MANAGEMENT OF PANCREATIC FLUID COLLECTIONS

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GOALS AND OBJECTIVES

• Review the pathophysiology of pancreatic fluid collections

• Learn ACCURATE classification of pancreatic fluid collections (PFC)

• Review basic management of PFCs

• Understand the various drainage techniques available

• Review basics of endoscopic cystgastrostomy and necrosectomy

• Understand the stents / tools needed for PFC management

• Review management of pancreatic ductal disruption
PANCREATITIS IS RELEVANT

• In 2009 it was the most common GI discharge diagnosis

• Cost: 2.6 billion dollars / year

• Increase in prevalence and hospital admission in 15 years

• 1988 → 40/100,000 admissions

• 2003 → 70/100,000 admissions

COMPLICATIONS OF PANCREATITIS

- Organ failure / sepsis

- Necrotizing pancreatitis (sterile or infected)

- Pancreatic duct leak / disruption
  - Associated with more severe pancreatitis
  - Can lead to pancreatic fluid collections

- Pancreatic fluid collections (5-15% of patient w/pancreatitis)
  - Pseudocysts
  - Walled of Necrosis
HOW DO COLLECTIONS FORM?
### ATLANTA CLASSIFICATION OF PANCREATIC FLUID COLLECTIONS

<table>
<thead>
<tr>
<th></th>
<th>Material In Collection</th>
<th>Presence of Defined Wall</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Early (Usually &lt; 4 weeks)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acute PFC</td>
<td>Fluid</td>
<td>No</td>
</tr>
<tr>
<td>Acute Necrotic Collection</td>
<td>Solid +/- Fluid</td>
<td>No</td>
</tr>
<tr>
<td><strong>Late (Usually &gt; 4 weeks)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pseudocyst</td>
<td>Fluid</td>
<td>Yes</td>
</tr>
<tr>
<td>Walled-off Necrosis</td>
<td>Solid +/- Fluid</td>
<td>Yes</td>
</tr>
</tbody>
</table>

A) Acute pancreatic fluid collection
- No well defined wall
- Homogenous
- Contains fluid material
- Resolve spontaneously

A) Acute Necrotic Collection
- No well defined wall
- Heterogenous
- Solid and fluid material

**LESS THAN 4 WEEKS**
A) Pseudocyst
- Well defined wall
- Contains fluid material
- Homogenous

A) Walled-off Necrosis
- Well defined wall
- Solid and liquid material
- Heterogeneous

**GREATER THAN 4 WEEKS**
IDEAL IMAGING MODALITY

• Important to determine Pseudocyst vs. WON
• Radiologic characteristics for WON
  • Larger size
  • Extension to paracolic or retrocolic space
  • Irregular border
  • Fat attenuation / debris in the PFC
  • Presence of pancreatic ductal discontinuity
• Contrast-enhanced CT is most common for PFCs
• MRI is better than CT to quantify solid debris / necrosis
• MRCP is highly sensitive for PD disruption
• EUS can estimate fluid-to-debris component

PSEUDOCYST MANAGEMENT

• SIZE DOES NOT MATTER!

• Most fluid collections resolve within 7-10 days

• Asymptomatic pseudocysts do NOT require intervention

• Symptomatic pseudocysts should be drainaged
  • Continued pain
  • Biliary obstruction
  • Gastric outlet obstruction
  • Infection

• Drainage options: Percutaneous, Surgical, Endoscopic

NECROTIZING PANCREATITIS

• Most patients don’t require aggressive intervention

• Antibiotics in STERILE necrosis are NOT recommended

• Give antibiotics for INFECTED necrosis
  • Carbapenems → Dec M&M / need for surgery
  • 64% improve with antibiotics alone
  • CT guided FNA of necrosis not routinely recommended

• Walled off Necrosis (well defined wall)
  • Drain if: pain, infection, gastric / biliary obstruction, general unwellness
  • Drainage / debridement should be delayed for 4 WEEKS

• Drainage options: Percutaneous, Surgical, Endoscopic

BEST METHOD OF DRAINAGE?

