Prevention and Management of ERCP Complications

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“ERCP is most dangerous to those who need it the least.”

- Peter Cotton
ERCP-risk benefit

- Rarely favorable for diagnosis
  - Exception: Tissue sampling of indeterminate strictures vs. EUS FNA

- EUS and/or MRCP select patients for therapy

ERCP-risk benefit

- Nearly always favorable for therapeutic indications
  - Surgical exploration of bile duct higher morbidity
  - Stenting equivalent to surgical bypass and less invasive
  - PTC morbidity substantial
  - Endotherapy may avoid high risk pancreatic surgery for leaks, disruptions.
  - Ampullectomy less morbid than open surgery with similar outcomes
ERCP Complications

- Pancreatitis: 6.7%*
- Major bleeding: 2%
- Perforation: 0.3%
- Cholangitis: <1%
- Cardiopulmonary / sedation: <1%
- Failed procedure

*Freeman ML et al. GIE 2001

Complications of ERCP

General Considerations:
- Is the indication for ERCP strong enough to warrant the risks?
  - Low suspicion: Alternative imaging
  - Death in 0.4 -0.6%
- Does the performing physician have adequate case volume?
Cardiopulmonary Complications of ERCP

• Common cause of ERCP-related death (up to 50%)
• Requires careful monitoring
• Anesthesia vs. conscious sedation
• 20-50% ST depression during ERCP*

*Rastogi & Campbell GIE 2006

Post-ERCP Pancreatitis

• Definition requires all 3:
  – New or worsened pain
  – amylase 3X ULN > 24 hrs post-ERCP
  – requiring >2 days hospitalization
• Severity:
  – Mild: <4 days hospitalization
  – Moderate: 4-10 d. hospitalization
  – Severe: >10 d. hospitalization
Case

- 63 yo man on coumadin (for DVT, factor V Leiden) presented with rectal bleeding
- Colonoscopy: non-bleeding tics
- EGD: prominent ampulla, bx: adenoma

Case

- Developed severe post-ERCP pancreatitis with necrosis and bacteremia
- Had 3 hospitalizations over next 4 months for pancreatic abcess, pancreatic duct leak, liver abscess, and intra-abdominal thrombosis

Can we avoid this?
## Risk Factors for Post-ERCP Pancreatitis

<table>
<thead>
<tr>
<th>Patient specific risks</th>
<th>Odds ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior ERCP-induced pancreatitis</td>
<td>5.4</td>
</tr>
<tr>
<td>Suspected SOD</td>
<td>2.6</td>
</tr>
<tr>
<td>Female gender</td>
<td>2.5</td>
</tr>
<tr>
<td>Absence of chronic pancreatitis</td>
<td>1.9</td>
</tr>
<tr>
<td>Normal bilirubin</td>
<td>1.9</td>
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</tbody>
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## Risk Factors for Post-ERCP Pancreatitis

<table>
<thead>
<tr>
<th>Technique specific risks</th>
<th>Odds ratio</th>
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<tbody>
<tr>
<td>Difficult cannulation</td>
<td>3.4</td>
</tr>
<tr>
<td>Pancreatic injection (&gt;1)</td>
<td>2.7</td>
</tr>
<tr>
<td>Sphincter balloon dilation</td>
<td>4.5</td>
</tr>
<tr>
<td>Pancreatic sphincterotomy</td>
<td>3.1</td>
</tr>
</tbody>
</table>
Risks for Pancreatitis: Prospective US Multi-Center Study*

<table>
<thead>
<tr>
<th>Multivariate risk factors</th>
<th>Odds Ratio</th>
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</thead>
<tbody>
<tr>
<td>Minor sphincterotomy</td>
<td>3.8</td>
</tr>
<tr>
<td>Suspected SOD</td>
<td>2.6</td>
</tr>
<tr>
<td>Prior ERCP-pancreatitis</td>
<td>2.0</td>
</tr>
<tr>
<td>Age &lt;60</td>
<td>1.6</td>
</tr>
<tr>
<td>2 or more pancreatic injections</td>
<td>1.5</td>
</tr>
<tr>
<td>Trainee involvement</td>
<td>1.5</td>
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</tbody>
</table>

Not risk factors: female gender, idiopathic pancreatitis, difficult cannulation, major sphincterotomy, SOM

*Cheng AJG 2006

Does SOM Increase Procedure-Induced Pancreatitis?

- Pancreatitis rates (26%)*
  - Compared to 3% rate in bile duct stone pts
  - Pancreatitis risk increased by ES and pancreatography

Conclusion: It’s the diagnosis (suspected SOD) not the manometry that increases risk

- Suspected SOD pts:
  - ERCP with SOM vs. ERCP alone—No differences
Medications to Lower Post-ERCP Pancreatitis

<table>
<thead>
<tr>
<th>Gabexate mesylate</th>
<th>Allopurinol</th>
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<tbody>
<tr>
<td>Somatostatin</td>
<td>Glyceryl trinitrate</td>
</tr>
<tr>
<td>Octreotide</td>
<td>Glucagon</td>
</tr>
<tr>
<td>IL-10</td>
<td>Calcitonin</td>
</tr>
<tr>
<td>Nifedipine</td>
<td>Heparin</td>
</tr>
<tr>
<td>Prednisone</td>
<td>Beta-carotene</td>
</tr>
<tr>
<td>Lidocaine spray</td>
<td>*Diclofenac / Indomethacin</td>
</tr>
<tr>
<td>N-acetylcysteine</td>
<td>**Ulinastatin</td>
</tr>
</tbody>
</table>

