

Laparoscopic Pancreaticoduodenectomy: Taking Advantage of the Unique View from the Caudal Side

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Although minimally invasive surgery has rapidly evolved to include a variety of complex surgical procedures, laparoscopic pancreaticoduodenectomy (PD) has yet to be accepted as a generalized surgical method for the resection of pancreatic head lesions. One of the main reasons for this is the difficulty dissecting the pancreatic head from the mesenteric vessels, that is, the superior mesenteric vein (SMV), the portal vein (PV), and the superior mesenteric artery (SMA), as well as the difficulty of pancreaticoenteric anastomosis.¹⁻³ We standardized the procedures for pancreatoduodenectomy and have already reported our favorable results.⁴ Here, we describe a technique in which we standardized safe and clear dissection of the pancreatic head from the mesenteric vessels by taking advantage of the unique laparoscopic view from the caudal side.

METHODS

Patients are placed in a lithotomy position. A 12-mm trocar is placed at the umbilicus or a little lower than the umbilicus and pneumoperitoneum is established. Two other 12-mm trocars are placed, both lateral to the first trocar, and two 5-mm trocars are placed at the right and left infracostal arch. The positions of these 4 trocars are all on the right and left mid-clavicular lines.

After mobilization of the hepatic flexure of the colon, Kocher's maneuver is performed, exposing the surface of the nerve plexus of the pancreatic head (Fig. 1)⁵ at the root of the SMA and the celiac axis. Holding up the pancreatic head, the posterior and right aspect of PV is exposed first at the hepatoduodenal ligament by the surgeon standing on the patient's right side. The PV is exposed up to the cranial edge of the nerve plexus of the pancreatic head, at which the PV hides behind the nerve plexus (Fig. 2). The right gastric and gastroepiploic

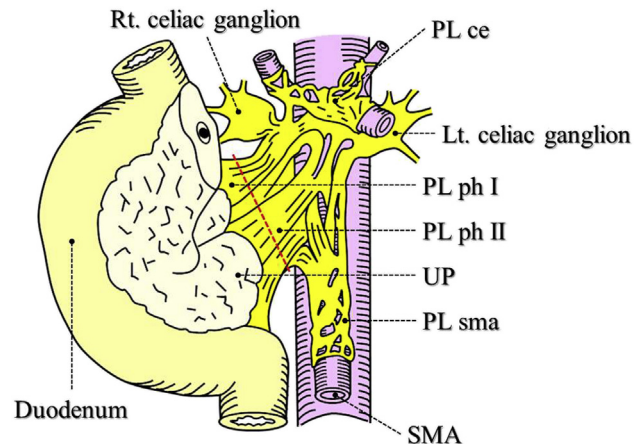


Figure 1. The nerve plexuses of the pancreatic head. This is a modified schema of the original in a previous report.⁵ The uncinate process (UP) is separated from the superior mesenteric artery (SMA) and the celiac axis by dissecting the connective tissue, including the nerve plexuses on the red dashed line. Rt., right; Lt., left; PL ce, nerve plexus of the celiac axis; PL ph I, nerve plexus between the pancreatic head and the celiac axis; PL ph II, nerve plexus between the UP and SMA; PL sma, nerve plexus around the SMA, which forms a nerve sheath.

vessels are divided. The bulbus duodeni (in pylorus-preserving PD) or the pyloric antrum (in PD) is cut using a linear stapler. After exposing the hepatic artery around the root of the gastroduodenal artery, the gastroduodenal artery is clipped and cut at the root. Then, behind that, the anterior aspect of PV is exposed on just the cranial side of the pancreatic neck. The common bile duct (CBD) is encircled and taped. On the caudal side of the pancreas, the anterior aspect of SMV is exposed and the mesentery of the transverse colon is dissected from the pancreatic head as widely as possible. The pancreatic neck is dissected from the SMV and PV bluntly and taped. The upper portion of the jejunum is divided near the ligament of Treitz with a linear stapler and the proximal jejunum is separated from the mesojejunum with LigaSure (LigaSure Blunt Tip; Covidien).

Dissection of the pancreatic head from the mesenteric vessels proceeds by peeling the pancreas from the uncinate process to the pancreatic neck clockwise from the caudal side (Video 1). Taking advantage of the unique view from the caudal side, the posterior aspect of SMA enveloped

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Abbreviations and Acronyms

CBD = common bile duct
 PD = pancreaticoduodenectomy
 PV = portal vein
 SMA = superior mesenteric artery
 SMV = superior mesenteric vein

with a nerve sheath (the nerve plexus around the SMA) beside the pancreatic uncinata process is exposed by dividing the fat tissue behind SMA through a hole opened in the ligament of Treitz (Fig. 3). As necessary, dissection between the uncinata process and SMA is possible, as well as transection of the inferior pancreaticoduodenal artery in this operating field (Video 2).

