EARLY RETROPANCREATIC LAMINA DISSECTION DURING PANCREATICODUODENECTOMY: HOW, WHEN AND WHY?

C. Lupaşcu¹, Corina Ursulescu², N. Dănilă³, V. Grigorean³, E. Târcoveanu¹, D. Andronic¹

University of Medicine and Pharmacy „Grigore T. Popa” - Iaşi
Faculty of Medicine
1. Discipline of Surgery
2. Discipline of Radiology
University of Medicine and Pharmacy “Carol Davila” – Bucharest
Faculty of Medicine
3. Department of Surgery

EARLY RETROPANCREATIC LAMINA DISSECTION DURING PANCREATICODUODENECTOMY: HOW, WHEN AND WHY? (Abstract): Pancreatectoduodenectomy is the procedure of choice for tumors of the pancreatic head and periampullary region. During pancreaticoduodenectomy, early neck division may be inadequate in case of hepatic artery anatomic variants, suspected involvement of the superior mesenteric vessels or intraductal papillary mucinous neoplasms. Material and methods: We describe our early approach to the superior mesenteric vessels during pancreaticoduodenectomy, by retroportal lamina dissection before pancreatic transection. Results: We used this approach in 41 patients. There were 28 patients with abnormal hepatic artery, which was spared in 26 cases. Hepatic artery reconstruction was required in 2 cases. Nine patients with intraductal papillary mucinous neoplasms underwent 6 pancreaticoduodenectomies extended to the body and 3 total pancreatecoduodenectomies. Four patients with adenocarcinoma involving the portomesenteric vein required pancreatectoduodenectomy with venous resection and reconstruction. Conclusions: Early retropancreatic lamina dissection is useful way to tailor a pancreatectoduodenectomy which is recommended in selective indications. Keywords: PANCREATIC SURGERY, TECHNIQUE, HEPATIC ARTERY, SUPERIOR MESENTERIC ARTERY.

Pancreatectoduodenectomy (PD) is the treatment of choice for tumors of the pancreatic head and periampullary region. Since the first PD performed by Whipple in 1937, more than 65 improvements of the technique were made, concerning mainly pylorus preservation or reconstruction of pancreateico-digestive continuity. Standard PD is usually performed backward, with transection of the pancreatic neck before the superior mesenteric artery (SMA) dissection. Recently, indications of PD have extended to intraductal papillary mucinous neoplasms (IPMN) and periampullary tumors invading the mesentericoportal vein. In these last two conditions, division of the pancreatic neck may be inappropriate so division of the body can be preferred. We perform in such cases, as well as in hepatic artery (HA) variants, a PD with early retropancreatic lamina dissection (RPLd), close to the origin of the SMA, to readily assess
variant pattern of the arterial blood supply to the liver and radicality of resection, to perform mobilization of the specimen before pancreatic division, and, if necessary, to safely perform venous clamping. RPLd was first suggested by Pessaux (1). The purpose of the current study is to describe how, when and why we perform PD with RPLd.

MATERIAL AND METHODS

One hundred thirty six consecutive patients underwent PD for periampullary and pancreatic head tumors between January 1, 2007 and December 31, 2011. Among them, 41 (22 males and 19 females, median age 59 years, range 44-78), underwent PD with early RPLd. Twenty eight patients have been preoperatively assessed by multidetector computed tomography with HA anomalies and 4 with adenocarcinoma involving the portomesenteric axis. IPMN have been preoperatively assessed by abdominal multidetector computed tomography and endoscopic ultrasound with guided fine needle aspiration. Twenty cases had RHA arising from SMA (18, replaced=11 or accessory=7) or Ct (2 cases of replaced RHA). Eight cases had a RCHA originating in SMA.

TECHNIQUE

Surgical exploration must be completed by intraoperative ultrasonography. The pancreas head exposure is obtained by an extended Kocher maneuver, incision of the attachment of the transverse mesocolon to the right perinephric area, and opening of the lesser sac by separating the greater omentum from the transverse colon. The superior mesenteric vein (SMV) is exposed where it lies to the anterior third duodenum (fig. 1).

Dorsal to the pancreas, the dissection must pass beyond the aorta, to get full posterior mobilization of the duodenopancreas to the left, and to distinguish the plane between the SMV and the SMA. Liver and peritoneal exploration is performed as well as the palpation of the mesenteric root and biopsy examination of aortocaval nodes with frozen section.