• Endoscopic vs. Radiological Drainage\textsuperscript{1}:
  – Similar technical success rate and adverse events
  – Endoscopic: Lower Re-intervention, shorter length of stay, decreased imaging studies required

• Endoscopic vs. Surgical Drainage\textsuperscript{2}
  – Comparable in treatment success and re-interventions
  – Endoscopic: Shorter length of stay, Lower cost, Improved mental/physical health

• Endoscopic: Lower cost, Decreased LOS, Least Invasive

ENDOSCOPIC CYSTGASTROSTOMY

Diagram showing the location of a pseudocyst in the pancreas and the cystogastrostomy, where pancreatic juice drains from the pseudocyst.
73 y/o F w/pmhx of HTN, CAD, and DM is admitted with gallstone pancreatitis. Patient is treated conservatively for pancreatitis and eventually undergoes ERCP for removal of bile duct stones. Over the course of several weeks patient develops necrotizing pancreatitis and eventually walled off pancreatic necrosis. She reports significant pain, inability to tolerate any PO intake and general unwellness.
WON: 17CM X 7CM X 6CM
ENDOSCOPIC METHODS

• Conventional drainage
  • Requires endoscopic visualization of extraluminal bulge
  • Cyst puncture with needle knife and fistula formation
  • Cannot account for intervening vessels
  • Cannot be done without bulge (up to 40% of collections)

• EUS guided drainage
  • Can be performed in absence of extraluminal bulge
  • Can avoid vascular structures with Doppler flow
  • Can determine presence of solid debris (WON vs. pseudocyst)
  • PREFERRED DRAINAGE METHOD
PRE-PROCEDURE PREPARATION

- PRE-PROCEDURE ANTIBIOTICS
- Hold anticoagulants / antiplatelets
- Fluoroscopy
- EUS Linear Scope – 180 series
- 19G FNA needle
- Suction syringe
- Long 0.035 in guidewire
- Sohendra Dilator or Hurricane / TTS dilation balloon
- Needle knife
- Stents: Fully covered metal stent & Double pigtail stents
- Use CO2
- Adequate back up is KEY (Surgery and IR)
19G NEEDLE PUNCTURES CYST
STYLET REMOVED

- Stylet is completely removed
- Suction syringe attached
- Fluid is aspirated
  - CEA
  - Amylase
  - Cell count
  - Gram stain / culture
- Wire inserted into EUS needle
GUIDEWIRE COILED INTO CYST
BALLOON DILATION OF TRACT
STENT PLACEMENT
STENT PLACEMENT
CYSTGASTROSTOMY

Varadarajulu: https://www.youtube.com/watch?v=wSxg8hlOVXg
WHAT IS THE BEST STENT?

• Plastic stents
  – Typically use two double pigtail stents
  – Do not migrate
  – Up to 90% effective

• Fully Covered Self-Expanding Metal Stents (FCEMS)
  – Expensive
  – Larger diameter
  – 90 to 100% technical success rate
  – 78 to 98% clinical success rate
  – Up to 15% complications: stent migration, bleeding, perforation

Original Article

Efficacy of metal and plastic stents for transmural drainage of pancreatic fluid collections: A systematic review

Ji Young Bang,¹ Robert Hawes,² Albert Bartolucci³ and Shyam Varadarajulu²

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PLASTIC AND METAL ARE EQUIVALENT FOR PSEUDOCYSTS

• 17 studies with 881 patients
• Each study had >50 patients
• Treatment Success
  • Plastic 85% (CI: 81-89%) vs Metal 83% (CI: 74-89%)
• Adverse rates
  • Plastic 16% (CI: 14-39%) vs Metal 23% (CI: 16-33%)
• Recurrence
  • Plastic 10% (CI: 8-13%) vs Metal 9% (CI: 4-19%)
• Current evidence does not support routine use of metal stents

Abdominal pain gets somewhat better after cystgastrostomy. Repeat CT scan in 1 week shows the collection to be decreasing in size, but the collection remains persistent. The decision is make to perform an endoscopic pancreatic necrosectomy.
PANCREATIC NECROSECTOMY

• Historically: open surgical drainage and debridement
  – High morbidity: 34-90%
  – High mortality: 6-25%
  – AE: organ failure, perforation, infection, bleeding, fistulae, hernias
  – Laparoscopic debridement is now surgical option of choice

• Percutaneous
  – Ideally use a retroperitoneal approach
  – Start at 12F and can upsize to 28F
  – Irrigate with 10-20mL of NS three times a day
  – Success: 35-84%
  – Mortality: 5.6-35%
  – Morbidity: 11-42% (20% fistula rate)

BEST METHOD OF NECROSECTOMY?

