Prevention and Treatment of Post ERCP Complications. 
An Update

Andres Gelrud, MD, MMSc
Director, Pancreatic Disease Center
Miami Cancer Institute
Baptist Hospital &
Gastro Health

Feb 9th, 2024
• Boston Scientific: Consultant; Research and Development pancreatic stents
• Abbvie: Consultant; Lectures (pancreatic enzymes)
• UpToDate: Author Royalties (pancreatitis related topics)
• Parexel: Physician adjudicator pancreatic events
• Pancreas Journal: Associate Editor
• Ariel Precision Medicine: Medical Board of Directors (pancreas genetics)
• National Pancreas Foundation: Medical Board of Directors
Biliary Pancreatitis

- Diagnosis of acute pancreatitis, elevated transaminases and elevated Tbili
- Approx 80% of the stones will pass spontaneously
- Plan:
  - Follow LFTs / Total bili
  - MRCP
  - EUS
Biliary Pancreatitis
Outline

• Complications (rare & not so rare)
• Prevention
• Management
• Summary
Indications for ERCP
Complications (specific)

- Pancreatitis
- Bleeding
- Perforation
- Infection
  - Patient related
  - Endoscope related
- Rare complications…
Complications (specific)

- Pancreatitis
- Bleeding
- Perforation
- Infection
  - Patient related
  - Endoscope related
- Rare complications…
Complications (Nonspecific)

- Sedation related
- Complications related to biliary and pancreatic stents
- Impaction of retrieval baskets
- Very rare: Contrast allergy; Electrosurgical hazards; Gallstone ileus; Liver abscess, gas embolism
## Overall Complications of ERCP with Sphincterotomy and Related Mortality

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<thead>
<tr>
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<tbody>
<tr>
<td><strong>Study</strong></td>
<td>Retrospective multicenter review</td>
<td>Prospective multicenter study</td>
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<tr>
<td><strong>Patients</strong></td>
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<td>Number</td>
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<td><strong>Bleeding</strong></td>
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<tr>
<td>Percent</td>
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<td>1.5</td>
<td>1.4</td>
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<td><strong>Perforation</strong></td>
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<tr>
<td>Number</td>
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<td>8</td>
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<tr>
<td>Percent</td>
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<tr>
<td>Percent</td>
<td>8.2</td>
<td>9.8</td>
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<tr>
<td><strong>Deaths</strong></td>
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<tr>
<td>Number</td>
<td>103</td>
<td>10</td>
<td>5</td>
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<tr>
<td>Percent</td>
<td>1.3</td>
<td>0.4</td>
<td>0.7</td>
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General Complications

- Pancreatitis
- Bleeding
- Perforation
- Infection
### Post ERCP Pancreatitis

<table>
<thead>
<tr>
<th>Patient</th>
<th>Procedure</th>
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<tbody>
<tr>
<td>Female</td>
<td>Pancreatic injection (extent)</td>
</tr>
<tr>
<td>Younger age</td>
<td>Pancreatic wire placement</td>
</tr>
<tr>
<td>Suspected SOD</td>
<td>Difficult or failed cannulation</td>
</tr>
<tr>
<td>Prior post ERCP pancreatitis</td>
<td>Precut Sphx</td>
</tr>
<tr>
<td>Normal bilirubin</td>
<td>Panc Sphx; Minor Sphx</td>
</tr>
<tr>
<td>NOTE: Chronic pancreatitis; smoking; liver dz / PREVENTIVE</td>
<td>Ampullectomy</td>
</tr>
</tbody>
</table>

DiMagno et al. Pancreas 2013
Freeman M et al. NEJM 1996
Freeman M et al. GIE 2004 & 2001
Risk Reduction

- **Pre-Procedure**
  - Indications
  - Patient selection
  - MD selection
  - Diagnostic w/u
  - IV hydration with LR (1lt)

