Postoperative Pancreatic Fistulæ
Brooklyn VA Medical Center

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Case #1

- 68 y/o male with asymptomatic 4 cm adenocarcinoma in 2nd and 3rd portion of duodenum found on EGD for recurrent H. pylori gastritis

- Colonoscopy – wnl

- PMH – HTN, DM, depression
Preop Labs

- Preop labs
- HCT – 41
- Coags - wnl
- LFTs - wnl
- Albumin – 4.6
Whipple (5/19/10)

- 12 hours
- IVF – 7500
- Transfusion – 1 unit PRBCs
- EBL – 1000 cc
- Urine – 700 cc
- JP x 1
ISGPS Pancreatic Anastomosis Classification

• Pancreatic remnant
  – I (duct size <3 mm)
  – A (soft or normal pancreas)
  – PM1 (mobilization of pancreatic remnant <1 cm)

• Pancreatic Anastomosis
  – I (pancreaticojejunostomy)
  – A (duct to mucosa)
  – S1 (internal pancreatic duct stent)
Hospital Course

- POD#1 – extubated
- POD#5 – JP fluid amylase 46
- POD#1-7 – fevers to 101.8, tachycardia to 120
- POD#7 – decompensated, CT abd/pelvis showed moderate pelvic fluid collection
- POD#8 – exploratory laparotomy, drainage, TPN started
- POD#16 - extubated
Hospital Course

• POD#15-23 – octreotide
• POD#33 – started J tube feeds and clears
• POD#37 – started regular diet
• POD#38 – JP drains removed
• POD#48 – awaiting D/C home with VNS
ISGPF Grade C postoperative pancreatic fistula

- Ill appearing
- CT scan positive
- Persistent drainage after 3 weeks
- Reoperation
- Signs of infection
- Sepsis
Clavien-Dindo Classification of Surgical Complications

- Grade IVb – respiratory failure and hemodynamic instability on POD#7
Case #2

• 75 y/o male with 3 cm ulcerated submucosal lesion in 1st portion of duodenum found on EGD for anemia and 20 lb weight loss over 3 months, FNA showed adenocarcinoma

• Colonoscopy – 3.5 cm cecal tubulovillous adenoma

• PMH – HTN, DM, DVT/PE s/p IVC filter
• PSH – n/a
Preop Labs

- Preop labs
- HCT – 38%
- Coags - wnl
- LFTs - wnl
- Albumin – 4.4
Whipple (5/27/10)

- 12 hours
- IVF – 10500
- Transfusion – none
- EBL – 700 cc
- Urine – 1200 cc
- JP x 2
ISGPS Pancreatic Anastomosis Classification

- Pancreatic remnant
  - I (duct size <3 mm)
  - A (soft or normal pancreas)
  - PM1 (mobilization of pancreatic remnant <1 cm)

- Pancreatic Anastomosis
  - I (pancreaticojejunostomy)
  - A (duct to mucosa)
  - S0 (no stent)
Hospital Course

- POD#1 – extubated
- POD#4 – started J tube feeds
- POD#11 – start PO diet
- POD#11 – fluid amylase >9000
- POD#24-30 – octreotide given
- POD#37 – discharged home with JP drains
ISGPF Grade B postoperative pancreatic fistula

- Often well clinical condition
- Persistent drainage after 3 weeks usually
- No Reoperation
- No Sepsis
Clavien-Dindo Classification of Surgical Complications

• Grade II – octreotide for persistent pancreatic fistula
Postoperative Pancreatic Fistulae

- Whipple
- The Clavien-Dindo Classification
- Complications of Whipple
- Postoperative pancreatic fistula: ISGPF
- Risk Factors for Clinically Relevant Fistulae
- Management of pancreatic fistulas
- Pancreatic anastomoses: ISGPS
- Preventing pancreatic fistulas
The Clavien-Dindo Classification of Surgical Complications

The Clavien-Dindo Classification of Surgical Complications

- I – no need for pharmacological treatment or surgical, endoscopic and radiological interventions
- II – pharmacological treatment
- III – surgical, endoscopic or radiological intervention (a – no GA, b – GA)
- IV – life-threatening complication (a – single organ, b – multi organ dysfunction)
- V - death

Complications of Whipple (n=650)

None – 59%

- Delayed Gastric Emptying – 41%
- Pancreatic Fistula – 19%
- Wound Infection – 14%
- Intra-abdominal Abscess – 5%
- Cholangitis – 5%
- Pneumonia – 3%
- Bile leak – 3%
- Pancreatitis – 2%
- Marginal Ulcer – 1%

“No attempt should be made to reestablish the continuity of the duodenum or of the pancreas with the intestine.”
Postoperative pancreatic fistula: An international study group (ISGPF) definition

POPFD Definition

A drain output of any measurable volume of fluid on or after postoperative day 3 with an amylase content greater than 3 times the serum amylase activity.

