Pancreatic Pseudocysts

Eric Rellinger
October 3, 2012
Vanderbilt General Surgery
Overview

- Pancreatitis (Acute, Necrotizing, Chronic)
- Pancreatic Pseudocysts
  - Clinical Presentation
  - Diagnostic Evaluation
  - Therapeutic options
  - Management
Acute pancreatitis

- 200,000 cases of acute pancreatitis per year
- Management focuses on maximizing tissue oxygen perfusion and pain control
- Scoring systems are available
- Severe acute pancreatitis: Ransom score >3 or Apache II score > 8
- Acute pancreatitis < Severe acute pancreatitis < Necrotizing acute pancreatitis < Infected necrotizing pancreatitis

<table>
<thead>
<tr>
<th>Table 1: Commonly used scoring systems: Advantages and disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
</tr>
<tr>
<td>Ranson's criteria on admission</td>
</tr>
<tr>
<td>Apache II</td>
</tr>
<tr>
<td>BISAP</td>
</tr>
<tr>
<td>CTSI</td>
</tr>
</tbody>
</table>

WBC, White blood cell count; LDH, lactate dehydrogenase; AST, aspartate aminotransferase; Hgb, hemoglobin; Ca, Serum calcium; SIRS, systemic inflammatory response syndrome; BUN, blood urea nitrogen
Necrotizing Pancreatitis

- Diagnosis based on opacification of pancreatic tissue during a CT scan with IV contrast
- Necrotic tissue indistinguishable from inflamed tissue for first 72-96h
- More necrosis correlates with likelihood of infection
- Infected necrosis diagnosed by the presence of gas or FNA cultures
- Clinical condition guides intervention
- Attempt to delay operative intervention to permit demarcation of necrosis and compartmentalization of infection
Chronic pancreatitis

- The histologic hallmark of chronic pancreatitis is the persistent inflammation and irreversible fibrosis associated with atrophy of the pancreatic parenchyma
- Associated with chronic pain and endocrine (HgA1C) and exocrine insufficiency (fecal elastase); may be associated with jaundice, persistent N/V
- CT useful for diagnosis; ERCP - gold standard for defining ductal anatomy - should be considered a therapeutic modality for ductal complications
Pancreatic pseudocysts

- Pancreatic pseudocyst: persistent, post-inflammatoty fluid collections, containing enzyme-rich fluid, surrounded by a thick, mature wall
- Lack an epithelial lining
- Generally occur in the setting of pancreatitis or external trauma
- Traditionally, a pseudocyst was defined as any fluid collection that persisted for longer than 4-6 weeks
Clinical Presentation of Pseudocysts

- Intraparenchymal vs. peripancreatic
- Asymptomatic vs. symptomatic
- Symptomatology:
  1) failure to clinically progress (5-7 days)
  2) abdominal pain,
  3) GI dysmotility (early satiety, nausea, vomiting, obstruction)
  4) biliary obstruction
  5) pancreatic ascites/effusion
  6) hemorrhage
Pathophysiology

- Most common etiology: EtOH, gallstones, trauma, iatrogenic
- Acute episode: normal pancreatic duct, ductal disruption heals spontaneously
- Pancreatic necrosis: necrosis, organization, liquification; may also connect with main duct
- Chronic pancreatitis: pancreatic parenchymal fibrosis, irregularity leads to elevated intraductal pressure leading to disruption of an obstructed duct
Diagnostic Evaluation

- **US**: cost-effective, limited in evaluation of pancreas and retroperitoneum
- **CT**: primary modality used for the evaluation of cystic pancreatic lesions
- **MRI**: may distinguish cystic neoplasm from pseudocyst
- **MRCP**: noninvasive, permit duct visualization; less sensitive as duct may be obscured by pseudocyst
- **ERCP**: invasive, may exacerbate pancreatitis or seed sterile collection with GI flora
- **EUS/FNA**: assess pancreatic enzymes, cytology, tumor and genetic markers, mucin; risk of contaminating sterile collections
- **Ductography**: useful intraoperatively or with surgically or percutaneous drains
Therapeutic Options

- Open vs. laparoscopic procedures:
  a. Cystic drainage procedures:
     1) Cystogastrostomy, 2) Cystoduodenostomy, 3) Roux-en-Y cystojejunostomy
  b. Ductal drainage procedures:
     1) Peustow, 2) Frey, 3) Beger
  c. Resection:
     1) distal pancreatectomy +/- splenectomy, 2) cyst resection

- Endoscopic:
  1) endoscopic cystogastrostomy, 2) endoscopic cystoduodenostomy 3) transpapillary stent placement

- Percutaneous drainage- less invasive, risks prolonged drainage, bacterial colonization
Cystogastrostomy
Cystojejunostomy
Puestow (longitudinal pancreaticojejunostomy)
Beger/Frey Procedures

Beger Procedure

Frey Procedure
Management

- Treatment is driven by symptomatology
  - Traditionally, pseudocysts were treated if persisting beyond 6wks citing 50% risk of complications
  - Pseudocysts continue to spontaneously resolve for up to a year (complication rate=10%)
  - Larger pseudocysts (>6cm), less likely to resolve but may be safely watched in the absence of symptoms
- Little data exists on the appropriate interval for repeat imaging (most reimaged in 3-6mos)
Management- Important Considerations

