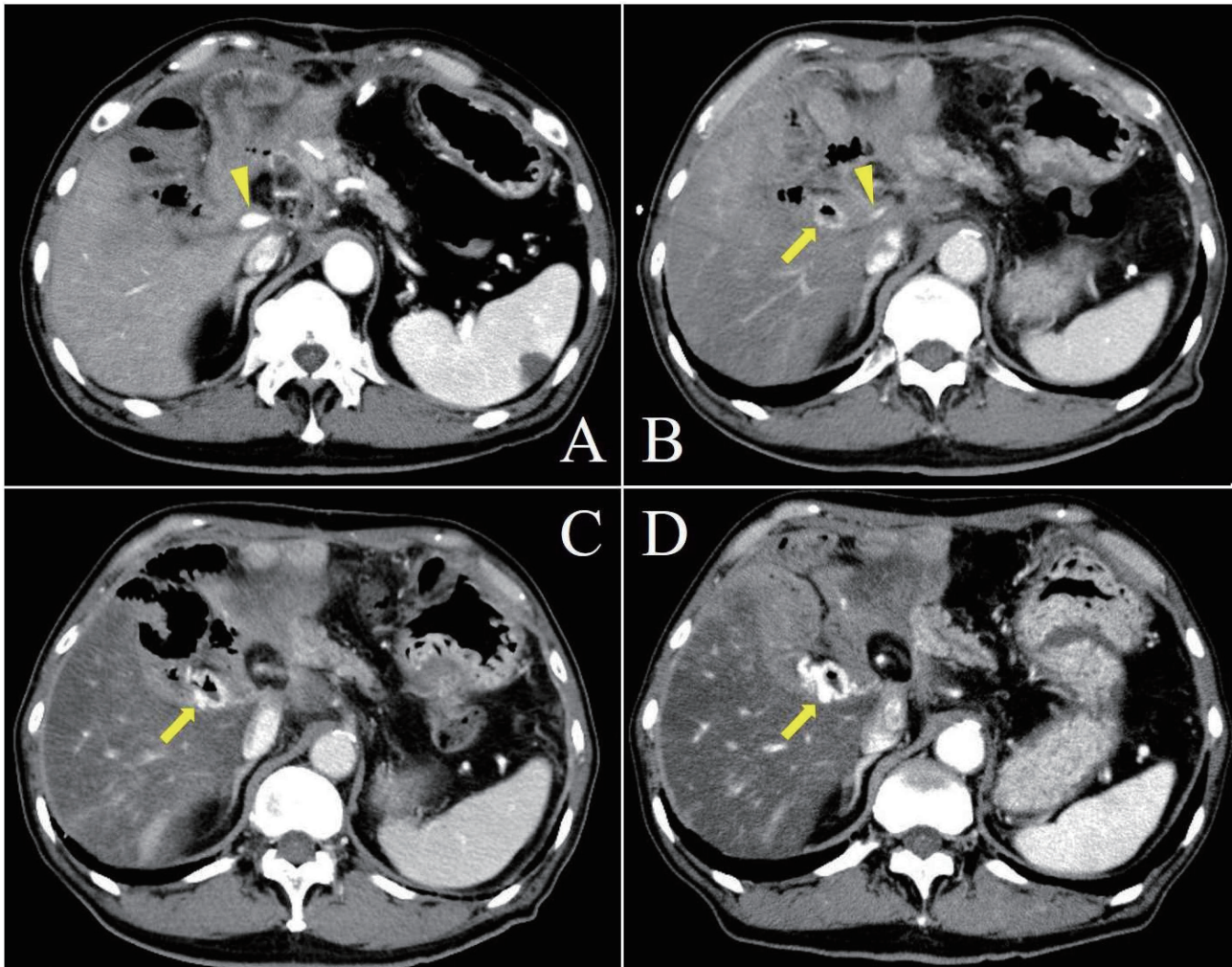


Fig. 3. Follow-up computed tomography (CT) imaging after emergency interventional radiology. (A) The first follow-up CT indicates that the reconstructed portal vein is narrowed by a structure consisting of granulation tissue around the portal vein (arrowhead). (B) CT at readmission demonstrates severe stenosis of the portal vein (arrowhead) and small collateral vessels around the hepaticojejunostomy site (arrow). (C) Varices around the hepaticojejunostomy site (arrow) and fatty liver had gradually have developed for 6 months after surgery. (D) CT at the second readmission shows both progression of the fatty liver caused by the decreased portal flow as well as the development of varices around the hepaticojejunostomy site.

to decreased portal flow into the liver, variceal bleeding from the digestive tract, and ascites due to portal hypertension and liver failure.⁶ Therefore, portal vein stenosis must be treated when it occurs with these complications. However, it is very difficult to redo a portal vein reconstruction procedure after hepatobiliary pancreatic surgery because of the hardened tissue around the reconstructed portal vein.^{7–9} Additionally, portosystemic shunting to reduce portal pressure cannot be performed as another procedure for benign portal stenosis because it aggravates hepatic encephalopathy and liver failure.^{7,10} Since the 1990s, portal vein stenting has been reported as a useful treatment for portal vein stenosis after liver transplantation or PD.^{3,11} The causes of portal vein stenosis after PD are not only local recurrence of malignant

disease but also portal vein resection of ≥ 3 cm,¹² granulation tissue formation associated with a postoperative pancreatic fistula,¹³ and fibrosis after radiotherapy.^{14–16} In the present case, although portal vein resection was short segment with 10 mm in length, the portal vein stenosis occurred by granulation tissue formation due to perforation of the afferent jejunum after interventional radiology for active bleeding from the vasa recta on the mesenteric side near the pancreatojejunostomy. We successfully performed both percutaneous transhepatic portal vein stenting using a vascular stent as well as embolization for the varices in the hepaticojejunostomy site with minimal invasiveness. Embolization of varices at the hepaticojejunostomy site is important to ensure sufficient portal flow, which might maintain the patency