# POPF Grading

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Conditions</td>
<td>Well</td>
<td>Often Well</td>
<td>Ill Appearing / Bad</td>
</tr>
<tr>
<td>Specific Treatment</td>
<td>No</td>
<td>Yes / No</td>
<td>Yes</td>
</tr>
<tr>
<td>US / CT</td>
<td>Negative</td>
<td>Negative / Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Persistent drainage</td>
<td>No</td>
<td>Usually Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Reoperation</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Death</td>
<td>No</td>
<td>No</td>
<td>Possibly Yes</td>
</tr>
<tr>
<td>Signs of infection</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sepsis</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Readmission</td>
<td>No</td>
<td>Yes / No</td>
<td>Yes / No</td>
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Risk Factors for Clinically Relevant Fistulae in Pancreaticoduodenectomy

- Soft Gland Texture (OR = 3.28)
- Ampullary, Duodenal, Cystic, Islet Cell (OR = 2.82)
- Pancreatic Duct Diameter (OR = 1.68 per 1 mm decrease)
- Intraoperative Blood Loss > 1 liter (OR = 8.67)

Risk of Increasing Risk Factors

Clinically relevant fistulae

number of risk factors

0 1 2 3 4

0% 20% 40% 60% 80% 100%

Impact of increasing number of risk factors for pancreatic fistulae

• Therapeutic intervention
  – Antibiotics
  – Blood transfusion
  – Supplemental nutrition

• Discharge disposition
  – Rehabilitation services vs. Home

• Hospital duration

Incidence of Pancreatic fistula, leak, or Abscess after Pancreatico-duodenectomy by lesion location

- Pancreas – 14%
- Bile Duct – 41%
- Ampulla – 29%
- Duodenum – 26%

Management of postpancreatectomy fistula, leak, and abscess

158 patients with postoperative collections

*16 Patients: Surgically placed JP controlled complication
26 patients: Reoperation for fistula, leak, or abscess
133 patients had percutaneous drainage procedures

16 operation alone (early reoperation)

10 IR drain prior to reoperation (late reoperation)

7 IR drain after reoperation

Toward improving uniformity and standardization in the reporting of pancreatic anastomoses: A new classification system by the International Study Group of Pancreatic Surgery (ISGAPS)
Pancreatic Remnant

- **Type (Main Pancreatic Duct Size)**
  - I - <3 mm
  - II – 3-8 mm
  - III - >8mm
- **Add (Gland Texture)**
  - A – soft or normal pancreas
  - B – Firm-hard or fibrotic pancreas
- **Mobilization of pancreatic remnant**
  - PM1 – <1 cm
  - PM2 – 1-2 cm
  - PM3 - >2 cm

Pancreatic Anastomosis

• **Type**
  - I - Pancreatojejunostomy
  - II – Pancreatogastrostomy
  - III – any other variation

• **Add**
  - A – Duct to mucosa
  - B – Dunking / invagination
  - S0 – no stent
  - S1 – internal pancreatic duct stent
  - S2 – external pancreatic stent
  - S3 – other types of stents

• **Performance of anastomosis**
  - Suture used
  - Suture size
  - Suture technique
  - also prophylactic octreotide, fibrin glue sealant, omental wrapping

**Pancreaticogastrostomy**

<table>
<thead>
<tr>
<th>Easy to perform</th>
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<tbody>
<tr>
<td>Stomach lies in front of pancreatic stump</td>
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<tr>
<td>No lumenal discrepancy in size with pancreatic remnant</td>
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<tr>
<td>Less prone to ischemia because of gastric vascular supply</td>
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<tr>
<td>Exocrine enzymes enter acidic environment</td>
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<tr>
<td>Low pH prevents complete activation</td>
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<tr>
<td>Lower leak rate because the enzymes don’t get activated</td>
</tr>
<tr>
<td>Alkaline pancreatic secretions protect gastrojejunalostomy from marginal ulcer</td>
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<tr>
<td>Single loop of jejunum for gastric and biliary anastomosis</td>
</tr>
<tr>
<td>Two, not three anastomoses to single loop</td>
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<tr>
<td>Less chance of kinking</td>
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Pancreaticogastrostomy vs Pancreaticojejunostomy

- Yeo 1995 (Baltimore, MD – Single center)
  - 73 PG, 72 PJ
  - no difference in fistula

- Duffas 2005 (French Association for Research in Surgery – Multicenter)
  - 81 PG, 68 PJ
  - no difference in fistula

- Bassi 2005 (Verona, Italy – Single center)
  - 59 PG, 82 PJ
  - no difference in fistula