- **Intra-Procedure**
  - Technical maneuvers
  - MPD stent

- **Post-Procedure**
  - Recognition
  - Drug (Indom. PR)
  - Treatment
Post-ERCP Pancreatitis
<table>
<thead>
<tr>
<th>First author(s)</th>
<th>Study design</th>
<th>Patients</th>
<th>n</th>
<th>Pancreatitis rate without and with pancreatic stent</th>
<th>p</th>
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<tbody>
<tr>
<td>Smithline 1993</td>
<td>RCT</td>
<td>Pre-cut biliary ES, SOD, small ducts</td>
<td>93</td>
<td>18%</td>
<td>14%</td>
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<tr>
<td>Sherman 1996</td>
<td>RCT (abstract)</td>
<td>Pre-cut biliary ES</td>
<td>93</td>
<td>21%*</td>
<td>2%</td>
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<tr>
<td>Tarnasky 1999</td>
<td>RCT</td>
<td>Biliary ES for SOD</td>
<td>80</td>
<td>20%</td>
<td>7%</td>
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<td>Elton 1998</td>
<td>Retrospective, case control</td>
<td>Pancreatic ES for all indications</td>
<td>194</td>
<td>12.5%</td>
<td>0.7%</td>
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<tr>
<td>Patel 1999</td>
<td>RCT (abstract)</td>
<td>Pancreatic ES for SOD</td>
<td>36</td>
<td>33%</td>
<td>11%</td>
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<tr>
<td>Vandervoort 1999</td>
<td>Prospective, case control</td>
<td>Pancreatic brush cytology for suspected malignancy</td>
<td>42</td>
<td>28.1%</td>
<td>0%</td>
</tr>
<tr>
<td>Aizawa 2001</td>
<td>Retrospective, case control</td>
<td>Biliary balloon dilation for stone</td>
<td>40</td>
<td>6%</td>
<td>0%</td>
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<tr>
<td>Fogel 2002</td>
<td>Retrospective, case control</td>
<td>Biliary +/- pancreatic ES for SOD</td>
<td>430</td>
<td>28.2%</td>
<td>13.5%</td>
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<td>Norton 2002</td>
<td>Retrospective, case control</td>
<td>Endoscopic ampullectomy</td>
<td>28</td>
<td>11.1%</td>
<td>20%</td>
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<tr>
<td>Fazel 2003</td>
<td>RCT</td>
<td>Difficult cannulation, biliary ES, SOD</td>
<td>76</td>
<td>28%</td>
<td>5%</td>
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<tr>
<td>Freeman 2004</td>
<td>Prospective, case control</td>
<td>All attempted major papilla PD stents in high-risk therapeutic ERCP</td>
<td>225</td>
<td>66.7%</td>
<td>14.4%</td>
</tr>
<tr>
<td>Catalano 2004</td>
<td>Retrospective, case control</td>
<td>Endoscopic ampullectomy</td>
<td>103</td>
<td>16.7%</td>
<td>3.3%</td>
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</tbody>
</table>
RCTs comparing panc stent placement and subsequent incidence of PEP
14 studies included
1,541 patients (760 got PS / 781 control)

Conclusion:
“PS placement prevented PEP after ERCP as compared with no PS placement”
Prevention

Prophylaxis of post-ERCP pancreatitis: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Updated June 2014

Authors: Jean-Marc Dumonceau, Angelo Andriulli, B. Joseph Elmunzer, Alberto Mariani, Tobias Meister, Jacques Deviere, Tomasz Marek, Todd H. Baron, Cesare Hassan, Pier A. Testoni, Christine Kapral

**Technical maneuvers:**
Minimize pancreatic injection, placement of PD stent in high risk cases, wire guided cannulation
7.1.5. Cannulation techniques

Statement 2010:
For deep biliary cannulation, the wire-guided technique reduces the risk of PEP and increases the success rate of primary cannulation when compared with the standard contrast-assisted method.

New information since 2009:
Five comparative studies and a meta-analysis comparing the wire-guided vs. the standard contrast-assisted method for selective biliary cannulation were published between 2009 and 2013 [127–132]. Four studies [128–131], two of which were RCTs [128, 131], did not confirm the results of previous meta-analyses that showed a lower risk of PEP with the wire-guided method. In most studies, the wire-guided method shortened cannulation and fluoroscopy times. However, in a recent meta-analysis that extended the analysis to 12 RCTs (3450 patients), the wire-guided method significantly lowered the incidence of PEP compared with the contrast-assisted method (RR 0.51; 95%CI, 0.32–0.82) [132]. In addition, the wire-guided cannulation technique was associated with greater primary cannulation success (RR 1.07; 95%CI 1.00–1.15), fewer precut sphincterotomies (RR 0.75; 95% CI 0.60–0.95), and no increase in other ERCP-related complications.
Wire Guided Cannulation
Prevention

**Pharmacology:**
Administration of prophylactic drug before or after high-risk cases, possible, pre-procedure hydration with Lactated Ringer
A Randomized Controlled Trial of Rectal Indomethacin for the Prevention of Post-ERCP Pancreatitis

