Pancreaticoduodenectomy in the Presence of Superior Mesenteric Venous Obstruction


The study goal was to determine the technical feasibility and outcomes associated with pancreaticoduodenectomy for periampullary malignancies with near (>80%) or complete (100%) superior mesenteric venous (SMV) obstruction. A retrospective examination of 11 patients with high-grade or complete SMV obstruction who underwent pancreaticoduodenectomy at five academic medical centers is reviewed. Pancreaticoduodenectomy for locally advanced periaipillary malignancies causing high-grade or complete SMV obstruction is technically feasible. Operative approaches and outcomes are presented. One 30-day death was observed. Median survival of the cohort is 18 months. Survivals exceeding 2 years post-resection have been observed. In a number of cases, significant palliation of pain and of biliary and duodenal obstruction were achieved. Based on this initial series, pancreaticoduodenectomy in the presence of near or total SMV obstruction is feasible, may result in an R0 resection, and may be beneficial in select patients with a periampullary malignancy. We suggest such an approach be considered particularly following completion of neoadjuvant therapy without systemic progression. Further studies and more long-term follow-up at high-volume centers are required, however, to better determine the indications and potential benefit of such an undertaking. (J GASTROINTEST SURG 2005;9:915–921) © 2005 The Society for Surgery of the Alimentary Tract

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Surgical resection remains the best chance of cure and palliation for patients presenting with periampullary malignancies. Although historically associated with high perioperative mortality risk, pancreaticoduodenectomy currently can be performed at a number of high-volume centers with a 1%–4% periprocedural mortality rate.1–3 Consideration for surgical candidacy is generally determined based upon computed tomography (CT) criteria.4–6 Criteria include absence of metastatic disease, no extension into the superior mesenteric or celiac artery, and no tumor invasion into the portal mesenteric confluence. With improved surgical experience, especially over the past decade, reports from many centers with high-volume pancreatic surgeries have challenged the presence of portomesenteric invasion as a contraindication to pancreaticoduodenectomy.7–9 Of particular significance is the report of Tseng and coworkers10 from the M. D. Anderson cancer center who reported venous resection in 141 cases of pancreaticoduodenectomy from 1990 through 2002. This and other considerably smaller series have demonstrated that complete resection in patients with lateral tumor invasion of the superior mesenteric venous (SMV) without venous obstruction can be associated with outcomes approaching that of patients undergoing pancreaticoduodenectomy alone.7–10

Given the nearly equivalent long-term survival associated with venous resection for periampullary malignancies, the question of extending the benefits...
of pancreaticoduodenectomy to those patients with extensive local burden, including complete venous occlusion, therefore arises. Of note, such an approach was initially advocated by Fortner.\textsuperscript{11} We report herein 11 patients who presented with locally very advanced periampullary malignancies and complete or near-complete SMV occlusion. In each case, a pancreatectomy with resection of the SMV was performed. Results and complications are presented and discussed.

**PATIENT SELECTION AND TECHNIQUE**

Initially, patients who underwent SMV resections were limited to young, active patients in whom triple-phase CT scan suggested SMV involvement but complete occlusion was not suspected preoperatively. Resection was undertaken in these cases and complete or near-total venous obstruction noted in the resection specimen. Importantly, venous collaterals have generally not been a problem in these cases as can be found if portal obstruction is manifest. As the group’s experience has developed, we have offered the procedure to young, active patients, particularly those with otherwise favorable tumors, even if triple-phase CT has suggested complete venous obstruction on triple-phase CT scan. No preoperative magnetic resonance angiograms or other venous imaging techniques have been used.

The approach used in completing pancreaticoduodenectomy with near-total or total SMV thrombosis has varied (Fig. 1). In all cases, we identify the SMV inferior to the pancreas as initially described by Cameron\textsuperscript{12} or, if the tumor is found to be extending into the transverse colon’s mesentery, below the level of the middle colic veins. If possible, we attempt to define a plane between the SMV and the pancreatic neck by elevating the pancreatic neck off the SMV–portal vein confluence, working below at the level of the SMV and above at the level of the portal vein.\textsuperscript{9,13} Division of the common bile duct is frequently undertaken to facilitate exposure of the portal vein–SMV confluence (Fig. 2, A, B). If a clear plane between the pancreatic neck and the SMV cannot be defined or if preoperative SMV obstruction was noted, we divide the pancreas more laterally, generally above the confluence of the IMV with the splenic vein, after developing the plane between the pancreas and IMV with blunt and sharp dissection (Fig. 2, C, D). Of note, this maneuver is contrary to the classic teaching of pancreaticoduodenectomy that holds an inability to define the plane between the pancreas and the SMV is a contraindication to attempted resection.\textsuperscript{9} Following transection of the pancreas medial to the SMV, dissection and mobilization of the pancreas are continued with division of the duodenal bulb or performance of a hemigastrectomy, depending on the decision of whether to preserve the pylorus. The splenomesenteric confluence is identified and separated from the tumor and pancreatic head. The splenomesenteric confluence is left intact in all cases. Vascular control with vessel loops is generally obtained at this point. These maneuvers allow mobilization of the pancreaticoduodenal specimen with a freed portomesenteric confluence. It is not our practice to temporarily occlude the superior mesenteric artery to prevent edema. At this stage, the medial division of the pancreas allows mobilization of the medial aspect of the SMV with the specimen rather than leaving it in situ (Fig. 2, C, D).

It is generally our practice to attempt to complete the resection prior to reconstructing the SMV. Of particular help is separation of the SMA from the uncinate process and transection of the duodenal mesentery, as this allows anterior rotation of the specimen connected only by the portomesenteric venous confluence and SMV. Alternatively, in select cases where adequate collateral flow could be preserved, we have simply ligated and resected the occluded SMV without subsequent venous reconstruction (Fig. 3, C). If the SMV is to be ligated, however, great care must be exercised to prevent any impingement of hepatoportal splenic flow. In most cases, venous reconstruction has been undertaken. In many cases, a primary anastomosis can be performed without tension by completely mobilizing the liver and the root of the mesentery (Fig. 3, B). When this is not possible,