1) Etiology of pancreatitis

2) Maturity of pseudocyst wall

3) Relationship to solid organs/vasculature

4) Pancreatic duct anatomy

5) Clinical stability
Etiology of Pancreatitis

- Acute Pancreatitis- first-line therapy endoscopic intervention; isolated cysts may be amenable to percutaneous drainage
- Pancreatic necrosis- attempt to delay operative management to permit areas of necrosis to organize; internal drainage seldom appropriate in context of infection
- Chronic pancreatitis- management of the pseudocyst alone is seldom effective; tailor therapy to ductal anatomy/drainage

**infected pseudocysts are classically drained externally**
**Traditionally, pseudocyst fibrous wall was presumed to have matured within 4-6 weeks from the inciting event**
Relationship to solid organs/vasculature
Pancreatic duct communication
A Unifying Concept: Pancreatic Ductal Anatomy Both Predicts and Determines the Major Complications Resulting from Pancreatitis

William H Nealon, MD, FACS, Manoop Bhutani, MD, Taylor S Riall, MD, FACS, Gottumukkala Raju, MD, Orhan Ozkan, MD, Ryan Neilan, MD

- Single center retrospective case series 563 pts with pseudocysts (1985 to 2006)
- Goal to utilize pancreatic ductal anatomy to predict course and direct therapies
- Policy of routine evaluation of pancreatic duct anatomy (ERCP, MRCP, ductogram) was used pts with acute or chronic pancreatitis and pseudocysts
- ERCP was performed 24h prior to intervention; MRCP limited by sensitivity
- Operative intervention indicated for persistent symptomatic cysts, hemorrhage, infection, rupture, or obstruction
- Subgroup analysis of severe acute pancreatitis were included (Ranson >5, evidence of necrosis, Balthazaar grade III or IV, or organ failure)
- Attempt to delay intervention 4 weeks in severe or necrotizing pancreatitis; utilized large bore percutaneous drains for temporization/treatment
- Success of intervention- no recurrence of pseudocyst on follow-up imaging
- Outcomes- relief of pain, resumption of PO intake, LOH, readmission, need for critical care, need for operative debridement, success of percutaneous drainage
Nealon’s Classification
A Unifying Concept: Pancreatic Ductal Anatomy Both Predicts and Determines the Major Complications Resulting from Pancreatitis

William H Nealon, MD, FACS, Manoop Bhutani, MD, Taylor S Riall, MD, FACS, Gottumukkala Raju, MD, Orhan Ozkan, MD, Ryan Neelan, MD

Table 4. Distribution of Ductal Categories and Frequency of Spontaneous Resolution of Pseudocysts

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type I</th>
<th></th>
<th>Type II</th>
<th></th>
<th>Type III</th>
<th></th>
<th>Type IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Initial diagnosis pseudocyst (n = 563)</td>
<td>152</td>
<td>27</td>
<td>128</td>
<td>23</td>
<td>130</td>
<td>23</td>
<td>153</td>
<td>27</td>
</tr>
<tr>
<td>Spontaneous resolution (n = 142)</td>
<td>132</td>
<td>87</td>
<td>6</td>
<td>5*</td>
<td>0*</td>
<td>0</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Persistent pseudocyst (n = 421)</td>
<td>20</td>
<td>13</td>
<td>122</td>
<td>95*</td>
<td>130</td>
<td>100*</td>
<td>149</td>
<td>97</td>
</tr>
</tbody>
</table>

*Statistically significant difference between type I and type II.
†Statistically significant difference between type I and type III.

* Ductal anatomy predicts persistence of pseudocysts
A Unifying Concept: Pancreatic Ductal Anatomy Both Predicts and Determines the Major Complications Resulting from Pancreatidis

William H Nealon, MD, FACS, Manoop Bhutani, MD, Taylor S Riall, MD, FACS, Gottumukkala Raju, MD, Orhan Ozkan, MD, Ryan Neilan, MD

Table 4. Distribution of Ductal Categories and Frequency of Spontaneous Resolution of Pseudocysts

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type I</th>
<th></th>
<th>Type II</th>
<th></th>
<th>Type III</th>
<th></th>
<th>Type IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Initial diagnosis pseudocyst</td>
<td>152</td>
<td>27</td>
<td>128</td>
<td>23</td>
<td>130</td>
<td>23</td>
<td>153</td>
<td>27</td>
</tr>
<tr>
<td>Spontaneous resolution (n = 142)</td>
<td>132</td>
<td>87</td>
<td>6</td>
<td>5*</td>
<td>0†</td>
<td>0</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Persistent pseudocyst (n = 421)</td>
<td>20</td>
<td>13</td>
<td>122</td>
<td>95*</td>
<td>130</td>
<td>100†</td>
<td>149</td>
<td>97</td>
</tr>
</tbody>
</table>

*Statistically significant difference between type I and type II.
†Statistically significant difference between type I and type III.