The retropancreatic dissection is carried on downwards from the inferior border of the Winslow foramen along the Treitz fascia, exposing the inferior vena cava on its left side, the left renal vein with its upper margin and in between, the origin of the SMA (fig. 2, 3).

The SMA origin is isolated in this angle, and then, along the plane of its adventitia, the RPL, which is inserted on its right aspect, is dissected and removed “step-by-step” in a frontal plane behind the pancreas (fig 4). This dissection is achieved along 3-4 cm, from the SMA origin until its entrance into the mesentery, after progressive exposure and gentle medial retraction of the portal vein (PV), which is also set free from the RPL (fig 3, 4).

RPL is retracted rightwards and the lymphatic tissue between SMA and SMV is removed. The possible SMA invasion is early detected, due to RPL involvement, avoiding the risk for nonradical resection. Such exposure allows easier dissection of a right HA (RHA) originating from SMA or celiac trunk (Ct) or a replaced common HA (RCHA) coming from the SMA. This vessel, which arises 1-2 cm beneath the SMA origin, is looped and freed from the RPL, upwards to the hepatic pedicle. To facilitate the SMA and aberrant RHA or RCHA dissection, the duodenopancreas is retracted en bloc upwards, ventrally and to the left (Fig 3). Limited dissection along the right
Early retropancreatic lamina dissection during pancreaticoduodenectomy

side of the SMA (fig. 4) is advocated, to avoid an extensive removal of the peri-
vascular nervous plexus, resulting in post-operative intestinal motility troubles.

Fig. 1. Exposure of the SMV on the anterior third duodenum

Fig. 2. Retropancreatic dissection with a replaced RHA originating in SMA before RPLd and common bile duct division

Fig. 3. Retropancreatic dissection: the duodenopancreas with the tumor is retracted medially and to the left

Fig. 4. Intraoperative image just before pancreatic transection; the SMA was set free from the RPL along 3-4 cm

At this point the hepatic pedicle is dissected. After cholecystectomy, the common and proper HA are isolated, when they exist as such. The right gastric vessels are divided, the gastroduodenal artery is identified and clamped to ensure that the arterial
flow either in hepatic and gastric arteries remains normal and there is no unrecognized Ct stenosis. The gastroduodenal artery is divided, as well as the common bile duct above the entry of the cystic duct. This improves the exposure of the supra-pancreatic PV. Care must be taken during lymphadenectomy around the PV to an accessory or replaced RHA originating from the SMA or Ct, but also to a RCHA from the SMA. This vessel runs upwards behind the PV and we loop it. The SMV is entirely dissected at the inferior pancreatic margin with ligation of the right gastroepiploic vein and of all veins draining the uncinate, which is exposed up to the right side of the SMA. At this stage the posterior wall of the portomesenteric vein is entirely exposed. The Treitz ligament is divided, equally by a posterior approach, allowing mobilization of the duodeno-jejunal junction and its retraction beneath the superior mesenteric vessels, so the specimen to be removed reaches the right side of the mesenteric root. The inferior pancreaticoduodenal artery is identified and ligated. Once the radicality of PD is established jejunal and distal gastric division is performed according to Whipple procedure. The last step of the resection phase is the pancreatic neck transection, just in front of the PV. When pancreatic division must be performed on the body, we divide the dorsal pancreatic artery and collaterals of both the SMA and the SMV (from the inferior edge of the pancreas). In case of involvement of the portomesenteric confluence, we control the splenic vein behind the body. Adequate mobilization of the mesentery and right colon is necessary to perform safely, ”en bloc” resection and venous reconstruction. We estimate this mobilization as useful in case of limited portomesenteric invasion, in order to avoid vein grafting during venous reconstruction. In case of IPMN extending from the head to the body, we carry on the retro-pancreatic mobilization towards the left and dissect the splenic vessels with successive ligation of their collaterals. When the pancreatic body is mobilized enough from the splenic vessels, we can divide the pancreas at any level, or entirely remove it if necessary. Frozen section analysis is performed on the cut surfaces, to assess the malignant status of the remnant pancreas. The reconstruction phase, drains placement and postoperative care are similar to those from standard PD.

