Surgical Management of Peri-Ampullary Tumors

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Disclosures - None
Objectives

1. To review the surgical history of the Whipple procedure for periampullary tumors.
2. To review the differential diagnosis for patients presenting with obstructive jaundice and a periampullary mass.
3. To review the varying prognoses of the different types of periampullary tumors.
Objectives

4. To review the optimal workup and appropriate staging procedures for periampullary tumors to determine if surgery is appropriate.

5. To review the complexities and the surgical challenges of the Whipple procedure and to understand potential postoperative complications.

6. To review the surgical results of patients undergoing the Whipple procedure at RiverBend.
Case Study

- FH is a 63 yr. old WM who presents with a 3 week history of jaundice, pruritus, and a 7 pound weight loss. He denies abdominal or back pain. He denies any fever, chills, or fatty food intolerance.
- PE: Remarkable for “Courvoisier gallbladder”
- Labs: Bilirubin 8.9; Alk phos 576; ALT 253; AST 189; CA 19-9 187.
Case Study

- Ultrasound – Distended gallbladder; extrahepatic and intrahepatic biliary ductal dilatation.
- CT – 2.6 cm hypodense mass involving the head of the pancreas. There is no evidence of metastatic disease. There is no evidence of invasion of the portal vein or SMA.
- ERCP – High grade distal CBD stricture consistent with neoplasm; CBD stented
ERCP and Biliary Stent Placement
Case Study

- Patient underwent a classic Whipple procedure being discharged on 7\textsuperscript{th} postop day.
- Pathology – “3.1 cm poorly differentiated ductal adenocarcinoma involving head and uncinate process of pancreas; angiolymphatic invasion present; surgical and ductal margins negative; 3 of 14 peripancreatic lymph nodes positive for metastatic disease.”
Case Study

• Patient treated with adjuvant chemo and radiation therapy.

• 5 years later patient developed gastric outlet obstruction 2nd to marginal ulcer of his gastrojejunostomy. He underwent partial gastric resection with conversion of his gastrojejunal anastomosis to a Roux-en-y reconstruction. There was no evidence of recurrent cancer.

• At age 81 the patient remains alive today; 18 years following his surgery; free of recurrent pancreatic cancer.
18 Year Pancreatic Cancer Survivor
Carcinoma of Head of Pancreas
Pancreatic Cancer

- Pancreatic cancer is the 4\textsuperscript{th} and 5\textsuperscript{th} leading cause of cancer related deaths in men and women respectively in the U.S. and in Europe.
- Pancreatic cancer is notoriously resistant to nonsurgical forms of oncologic treatment such as radiation therapy, chemotherapy, and immunotherapy.
- Surgical resection offers the only chance for cure with patients with pancreatic and periampullary cancers.
- Curative resection is the single most important factor determining the outcome in patients with pancreatic cancer.
Prognosis of Pancreatic Cancer
American Cancer Society Statistics

- 1 year relative survival rate – 20%
- 5 year survival rate – 4%
- In cases where surgical resection can be performed the average survival rate is 18 to 20 months and the 5 year survival rate is 10%.
- In cases in which tumor removal at the time of surgery is felt to be complete (R0) resection 5 year survival can be as high as 20 – 25%.
Anatomy of the Ampullary Region

Gallbladder

Duodenum

Pancreas

Common Bile Duct
Anatomy of the Pancreas and Duodenum
Periampullary Tumors

- A term to define a heterogeneous group of neoplasms arising from the head of the pancreas, the duodenum.
- The term should be distinguished from ampullary tumors in which the tumor is topographically centered in the region of the ampulla of Vater.
- Differentiating ampullary cancers from those arising from periampullary structures is clinically important because of the significant difference in their resectability and prognosis.
Periampullary Tumors

- Periampullary tumors may originate from the head of the pancreas, the ampulla of Vater, the distal common bile duct and the duodenum.
- These tumors are derived either from the epithelium, the connective tissue, the lymphoid tissue or the neuroendocrine cells in that anatomic region.
- As a group periampullary cancer account for >30,000 cancer related deaths per year in the US.
Ampullary and Periampullary Tumors