* Ductal anatomy predicts persistence of pseudocysts
A Unifying Concept: Pancreatic Ductal Anatomy Both Predicts and Determines the Major Complications Resulting from Pancreatitis

William H Nealon, MD, FACS, Manoop Bhutani, MD, Taylor S Riall, MD, FACS, Gottumukkala Raju, MD, Orhan Ozkan, MD, Ryan Neilan, MD

Table 5. Success Rates for Percutaneous Drainage of Patients with Pseudocysts Segregated by Duct Category. Frequency of Episodes of Sepsis and Duration of Drainage

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type I (n = 20)</th>
<th>Type II (n = 122)</th>
<th>Type III (n = 130)</th>
<th>Type IV (n = 149)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percutaneous drainage attempted (n = 162), n</td>
<td>18/20</td>
<td>53/122</td>
<td>71/130</td>
<td>20/149</td>
</tr>
<tr>
<td>Persistent fistula after PD/failed PD, n (%)</td>
<td>3/18 (17)</td>
<td>27/55 (51)*</td>
<td>71/71 (100)†</td>
<td>20/20 (100)</td>
</tr>
<tr>
<td>Episodes of sepsis after PD, n (%)</td>
<td>0/18</td>
<td>34/53 (64)*</td>
<td>64/71 (90)†</td>
<td>6/20 (30)</td>
</tr>
<tr>
<td>Duration of drainage, d, mean ± SEM</td>
<td>11.4 ± 6.1</td>
<td>27.4 ± 14.1</td>
<td>69.7 ± 13.6†</td>
<td>22.1 ± 9.3</td>
</tr>
</tbody>
</table>

*Statistically significant difference between type I and type II.
†Statistically significant difference between type I and type III.
PD, percutaneous drainage.

**Normal ductal anatomy predicts success with percutaneous pseudocyst drainage**
Operative debridement was required in 70% of patients with severe pancreatitis, more than twice as frequently in type II and III (83-85%) vs. type I (39%).
A Unifying Concept: Pancreatic Ductal Anatomy Both Predicts and Determines the Major Complications Resulting from Pancreatitis

William H Nealon, MD, FACS, Manoop Bhutani, MD, Taylor S Riall, MD, FACS, Gottumukkala Raju, MD, Orhan Ozkan, MD, Ryan Neilan, MD

Table 7. Patients with Severe Necrotizing Pancreatitis in Longterm Followup Segregated by Duct Category

<table>
<thead>
<tr>
<th>Variable</th>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
<th>Type IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Severe pancreatitis (n = 174)</td>
<td>56/174</td>
<td>32</td>
<td>47/174</td>
<td>27</td>
</tr>
<tr>
<td>Operative debridement (121/174, 70%)</td>
<td>22/56</td>
<td>39</td>
<td>39/47</td>
<td>83*</td>
</tr>
<tr>
<td>Persistent fistula after operative drainage (78/121, 64%)</td>
<td>6/22</td>
<td>27</td>
<td>21/39</td>
<td>54</td>
</tr>
<tr>
<td>Recurrent sepsis after resolved severe pancreatitis (44/174, 25%)</td>
<td>0/56</td>
<td>0</td>
<td>17/47</td>
<td>36*</td>
</tr>
<tr>
<td>Recurrent pancreatitis after resolved necrotizing pancreatitis (96/174, 55%)</td>
<td>4/56</td>
<td>7</td>
<td>29/47</td>
<td>62*</td>
</tr>
</tbody>
</table>

*Statistically significant difference between type I and type II.
Statistically significant difference between type I and type III.

** Ductal narrowing/disconnection predicts recurrent pancreatitis and sepsis
When to evaluate ductal anatomy?

- Ductal anatomy is not utilized in the setting of hemorrhage and plummeting clinical status
- Most pseudocysts resolve in the first 4-6wks
- ERCP- invasive, risk of recurrent pancreatitis and infecting sterile pancreatic fluid collections
- ERCP should only be completed with intervention planned within the subsequent 48h
- MRCP- noninvasive, less sensitive, improved ductal visualization s/p cyst drainage
Therapy directed by ductal anatomy

- Type Ia
- Type Ib
  - Nonoperative (percutaneous vs. endoscopic)
- Type IIa
- Type IIb
  - Transpapillary stent vs. operative resection or drainage (duct vs. cyst)
- Type IIIa
- Type IIIb
  - Operative resection or drainage (duct vs. cyst)
- Type IVa
- Type IVb
  - Endotherapy (stent, stone extraction, lithotripsy) vs. operative ductal drainage/pancreatic head resection
Summary

- Pancreatic pseudocysts are persistent, post-inflammarory fluid collections, containing enzyme-rich fluid, surrounded by a thick, mature wall
- Intervention is driven by symptomatology
- Multidisciplinary approach to management (Surgery, Interventional Radiology, Gastroenterology)
- Therapeutic options include: percutaneous, endoscopic, laparoscopic, and open surgical approaches
- Persistent, refractory fluid collections/fistulas likely reflect main duct disruption
- Ductal anatomy is a key driver of successful therapeutic management of persistent pseudocysts