*4 positive / 1 negative studies  **Single positive study

Meta-analysis of rectal NSAIDs


<table>
<thead>
<tr>
<th>Study</th>
<th>Risk Ratio (95% CI)</th>
<th>Weight (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murray (diclofenac)</td>
<td>0.41 (0.18 to 0.65)</td>
<td>30.9</td>
</tr>
<tr>
<td>Sotoudehmanesh (indomethacin)</td>
<td>0.47 (0.19 to 1.12)</td>
<td>27.3</td>
</tr>
<tr>
<td>Montaño Loza (indomethacin)</td>
<td>0.40 (0.13 to 1.22)</td>
<td>18.2</td>
</tr>
<tr>
<td>Khoebatan (diclofenac)</td>
<td>0.15 (0.04 to 0.65)</td>
<td>23.6</td>
</tr>
<tr>
<td>Overall (95% CI)</td>
<td>0.36 (0.22 to 0.60)</td>
<td></td>
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A Randomized Trial of Rectal Indomethacin to Prevent Post-ERCP Pancreatitis


Indomethacin effective and safe

NNT=13
Techniques to Lower Post-ERCP Pancreatitis

- Wire cannulation instead of contrast*
  - Meta-analysis: 5 studies, 1745 pts: 58% reduction
- Temporary PD stenting
- Not shown beneficial:
  - Post biliary ES botox injection
  - Pure cut may be safer than blended cut
  - Low osmolality contrast

Temporary Pancreatic Stenting

- RCT: Stent lowers risk in biliary SOD pts*
- Used for other high risk cases
- Controversy: single pigtail flangeless 3F stents** vs. 5F
- Spontaneous stent passage: 70-90%
- Successful placement in 4 studies=88%

* Tarnarsky Gastroenterology 1998
** Rashdan Clin Gastro & Hep 2004
Stenting to Minimize Pancreatitis Meta-Analysis

Problems with Prophylactic PD Stent

- Technical difficulty in placement
  - Small stents require 0.018 guide wire
- Increased risk in failed stent placement
- May require repeat endoscopy
- Increased cost
- Possible stent-induced damage
- Lack of expert agreement on methods
Risk Factors for Post-ERCP Pancreatitis

- Suspected sphincter of Oddi dysfunction
- Young age
- Normal bilirubin
- History of post-ERCP pancreatitis
- Difficult or failed cannulation
- Pancreatic duct injection
- Pancreatic sphincterotomy (especially minor papilla)
- Balloon dilation of intact biliary sphincter
- Precut sphincterotomy

Case

- 68 yo woman comes to ED with biliary pain 6 months after cholecystectomy
- Labs: bili=4.5, ALT=125
- US: “mild biliary dilation” CBD=10 mm
- Meds: linsinopril, metformin, 81 mg aspirin, and allopurinol
- ERCP & ES: small stone extracted, pt discharged next day
Case

Post ES Bleeding

- Incidence depends on definition
  - Clinical criteria: 1-2%
  - Endoscopic: 10-13%
- 50-70% are delayed
- Pre-ES coagulation criteria
  - Platelets >50,000 (or corrected)
  - PT within 3 sec of control (or corrected)
  - Avoid Clopidogrel 7d pre + 14d post (if safe)
- Balloon dilation in coagulopathic patients
Risks for Post ES Bleeding

- Five risks significant in multivariate analysis:
  - Coagulopathy pre-ES
  - Cholangitis
  - Anti-coagulant Rx < 3d post-ES
  - Low case volume
  - Observed bleeding during procedure

Freeman 1996 NEJM

Treatment of Post-ES Bleeding

- Epinephrine injection
- Balloon tamponade
- Endoscopic thermal therapy (MPEC or Heater probe*) or clips
- Combination of injection / Endo Rx
- Angiographic embolization
- Surgery

*Kuran GIE 2006
Post-ERCP Perforation

• Incidence: 0.3%
• Types of perforation:
  – Wire or stent induced: Rx is antibiotics
  – Intra-peritoneal: Rx is surgery
  – Retroperitoneal: 10-20% require surgery
• Risks:
  – BII anatomy
  – Needle-knife sphincterotomy
  – Suspected SOD

Retroperitoneal Perforation
Post-ERCP Perforation

• Likely under-reported due to asymptomatic nature of most ductal and retroperitoneal perforations
• Routine CT scan 24 hrs after sphincterotomy: 13% incidence of retroperitoneal air

*Hans de Vries GIE 1997

Post-ERCP Cholangitis

• Incidence 0.1-1.0%
• Risks:
  – Jaundice; especially due to malignancy
  – Failed / incomplete drainage
  – Operator inexperience
• Antibiotics
  – Pre: for suspected obstruction (controversial)
  – Post: for 5-7d for poor drainage
Post-ERCP Complications: Summary

• Pancreatitis most common (5%) with rates of 25% in high risk patients
• Temporary PD stents effective prophylaxis
• Wire cannulation safer than contrast
• Patient-related risk factors are major determinants of risk
• Cannulation difficulty and operator expertise also important

ERCP is Fundamentally a Therapeutic Procedure

• If your only tool is a hammer, everything looks like a nail!
  – Established indication
  – Proper patient selection through use of less invasive preprocedure imaging
    • EUS
    • MRCP
Strategies to Reduce Procedural Complications

• Improved training (experience)
• Awareness of risk factors
• Indication and contraindications
• Referral of high-risk cases to advanced centers