RESULTS

The aberrant vessel was preserved in 26 (63.41%) cases. A RCHA originating from the SMA was involved by an enlarged lymph nodes mass behind the pancreatic head in 2 patients. A segmental resection of the involved RCHA had to be performed with arterial reconstruction, using the reversed splenic artery. Four patients with ductal adenocarcinoma involving the portomesenteric confluence required en bloc resection, mobilization of the right colon and mesentery root followed by mesentericoportalvenovenous suture. We re-implanted the splenic vein into the PV in all cases. When vascular reconstruction was required, clamping time did not exceed 22 minutes. Anastomotic patency and normal blood flow were confirmed by Doppler ultrasound at the end of the procedure.

The same approach was used in 9 patients with IPMN (6 PD extented to the body- IPMN in the head, neck or uncinate, and 3 total PD - IPMN diffusely involving the pancreatic duct). Mean operative time over all the 41 patients was 315 minutes
and mean blood loss 430 ml. The mean hospital stay was 16.5 days. There were no early complications particularly related to this approach. For the malignant tumors, a R0 resection was achieved in 24 (58.54%) patients and a R1 in 2 (involvement of the RPL). The median survival time was 25.8 months. The follow-up lasted until patient death or until the cut-off date of January 31, 2012. At the time of the last follow-up, 29 (70.73%) patients were still alive.

**DISCUSSION**

Because of recent decrease in mortality rate, PD is now routinely performed for tumors of the pancreatic head and peripancreatic region, but also for IPMN or periampullary tumors invading the mesentericoportal vein. We have described herein our technique of early RPLd during PD on the right side of the SMA, before the digestive and pancreatic continuity should be interrupted. We consider this technique particularly suitable in case of HA abnormality, with RHA originating from SMA or Ct, or RCHA from the SMA, suspected involvement of the SMA, IPMN extended from the pancreatic head to the body and involvement of the portomesenteric vein.

Standard PD includes the creation of a tunnel between the pancreatic neck and the PV, followed by neck transection. The pancreatic continuity is interrupted before radicality of the resection could be assessed close to the SMA. Even in some recent series, nonradical PD represents 9 to 25% cases (2). Moreover, in the standard PD, dissection of a RHA or RCHA is usually performed late, when bleeding from the resection specimen decreases the exposure of the SMA and of an aberrant RHA. Early neck transection is not suitable when the neck is involved, as in tumors involving the portomesenteric vein or in IPMN extended to the body. One of the difficulties of PD is variability of peripancreatic vessel anatomy (3). Assessment of variant pattern of the arterial blood supply to the liver in patients who are about to undergo a PD avoids unnecessary complications, as fatal hepatic injury. Accidental ligation of aberrant HA may result in hepatic necrosis, ischemic biliary injury or anastomotic complications (4). The importance of sparing this artery during PD lies not so much in preventing hepatic ischemia, but in preventing a breakdown of bilioenteric anastomosis, because the blood supply to the cranial part of the common bile duct is entirely dependent on the RHA after PD. Preoperative assessment of coeliac–mesenteric vascular pattern (variants, strictures) is of the utmost importance for the surgeon. RHA or RCHA from SMA may course behind, within the pancreas head, or along its ventral side (5).

Ductal carcinoma with venous limited involvement can be safely resected with a long-term survival similar to that observed after radical resection without venous involvement (3). In this situation, venous resection is best performed “en bloc” to obtain disease-free margins. This approach results in the tumor being attached only to the involved veins so clamping of the portomesenteric confluence is easier and shorter. Mobilization of the right colon and mesentery root are useful to avoid vein grafting during reconstruction of the PV (6). It is expected that, because pancreatic transection is performed at the end, congestion and bleeding are less likely whereas the venous drainage of both the specimen and bowel are compromised minimally during most of the procedure (7).

In case of IPMN, the most frequent localization is the pancreatic head, but in-
volvement of the body may occur to some patients (8). In this setting and particularly in malignancies, en bloc resection requires pancreatic division of the body. The final transection of the pancreas can be performed at the desired place if it is enough mobilized from the splenic vessels, preventing tumor opening, which might disseminate cancer into the abdomen. Furthermore, dissection along the splenic vessels can be extended up to the splenic hilum allowing splenic preservation if the whole pancreas must be resected (8).

In conclusion, early RPLd is useful technique to expose the retropancreatic-mesenteric vasculature during PD. We advocate this approach in selective situations, such HA anatomic variants, suspected SMA involvement, limited invasion of the mesentericoportal axis and IPMN. RPLd also standardizes the radicality of PD and allows earlier vascular control. Further prospective studies are required to assess its advantages over standard PD, since there is no consensus worldwide.

REFERENCES