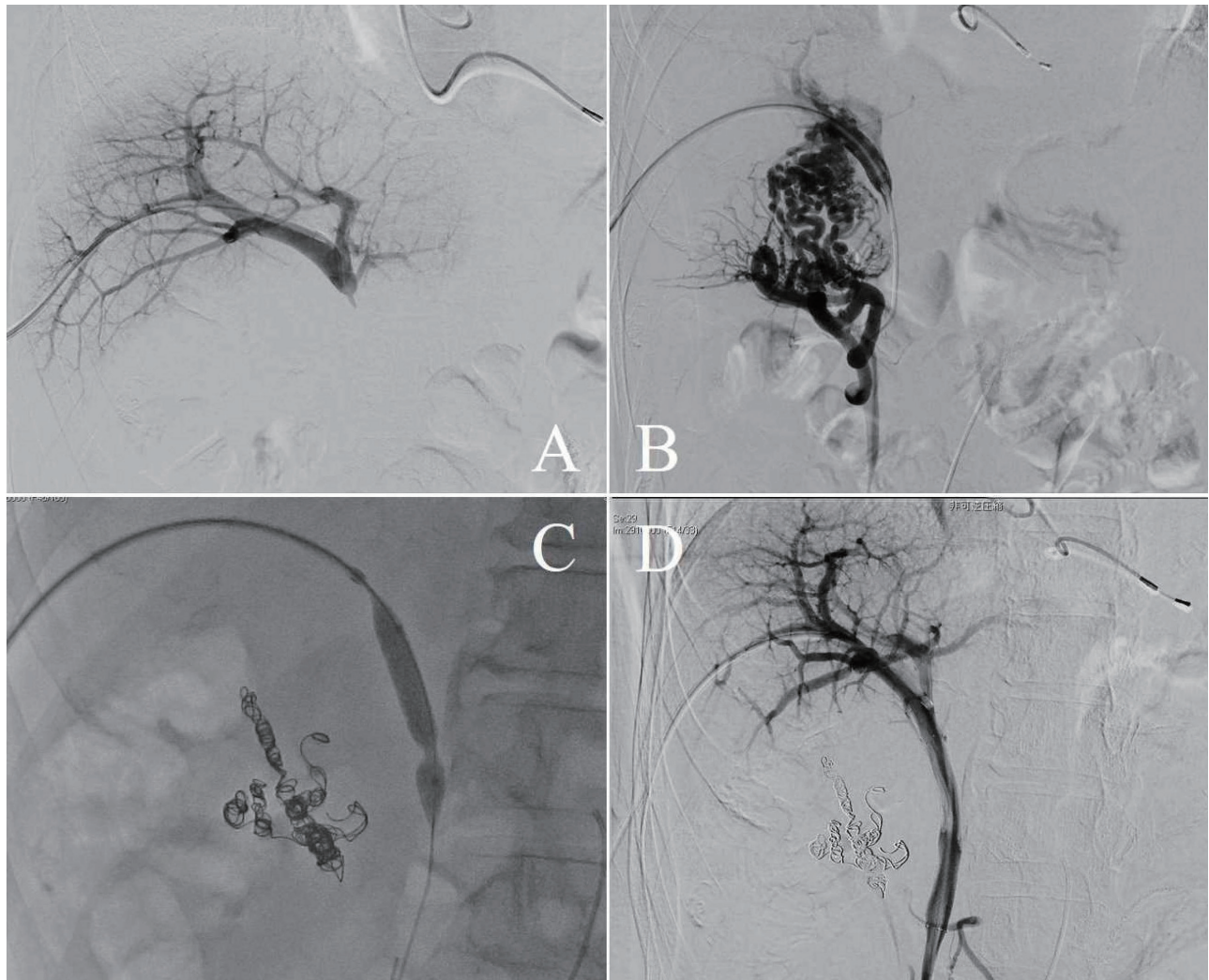


Fig. 4. Percutaneous transhepatic portal vein stent placement. (A) Portal venography shows complete obstruction of the portal vein. (B) Portal venography shows remarkable development of varices around the hepaticojejunostomy site. (C) Coiling for varices around the hepaticojejunostomy and expansion of the portal vein using a balloon catheter. (D) Portal angiography after stenting. Portal flow was adequate.

of the portal stent.^{17, 18} The usefulness and efficacy of anticoagulant therapy after portal vein stenting is unclear. While anticoagulant therapy is reportedly useful to maintain the patency of the portal vein stent,¹⁹ sufficient portal flow by embolization of collaterals is reported the importance for maintenance of the patency of the portal vein stent.^{17, 18} Furthermore, Kato et al. reported that the presence of a collateral vein is the only variable related to the development of stent occlusion.²⁰

In the present case, the patient had previously undergone pacemaker implantation for sick sinus syndrome and had continued anticoagulant therapy before surgery. Therefore, whether anticoagulant therapy was required after portal stenting remains unclear in this case.

In conclusion, portal vein stenting is a useful and

less invasive therapy for portal vein stenosis after PD. Therefore, approval of this procedure should be considered as a standard therapy for portal vein stenosis in Japan.

Ethics approval and consent to participate: Consent for publication was obtained from the patient.

The authors declare no conflict of interest.

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