After passing the jejunum stump to the right side, the surgeon pulls up the pancreatic head as the assistant pulls up the tape placed at the pancreatic neck to pull the pancreas away from the SMV radially (Fig. 4). Maintaining this position, the uncinata process is dissected from the mesenteric vessels toward the hepatoduodenal ligament by dividing the connective tissue, which includes the nerve plexus, inferior pancreaticoduodenal artery, and the branches of SMV, mostly with only LigaSure. When there is a thick inferior pancreaticoduodenal artery, it is divided after clipping. During this procedure, the

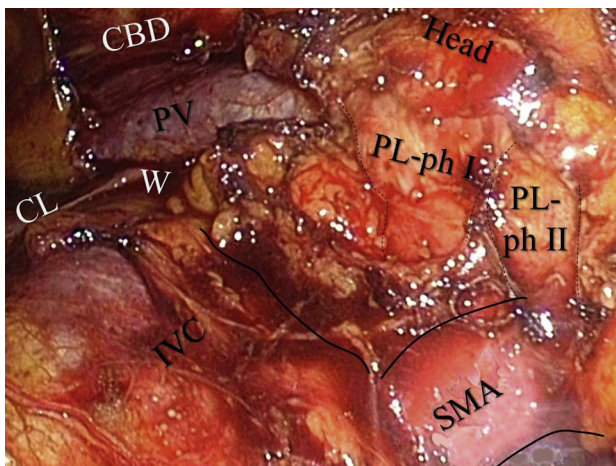


Figure 2. Findings of exposed nerve plexuses of the pancreatic head from the back side in the early stage of surgery. After Kocher's maneuver, the nerve plexus between the pancreatic head and the celiac axis (PL-ph I) and a part of the nerve plexus between the uncinata process and the superior mesenteric artery (PL-ph II) are exposed by ablating soft tissue around them. At the hepatoduodenal ligament, the posterior and right aspect of the portal vein (PV) is exposed up to the cranial edge of PL-ph I, at which PV hides behind PL-ph I. CBD, common bile duct; CL, caudate lobe; Head, the dorsal aspect of the pancreatic head; SMA, superior mesenteric artery; W, Winslow's foramen.

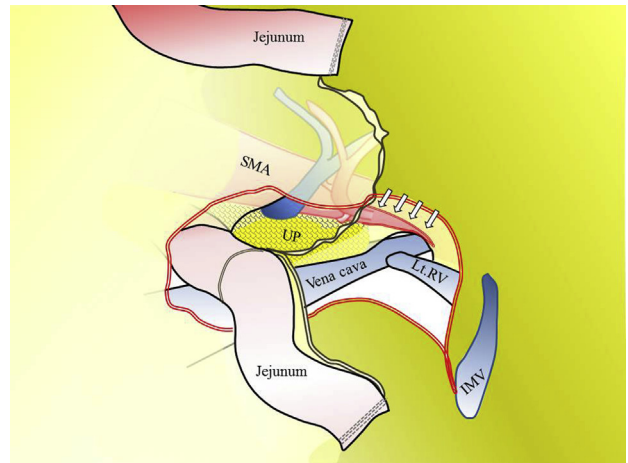


Figure 3. The view of the posterior aspect of the pancreatic head through the hole opened in the ligament of Treitz. Taking advantage of the unique laparoscopic view from the caudal side, the posterior aspect of the superior mesenteric artery (SMA) enveloped with a nerve sheath (plexus mesentericus superior) beside the uncinata process (UP) is exposed (white arrows) by dividing the fat tissue behind SMA through the hole opened in the ligament of Treitz. Lt. RV, left renal vein; IMV, inferior mesenteric vein.

surgeon stands between the patient's lower limbs and LigaSure is inserted through the port at the umbilicus to be parallel with the SMA, so that the risk of injury to the SMA is reduced (Fig. 5). The dissection using LigaSure is repeated in order: first, the dorsal layer (tissue

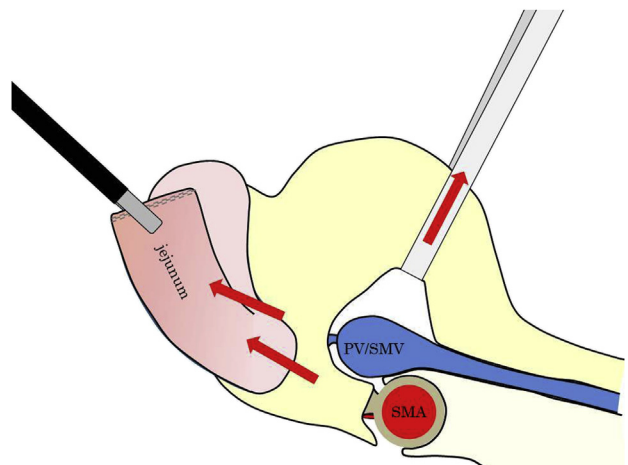


Figure 4. Image of the pancreatic head region centering on the mesenteric vessels from the caudal side. After passing the jejunum stump to the right side, the surgeon pulls up the pancreatic head and the assistant pulls up the tape placed at the pancreatic neck to pull the pancreas away from the superior mesenteric vein (SMV) radially. Some interspace is created between the pancreatic parenchyma and the mesenteric vessels. Dissection of the pancreas from the mesenteric vessels is made easier by maintaining this position. PV, portal vein; SMA, superior mesenteric artery.

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