- Pancreatobiliary type carcinoma is morphologically indistinguishable from carcinoma of the pancreas and bile duct and usually shows desmoplastic stromal reaction.
- Although the mode of presentation and treatment options for ampullary and periampullary tumors are similar, their prognosis are quite different with that for adenocarcinoma of the pancreas being much worse than for the other tumors.
Prognosis of Periampullary and Ampullary Carcinomas – 5 yr survivals

- Duodenal carcinoma – 22% to 53%
- Ampullary carcinoma – 34% to 50%
- Distal cholangiocarcinoma – 24%
- Pancreatic adenocarcinoma – 5%

In ampullary and periampullary tumors - margin status, resected lymph node status and degree of tumor differentiation significantly influence outcome.
Pancreatic Cancer - Ultrasound
Pancreatic Cancer - MRI
Pancreatic Cancer – CT Scan
Pancreatic Cancer – CT Scan
Pancreatic Carcinoma - CT Scan
Ampullary Carcinoma
CT SCAN – Duodenal Carcinoma
PET SCAN – Duodenal Carcinoma
ULTRASOUND – Neuroendocrine Tumor
MRI – Neuroendocrine Tumor
ERCP – Distal Bile Duct Tumor
Autoimmune Pancreatitis - CT
Autoimmune Pancreatitis – PET Scan
Autoimmune Pancreatitis - ERCP
Autoimmune Pancreatitis – Postop ERCP
Main Duct IPMN of Pancreatic Head
Main Duct IPMN of Pancreatic Head
Main Duct IPMN of Pancreatic Head
IPMN of Uncinate Process of Pancreas
IPMN of Uncinate Process of Pancreas
World Health Organization Classification of Periampullary Tumors

Epithelial Tumors
a. Benign – Adenoma
b. Pre-malignant – Dysplasia
c. Malignant – Adenocarcinoma

Neuroendocrine Tumors
Carcinoids’ gangliocytic paraganglioma
WHO Classification of Tumors of the Periampullary Region

Stromal Tumors
a. Gastrointestinal Stromal Tumors (GIST)
b. Lipomas
c. Kaposi’s Sarcoma
d. Others

Malignant Lymphomas

Secondary Tumors

Hyperplastic Polyps, Adenomyomatous, Hyperplasia, Pancreatic Heterotopia
Signs and Symptoms of Periampullary Cancers

- Progressive weight loss
- Abdominal pain – midepigastric or right hypochondriac pain
- Back pain (advanced stages)
- Pruritis associated with jaundice
- Dyspepsia and vomiting
- Anorexia
- Diarrhea – absence of lipase within bowel
Signs and Symptoms of Perampullary Cancers

- Gastrointestinal bleeding
- Acute pancreatitis
- Courvoisier sign – Painless jaundice associated with palpable gallbladder
- Fever – Ascending cholangitis
- Hepatomegaly
- Migratory thrombophlebitis
Weight loss
Abdominal pain
Preoperative Diagnostic and Staging Modalities for Perampullary Tumors

- Ultrasound
- CT
- MRI
- Endoscopic ultrasound (EUS)
- Selective visceral angiography
- PET Scan
- Laparoscopy
Role of Preoperative Staging Modalities

- Tumor size and location
- Histologic diagnosis
- The presence or absence of hepatic or peritoneal metastasis or ascites
- Presence of extapancreatic tumor extension
- Presence or absence of suspicious lymph nodes in peripancreatic, periportal or celiac region with option of biopsy
- Vascular encasement – portal vein, SMA, SMV, hepatic artery
Staging of Periampullary Carcinoma

- Preoperative assessment should include investigations that are sensitive in detecting localized and potentially curable lesions.
- Preoperative assessment should be specific enough to maximally identify factors that render the tumor to be unresectable.
- The possibility of endoscopic stenting to relieve obstructive jaundice symptoms justifies appropriate patient selection to avoid needless laparotomies in patients with unresectable lesions.
Complication of ERCP
Complication of ERCP
Transhepatic Cholangiogram
Complications of ERCP
Complication of ERCP
Accurate staging is important for selecting patients with ampullary and periampullary carcinoma in whom surgery is contemplated with curative intent.

