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MULTIMEDIA ARTICLE

Robotic Resection and Reconstruction of the Superior Mesenteric Vein Without Graft During Pancreatoduodenectomy (with Video)

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Abstract

Background Pancreatoduodenectomy is the procedure of choice for tumors in the head of the pancreas. Invasion of major vessels is a relative contraindication for minimally invasive approach. We present a video of a robotic resection and reconstruction of the superior mesenteric vein (SMV) without the use of a graft during pancreatoduodenectomy.

Methods A 56-year-old female with ductal adenocarcinoma is referred for treatment. CT scan and endoscopic ultrasound showed a 3-cm tumor in the pancreatic head with contact with SMV. The multidisciplinary team decided for upfront surgery. Robotic superior mesenteric artery first approach was used to release the head of the pancreas, so the whole surgical specimen is only attached by the tumor invasion of the SM. After the partial resection of the SMV, its extension precluded lateral suture and a transverse anastomosis was necessary to minimize the risk of narrowing of the SMV. After completion of the venous anastomosis, reconstruction of the alimentary tract was done as usual.

Results Operative time was 430 min. Time of clamping was 30 min and the time for the SMV suture is 23 min. Estimated blood loss was 370 mL. Pathology confirmed a T3N1 ductal adenocarcinoma with free margins. The patient was discharged on the 7th postoperative day.

Conclusions Robotic resection and reconstruction of the SMV is safe and feasible without graft during pancreatoduodenectomy in patients with invasion but not encasing of the portal vein or SMV. The proposed technique should be used in cases where the invasion requires extended resection that precludes simple lateral suture.

Keywords Pancreas · artery-first · Robotic Surgery · vascular resection

Pancreatoduodenectomy (PD) is the procedure of choice for resectable tumors located in the head of the pancreas. With the introduction of new and more efficient chemotherapeutic agents along with technical refinements, there has been an increase in the indications for PD, as well as the complexity of these operations.[1] Vascular resection and neoadjuvant therapy are becoming more frequent, increasing the difficulty of the resection stage of PD.

Invasion of major vessels, particularly the portal and the superior mesenteric vein, is a relative contraindication for minimally invasive approach. Despite the potential advantages in terms of microdissection and micro-suturing capabilities, the robotic approach for pancreatic cancer with vascular invasion is still infrequent.[2]

We present a video of a robotic resection and reconstruction of the superior mesenteric vein (SMV) without the use of a graft during pylorus-preserving pancreatoduodenectomy. A 56-year-old female, with 1 week history of jaundice, is referred for treatment. CT scan showed a 3-cm adenocarcinoma in the head of the pancreas. CT and endoscopic ultrasound showed contact with SMV with no vein encasement. Endoscopic ultrasound classified this tumor as a T2N0 (3.1 × 2.9 cm and no enlarged locoregional lymph nodes). CT also showed a replaced right hepatic artery from superior mesenteric artery. Endoscopic ultrasound biopsy confirmed pancreatic ductal adenocarcinoma (PDAC). Tumor marker, CA19-9, was 67 U/mL (normal below 34 U/mL). Multidisciplinary team considered as a resectable PDAC and decided for upfront surgery. Robotic approach was proposed, and consent was obtained. Superior mesenteric artery first approach was used to release the head of the pancreas in a way that the whole

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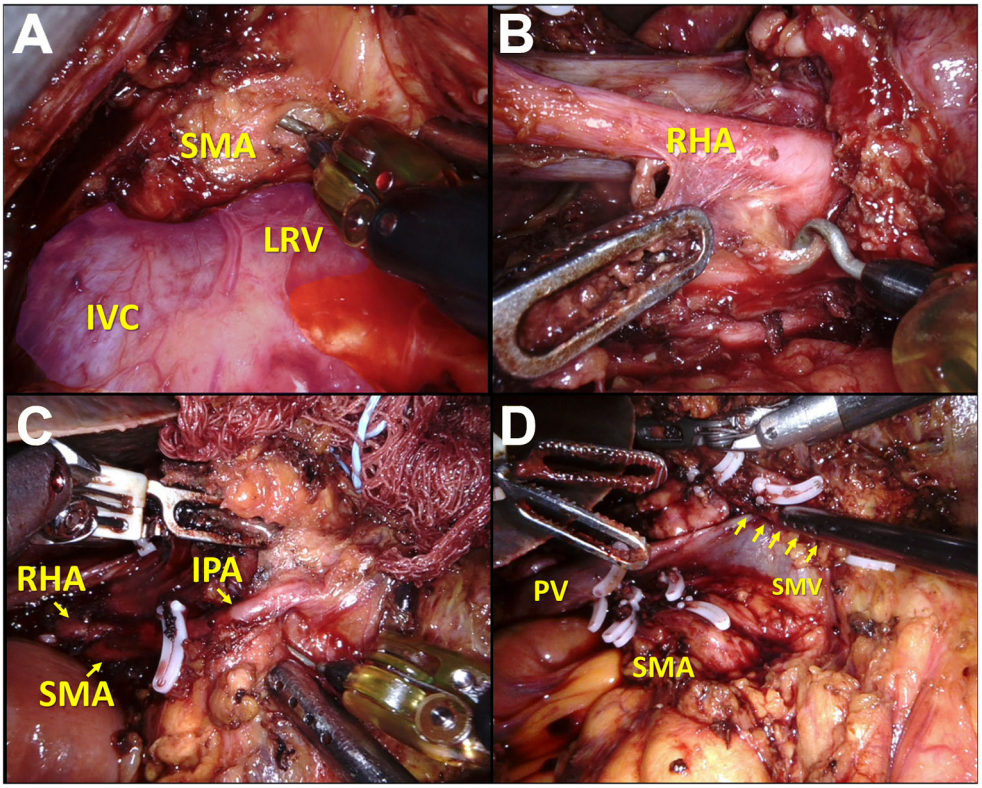