• Endoscopic vs Surgical (VARD)
  – Endoscopic: lower complication rate, fewer fistulae, less pancreatic enzyme requirement

• Endoscopic vs Percutaneous
  – Endoscopic: 92% resolution, Percutaneous: 25% resolution
  – 75% of percutaneous group required surgery
  – Endoscopic: less antibiotic use, pancreatic insufficiency and hospitalization

• Endoscopic is safer, but will need combination approach

Bakker O, et al. JAMA 2012
THE FUTURE IS NOW: ENDOSCOPIC NECROSECTOMY

- Endoscope inserted through cystgastrostomy tract / stent
- Mechanical removal of necrotic debris
- Debridement performed with variety of tools
- May require multiple sessions over several weeks
- Success: 80-90%, complications: 10-15%
- This is now FIRST LINE treatment
- Use “step-up” approach to surgery if needed

EQUIPMENT NEEDED

- Therapeutic endoscope (T1 or T2)
- Dilation balloon: 15-20mm to dilate tract
- Irrigation
  - Normal Saline
  - Hydrogen peroxide (1:5 or 1:10 dilution w/NS)
- Debridement tools
- Pre-procedure antibiotics
- Use CO2 for insufflation (lowers risk of air emboli)
- Nasocystic tube
NECROSECTOMY EQUIPMENT
PANCREATIC NECROSECTOMY

Piraka: https://www.youtube.com/watch?v=zPiwYn59aTA
CASE RESOLUTION

Patient undergoes two necrosectomy sessions with hydogen peroxide and mechanical debridement. Repeat CT scan at 4 weeks shows marked improvement and complete resolution at 8 weeks. Patient is pain free and tolerating oral intake with no problem. The cystgastrostomy stent is removed and she is scheduled for cholecystectomy.
PLASTIC OR METAL STENTS FOR WON?

- EUS drainage of WON done by plastic or metal stents
- Study done in Dig Endosc: 61 plastic & 72 metal
- Mean necrosectomy sessions
  - Plastic: 2.74
  - Metal: 1.46
- Adverse events
  - Plastic: 36%
  - Metal: 5.6%
- Need for surgery
  - Plastic: 26.2%
  - Metal: 2.7%
- No difference in mortality, still… FAVOR METAL STENTS

A HOT NEW STENT IS HERE!

- HOT AXIOS
- Lumen apposing metal stent (LAMS)
- Flanged ends prevent migration
- 10mm or 15mm diameter
- Electro-cautery enhanced
- No need for dilation prior to stent
- No need for fluoroscopy
- Significantly reduced procedure time
Fully covered self-expanding metal stents versus lumen-apposing fully covered self-expanding metal stent versus plastic stents for endoscopic drainage of pancreatic walled-off necrosis: clinical outcomes and success

Ali A. Siddiqui, MD, Thomas E. Kowalski, MD, David E. Loren, MD, Ammara Khalid, MD, Ayesha Soomro, MD, Syed M. Mazhar, MD, Laura Isby, BS, Michel Kahaleh, MD, Kunal Karia, MD, Joseph Yoo, MD, Andrew Ofosu, MD, Beverly Ng, MD, Reem Z. Sharaiha, MD

Philadelphia, Pennsylvania; New York, New York, USA
LAMS VS FCSEMS VS PLASTIC

- Retrospective cohort on outcomes of LAMS/FCSEMS/plastic
- Early Adverse events (bleeding, infection, perforation)
  - FCSEMS: 1.6% - significantly less
  - Plastic: 7.5%
  - LAMS: 9.3%
- Late Adverse events: stent occlusion higher in plastic/FCSEMS
- Rate of complete resolution at 6 months
  - Plastic: 81% - significantly less
  - FCSEMS: 95%
  - LAMS: 90%
- Mean number of procedures
  - LAMS: 2.2 – significantly lower
  - FCSEMS: 3.0
  - Plastic: 3.6
- Conclusion: Use METAL STENTS / LAMS for WON

Siddiqui AA, et al. GIE. 2016
PANCREATIC DUCT DISRUPTION

Duct leak / Partial disruption

Disconnected duct / Complete disruption
PANCREATIC DUCT DISRUPTION

Duct disruption

Stent bridging disruption
DISCONNECTED DUCT

• 50% of severe pancreatitis have PD disruption

• Pancreatic duct leak can be seen on MRCP/ERCP

• More commonly seen in WON than pseudocysts

• Pancreatic duct leaks lead to recurrence of fluid collections

• ERCP is treatment of choice
  • Pancreatic duct stent is placed across leak
  • Stent can also be placed into collection, exiting the papilla
  • There is a risk of infecting a sterile collection w/contrast injection
  • May not be useful in disconnected duct (complete disruption)

Trevino JM, et al. Successful stenting in ductal disruption. Gastroenterol Hepatol. 2010
TAKE HOME POINTS

- Important to differentiate pancreatic fluid collections
- Pseudocyst: Fluid only, WON: Fluid and solid
- Only drain symptomatic collections
- Wait 4 WEEKS prior to drainage of collections
- EUS guided drainage is the PREFERRED method
- May do plastic stents for pure Pseudocysts
- Metal stents for WON (prefer LAMS)
- Endoscopic necrosectomy is safer than surgery
- Multidisciplinary approach is the key!
THANK YOU!
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