Whipple procedure - pancreaticoduodenectomy is the usual operation of choice.
History of Major Pancreatic Surgery

“God placed the pancreas at the back (in the retroperitoneum) so that surgeons don’t mess with it.”

- Halsted in 1898 was the first who attempted successful local resection of a periampullary carcinoma – patient died 7 months later with recurrent tumor.
- The first resection for a periampullary cancer was performed by the German surgeon Walther Kausch in 1909 and described by Kausch in 1912.
History of Major Pancreatic Surgery

- Cordivilla - first to perform en block removal of the entire duodenum with the head of the pancreas for periampullary cancer.
- Kausch – performed the first such resection that was successful using a two stage procedure.
- The one stage pancreaticoduodenectomy was described independently by Whipple in 1935 and Brunschwig in 1937.
History of Major Pancreatic Surgery

• Whipple Procedure – One stage pancreatoduodenectomy performed by Allen Whipple in 1935.
• En bloc removal of the distal segment (antrum) of the stomach, the 1st and 2nd portions of the duodenum, the head of the pancreas, the common bile duct, and the gallbladder.

The head of the pancreas and the duodenum share the same arterial blood supply (the gastroduodenal artery); so that both organs must be removed if this single blood supply is severed.
Pancreateicoduodenectomy in Modern Medicine

• Very similar to Whipple’s original procedure
• Reconstruction consists of attaching the pancreas to the jejunum (pancreateico-jejunoostomy); attaching the hepatic duct to the jejunum (hepaticojejunoostomy) and attaching the stomach to the jejunum (gastro-jejunostomy).
• Whipple originally used the sequence: bile duct, pancreas, and stomach, whereas presently the common method of reconstruction is pancreas, bile duct, and stomach – Child’s operation.
Pylorus-Sparing Pancreateico-duodenectomy

- More recently many surgeons have converted to using the pylorus-sparing pancreateico-duodenectomy (Traverso-Longmire procedure/PPPD).
- Pylorus and normal gastric emptying is preserved.
- Initially questioned – Is it an adequate oncologic operation?
- Patients benefit from improved weight gain.
Pyloric Sparing Whipple Procedure
Standard Whipple Procedure

- Common hepatic duct
- Tail of pancreas
- Gastrojejunostomy
Prospective randomized multicenter study in 2004 compared standard Wipple procedure to PPPD to treat suspected periampullary cancer.

- The study found no significant difference in median blood loss (2.0 L) or duration of surgery (300 min).
- Delayed gastric emptying was equal in the 2 groups.
- At 115 months survival rates were equal in the 2 groups.

Pylorus-sparing pancreatico-duodenectomy (PPPD) vs standard Whipple procedure

- A systematic review and meta-analysis published in 2007 (6 trials, 574 patients) showed that operative time for PPPD was 72 minutes faster with 284 ml less blood loss compared to standard Whipple. PPPD required 0.66 fewer units of blood transfusions.

Another systematic review and meta-analysis published in 2007 showed no statistically significant difference in morbidity, hospital mortality, or survival between PPPD and standard Whipple procedure.

Operative time and intraoperative blood loss was greater in patients undergoing SW.

Pylorus-sparing pancreaticoduodenectomy (PPPD) vs. standard Whipple procedure

- A meta-analysis published in 2008 including 2822 patients (1335 SW and 1487 PPPD).
- Patients undergoing PPPD had a shorter operative time and required less blood transfusions compared to the SW group.
- There were no differences in postoperative complications or survival rates between the two groups.

