Portal Vein Resection in Borderline Resectable Pancreatic Cancer: A United Kingdom Multicenter Study

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BACKGROUND: Until recently, in the United Kingdom, borderline resectable pancreatic cancer with invasion into the portomesenteric veins often resulted in surgical bypass because of the presumed high risk for complications and the uncertainty of a survival benefit associated with a vascular resection. Portomesenteric vein resection has therefore remained controversial. We present the second largest published cohort of patients undergoing portal vein resection for borderline resectable (T3) adenocarcinoma of the head of the pancreas.

STUDY DESIGN: This is a UK multicenter retrospective cohort study comparing pancreaticoduodenectomy with vein resection (PDVR), standard pancreaticoduodenectomy (PD), and surgical bypass (SB). Nine high-volume UK centers contributed. All consecutive patients with T3 (stage IIA to III) adenocarcinoma of the head of the pancreas undergoing surgery between December 1998 and June 2011 were included. The primary outcomes measures are overall survival and in-hospital mortality. Secondary outcomes measure is operative morbidity.

RESULTS: One thousand five hundred and eighty-eight patients underwent surgery for borderline resectable pancreatic cancer; 840 PD, 230 PDVR, and 518 SB. Of 230 PDVR patients, 129 had primary closure (56%), 65 had end to end anastomosis (28%), and 36 had interposition grafts (16%). Both resection groups had greater complication rates than the bypass group, but with no difference between PD and PDVR. In-hospital mortality was similar across all 3 surgical groups. Median survival was 18 months for PD, 18.2 months for PDVR, and 8 months for SB ($p = 0.0001$).

CONCLUSIONS: This study, the second largest to date on borderline resectable pancreatic cancer, demonstrates no significant difference in perioperative mortality in the 3 groups and a similar overall survival between PD and PDVR; significantly better compared with SB. (J Am Coll Surg 2014;218: 401−411. © 2014 by the American College of Surgeons)

Pancreatic cancer is the 13th most common cancer worldwide, but the 4th most common cause of cancer death in the Western world, with little improvement in survival during the last few decades.[1] Surgical resection remains the only potentially curative option for these patients. However, <20% of patients who present with pancreatic cancer have resectable tumors.[2] Of the unresectable patients, approximately two thirds present with distant metastases and the rest with locally advanced disease with tumor extension into surrounding vasculature.[3] This has driven

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Abbreviations and Acronyms

PD = pancreaticoduodenectomy
PDVR = pancreaticoduodenectomy with vascular resection
PV = portal vein
SB = surgical bypass
SMV = superior mesenteric vein

surgeons throughout the years to strive to improve resectability rates. The treatment of borderline resectable pancreatic cancer with aggressive surgery was initially developed by Moore and colleagues, who, in 1951, performed the first superior mesenteric vein (SMV) resection and reconstruction, followed by Asada and colleagues from Japan in 1963.[4,5] Subsequently, Fortner in 1973 first described a "regional pancreatectomy" involving total pancreatectomy, radical lymph node clearance, combined portal vein resection (type 1), and/or combined arterial resection and reconstruction (type 2).[6] These procedures were later abandoned, as they conferred no survival benefit and carried a greater morbidity and mortality than conventional surgery.

During the last decade, with improvements in surgical technique, anesthesia, and critical care support, there has been renewed interest in vascular resection for isolated involvement of the portal vein (PV) and/or SMV in borderline resectable pancreatic cancer. There have been numerous reports on PV resection in borderline resectable pancreatic cancer, but with conflicting results.[7-16] Some studies have reported comparable complication rates between standard pancreaticoduodenectomy (PD) and pancreaticoduodenectomy with vascular resection (PDVR).[11,15-25] In 2004, Tseng and colleagues from the MD Anderson Center, found no survival difference in patients undergoing PD and PDVR.[16] Similarly, Yekebas and colleagues, in 2008, found similar postoperative morbidity and mortality rates between PD and PDVR.[19] Conversely, other studies have reported increased morbidity with no survival benefit with PDVR.[26-29] A systematic review by Siriwardena and Siriwardena in 2006 suggested that PDVR was associated with a high rate of nodal metastases and low survival rates.[27] There is also some evidence of better survival outcomes with PDVR over palliative treatment.[30-33]

This is a multicenter study on PV resection in T3 adenocarcinoma of the head of the pancreas aiming to compare perioperative morbidity and long-term survival in patients surgically explored with the intention to resect.

METHODS

Patients

This is a UK multicenter retrospective cohort study comparing PDVR, PD, and surgical bypass (SB) for T3 pancreatic adenocarcinoma of the head of the pancreas. Only patients with pancreatic adenocarcinoma undergoing surgery between December 1998 and June 2011 were included. We included patients with T3 and T4 tumors to capture all patients with venous involvement. The T4 tumors were then reclassified as T3 tumors based on the American Joint Commission on Cancer Staging System for Pancreatic Adenocarcinoma, which, in its 6th edition in 2003, reclassified tumors involving venous structures from T4 to T3. The inclusion criteria for the study were resectable disease based on CT or MRI scanning and no evidence of metastatic disease. Patients with any other form of tumor, such as cholangiocarcinoma or neuroendocrine tumors, were excluded to avoid bias. National ethical approval and National Information Governance Board approval were obtained to perform this study as a multicenter study. Nine high-volume UK centers contributed data. Patients were identified from prospectively compiled unit databases or from hospital pathology departments. Data not available from databases were obtained from electronic patient records or patient notes. Patient demographic, perioperative, histologic, and follow-up data were collected. Dates of death were obtained from electronic records, national registries, or the patient's general practitioner; for patients who were still alive, the last follow-up outpatient visit was considered the last follow-up date.

Preoperative evaluation

All patients underwent contrast-enhanced CT as routine preoperative workup. Magnetic resonance imaging, endoscopic ultrasound scan, and laparoscopy were performed on an individual patient basis based on the multidisciplinary team discussion. Magnetic resonance imaging is usually done if there is a suspicion of liver metastases. In the United Kingdom, all cancer cases are discussed at a multidisciplinary team meeting, which comprises hepatobiliary surgeons, oncologists, and radiologists at tertiary referral cancer centers. The multidisciplinary team decides on the best treatment modality for the patient based on all preoperative investigations. However, the final operative decision lies with the surgeon at laparotomy, based on findings. Only patients deemed resectable preoperatively were included. The criteria for en bloc resection where there is no evidence of metastatic disease were the following: tumor not involving the root of the small bowel mesentery; tumor not involving the superior mesenteric artery, coeliac axis, or hepatic artery; and intention of obtaining R0 resection margin status. Patients with PV occlusion were not included. Patients with metastatic disease were excluded.

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