Michigan; Indianapolis, Cleveland, Kentucky, Med Univ. South Carolina

General Complications

- Pancreatitis
- Bleeding
- Perforation
- Infection (including SCOPE infection)
## Complications from ERCP

### Prospective Series

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>N</th>
<th>Panc</th>
<th>Bleed</th>
<th>Perf</th>
<th>Infect</th>
<th>CP</th>
<th>Death</th>
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<tbody>
<tr>
<td>Cotton</td>
<td>2009</td>
<td>11,497</td>
<td>2.6%</td>
<td>0.3%</td>
<td>0.13%</td>
<td>0.3%</td>
<td>0.2%</td>
<td>0.06%</td>
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<tr>
<td>Williams</td>
<td>2007</td>
<td>5,264</td>
<td>1.6%</td>
<td>0.9%</td>
<td>0.4%</td>
<td>1.0%</td>
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<td></td>
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<tr>
<td>Cheng</td>
<td>2006</td>
<td>1,115</td>
<td>15.1%</td>
<td>0.9%</td>
<td>1.1%</td>
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<td>3.8%</td>
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<td>2,462</td>
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Risk Factors

• **Patient Factors**
  - coagulopathy
  - anticoagulation (hold prior to procedure)
  - renal failure on hemodialysis
  - cholangitis

• **Anatomical Factors**
  - periampullary diverticulum
  - Billroth II gastrectomy
  - ampullary stenosis
  - stone impaction
Risk Factors

- Technical Factors
  - sphincterotomy length
  - extension of previous sphincterotomy
  - needle-knife
  - low case volume
Post Sphincterotomy Bleed
Prevent & Treatment

**Prevention:**
- Identify high risk patients
- INR $\leq 1.5$
- Platelets 50-80k
- DDAVP for pts with platelet dysfunction

**Management:**
Endoscopic Injection, electrocautery, heater probe, APC, balloon tamponade, fully cover metal stents, hemoclips, Angiography, Surgery
General Complications

- Pancreatitis
- Bleeding
- Perforation
- Infection
### Complications from ERCP
#### Prospective Studies

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>N</th>
<th>Panc</th>
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Perforation Classification

- Type 1: Duodenal Wall
- Type 2: Ampullary
- Type 3: Ductal Injury
- Type 4: Retroperitoneal Air Alone

Case
Clips Large Capacity
Over The Scope Clip
Padlock Clip
Treatment - Perforation

- Start conservatively treatment with observation, IV antibiotics, NG suction, bowel rest and early surgical consultation
General Complications

- Pancreatitis
- Bleeding
- Perforation
- Infection
Complications from ERCP
Prospective Studies

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Infection

- Incidence: < 1%
- Hepatic abscess
- Acute cholecystitis
- Cholangitis (most frequent infectious complication)
  - commonly results from incomplete biliary drainage
  - highest rates observed in malignant hilar strictures and patients with PSC
Prevention

• Antibiotic prophylaxis for patients with:
  Biliary tract obstruction
  Features of biliary sepsis
  Pancreatic pseudocyst or WON

• Minimize volume of contrast injection
• Selective drainage in patients with hilar strictures (preferably after MRCP) to avoid contamination
Rare Complications

- Impaction of retrieval baskets
- Gallstone ileus
- **Contrast allergy**
- Portal Vein Gas
- Cardiac Air Embolism
- Arterial air embolism with cerebral ischemia
- Intraperitoneal hemorrhage
- Pneumothorax, pneumomediastinum
- Electrosurgical Hazards
Rare Complications
Rare Complications

- Impaction of retrieval baskets

Keep the plastic cover to prevent OP trauma & duodenal/biliary trauma. New devices are compatible with the ERCP scope working channel.
Stone Entrapment

Treatment options:

• Mechanical lithotripsy / salvage device
• ESWL
• Cholangioscopy
• Naso biliary catheter w drainage and then bring back in 1 wk and re treat
• Surgery
64 yo M s/p liver transplantation c/b anasto. stricture
Rare Complications – Stent Migration
73 yo F s/p Whipple for pancreatic head cancer, now presents with a third episode of acute pancreatitis
Conclusions

• Make sure you are fit for the job!
• Know your equipment
• There are clear indications - NIH consensus & ASGE & European SGE
• Don’t take unnecessary risks
• Pre-procedure hydration
• Pancreatic duct stenting!
• Indomethacin for high risk patients
• Recognize and treat complications
agelrud@gastrohealth.com