Iqbal et al; European J of Surgical Oncology 34 (11): 1237-45.
Pancreaticoduodenectomy vs Total Pancreatectomy

- Total pancreatectomy eliminates the morbidity and the risk of leak from the pancreaticojejunostomy.
- Removes entire pancreas and eliminated risk of tumor recurrence from close surgical resection margins or multifocal disease.
- Patients are often rendered brittle diabetic after this operation.
- Clinical trials have failed to demonstrate a significant survival benefits from total pancreatectomy.
Whipple Procedure
Pyloric Sparing Whipple Procedure
Whipple Procedure
Vascular Anatomy

Superior Mesenteric and Portal veins

Superior Mesenteric artery
Whipple Procedure – Portal Vein
Concomitant Vascular Reconstruction During Pancreatectomy For Malignancy

- Patients who underwent pancreatic resection with RV were at higher risk of intraoperative complications.
- Among the 25% of hospitals with the highest surgical volumes patients who underwent pancreatic resection with RC had significantly higher rates of postoperative complications and mortality than patients without VR.
Concomitant Vascular Reconstruction During Pancrearectomy For Malignancy

- The frequency of VR increased from less than 1% in 2001 to greater than 6% in 2009.
- At some hospitals the mean charge for patients undergoing pancreatectomy with VR is about $200,000.
- “What is the value of such treatment?”
- Head to head studies are needed in locally advanced cases comparing pancreatectomy with VR vs patients receiving chemotherapy or chemoradiation therapy.

Whipple Procedure
Pancreaticojejunostomy
Whipple Procedure
Hepaticojejunostomy
Whipple Procedure
Completed Reconstruction
Surgical Complexities of the Whipple Procedure

- Evaluating For Metastatic Disease
- Can the portal vein; the SMV, the hepatic artery, and the SMA be cleared?
- Should a portal vein resection be considered?
- Pylorus sparing vs Classic Whipple procedure?
- How should the pancreatic anastamosis be performed – ductal mucosal anastamosis vs envagination of the pancreas?
- Should the duodenojejunostomy be performed retrocolic vs antecolic?
Postoperative Complication of Whipple Procedure

- Pancreatic fistula – leak from the pancreaticejejunostomy
- Delayed gastric emptying
- Septic complications – intraabdominal abscess
- Abdominal hemorrhage
- Development or worsening of diabetes
- Medical problems – respiratory distress, pneumonia, pulmonary embolus, thromboembolic complications(DVT), renal dysfunction, MI and cerebrovascular accidents, hepatic and metabolic problems.
American College of Surgeons
National Surgical Quality Improvement Program

Semiannual Report, January 2013
Dates of Surgery: July 1, 2011 – June 30, 2012
Sacred Heart Medical Center
Number of Sites by State, Region, and Country Included in the January 2013 SAR (358)

*ACS NSQIP Adult*

- **CANADA 25**
- **UNITED ARAB EMIRATES 1**
- **LEBANON 1**
- **UNITED STATES 330**
- **WEST 83**
- **MIDWEST 74**
- **NORTHWEST 82**
- **SOUTH 91**
- **UNITED KINGDOM 1**
TARGETED – GENERAL: 15 Pancreatectomy, 239 Colectomy, 50 Proctectomy, 104 Bariatric, 8 Hepatectomy
### Sacred Heart Whipple Results

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Whipple Procedures – Personal Results

- 1986 to 2013 - 146 cases. 122 pyloric sparing; 24 classic Whipple procedures
- 2 perioperative deaths.
- Average LOS – 8.2 days
- Average blood loss 1010 cc.
- 6 pancreatic leaks; 2 required reoperation; 4 treated with percutaneous drainage.
- 2 patient required reoperation for bleeding.
- 10% of patients experienced delayed gastric emptying which responded to bowel rest and NG drainage.
Conclusions

- There is an increasing incidence of pancreatic cancer.
- There are varying prognoses and resectability rate for the different histologic types of periampullary tumors; many of these tumors have a more favorable prognosis than pancreatic adenocarcinoma and should be treated aggressively.
- Surgical treatment for periampullary cancer has evolved and can be offered with lower mortality rates and less morbidity.