Fig. 1 Superior mesenteric artery-first approach. **A** The superior mesenteric artery (SMA) is dissected above the left renal vein (LRV). *IVC*, inferior vena cava. **B** A replaced right hepatic artery (RHA) is dissected towards the SMA. **C** SMA is dissected from the head of the pancreas. The inferior pancreatic artery (IPA) is divided. Replaced right hepatic artery (RHA) and SMA are identified. **D** The surgical specimen is only attached by the tumor invasion (arrows) of the superior mesenteric vein (SMV). *PV*, portal vein

surgical specimen is only attached by the tumor invasion of the superior mesenteric vein.[3] After partial resection of the SMV, its extension precluded lateral suture and a transverse anastomosis (Clavien-Rudiger technique[4]) was necessary to minimize the risk of narrowing of the SMV. This technique precludes the use of patch graft.[4] After completion of the

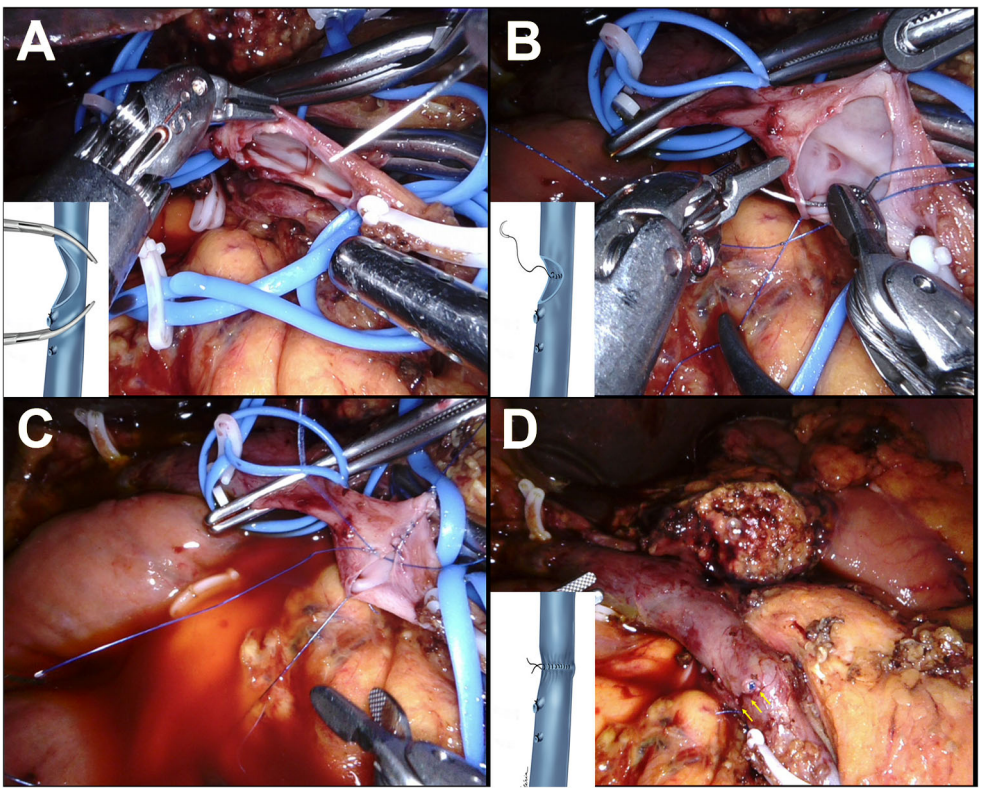

Fig. 2 Robotic reconstruction of the superior mesenteric vein without graft. **A** Intraoperative view after surgical specimen removal. In-picture: schematic drawing. **B** Intraoperative view during the transverse reconstruction of the superior mesenteric vein (SMV). In-picture: schematic drawing of the technique. **C** Intraoperative view before completion of the SMV anastomosis. **D** Intraoperative view after completion of the SMV anastomosis (arrows) and release of the clamps. In-picture: schematic drawing of the final aspect of the anastomosis

venous anastomosis, reconstruction of the alimentary tract was done as usual (Figs. 1 and 2).

Total operative time was 430 min, and the estimated blood loss was 370 mL with no need for transfusion during or after the procedure. Superior mesenteric vein was clamped for 30 min and the SMV transverse repair lasted 23 min. Pathology examination of the surgical specimen revealed a 4.1 × 3.0-cm (T3) moderately differentiated ductal adenocarcinoma with free margins and 2 positive lymph nodes from 25 harvested (N1). Recovery was uneventful except for a biochemical leak (formerly class A postoperative pancreatic fistula) and patient was discharged on the 7th postoperative day. Postoperative MRI showed good patency of the superior mesenteric vein, and no evidence of the disease 6 months after the procedure.

Robotic resection and reconstruction of the superior mesenteric vein is safe and feasible without the use of a graft during pylorus-preserving pancreatoduodenectomy in patients with invasion but not encasing of the portal vein or SMV. The proposed technique can be used in cases where the invasion is partial but requires extended resection that precludes simple lateral suture. Although not always necessary for optimal reconstruction, the artery-first technique[3] is useful to keep the surgical specimen only attached by the venous invasion which contributed for a successful reconstruction of the SMV without tension and without the need for a graft or patch.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11605-021-05043-9.

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