Approach to the Difficult ERCP
Cannulation

Jeffrey H. Lee, MD
Professor and Director, Advanced Endoscopy Fellowship and Training
Gastroenterology and Hepatology
MD Anderson Cancer Center

Biliary Strictures

- Benign conditions
  - Primary sclerosing cholangitis
  - Chronic pancreatitis
  - After liver transplantation
  - Gallstones
  - Radiation

- Malignant diseases
  - Pancreatic cancer
  - Ampullary cancer
  - Cholangiocarcinoma
  - Hepatoma
  - Lymphoma
  - Metastatic cancer
Biliary Obstruction

- Should we drain or not?
  - Benefits
    - Relief of jaundice, nausea, pruritus, loss of appetite
    - Avoid hepatotoxicity of chemotherapeutic agents
  - Risks
    - Violates sterile biliary system
    - Pancreatitis
- How should we drain?
  - Surgical bypass
  - Percutaneous drainage
  - Endoscopic drainage

Preparation for ERCP

- Clinical history
- Indication for the procedure
- Intubation?
Preparation for ERCP

- Imaging studies (CT, MRI/MRCP)
  - Patient’s anatomy
  - Evidence of luminal stricture
  - Location of the stricture
    - Extrahepatic
    - Hilar
    - Intrahepatic

Cannulation Techniques

1. Conventional approach
2. Two-wire technique
3. Pre-cut needle knife papillotomy
4. EUS-assisted ERCP
Cannulation Techniques - Conventional Approach

- Cannula vs. Sphincterotome
- With or without a guidewire
- Guidewire
  - 450 cm vs. 260 cm
  - Straight tip vs. angled tip
  - 0.035 inch vs. 0.025 inch

<table>
<thead>
<tr>
<th>Cannula</th>
<th>Cannula + GW</th>
<th>Sphincterotome</th>
<th>Sphincterotome + GW</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>101</td>
<td>102</td>
<td>100</td>
</tr>
<tr>
<td>CBD cannulation within 10 min</td>
<td>72 (71.3%)</td>
<td>75 (73.5%)</td>
<td>68 (68%)</td>
</tr>
<tr>
<td>CBD cannulation Avg. time</td>
<td>206 sec</td>
<td>173 sec</td>
<td>237 sec</td>
</tr>
<tr>
<td>Precut NKS</td>
<td>4 (4%)</td>
<td>6 (5.9%)</td>
<td>2 (4%)</td>
</tr>
<tr>
<td>Final CBD cannulation</td>
<td>95 (94.1%)</td>
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</tr>
<tr>
<td>Pancreatitis</td>
<td>4 (4)</td>
<td>6 (5.9)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>Perforation</td>
<td>2</td>
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Conventional Approach

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<td>Final CBD cannulation</td>
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<td>90 (92.8%)</td>
</tr>
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<td>2 (2)</td>
<td>2 (2.1)</td>
</tr>
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<td></td>
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Cannulation Techniques-
Two-wire Technique

- Frequent inadvertent cannulation of PD
- A guidewire into PD
- Sphincterotome and a second guidewire
- A wire in PD will help prevent repetitive cannulation of PD
- Comparable success rate to the precut approach

Cannulation Techniques - Precut Papillotomy

- Precut papillotomy can improve the success rate of ERCP
  - Needle knife papillotomy
    - With or without a PD stent
  - Suprapapillary fistulotomy

Cannulation Techniques - Two-wire Technique vs. Precut

<table>
<thead>
<tr>
<th></th>
<th>Two-wire, N=23</th>
<th>Precut, N=21</th>
<th>P-value</th>
</tr>
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<tbody>
<tr>
<td>Success rate by 1st technique, n (%)</td>
<td>17 (74%)</td>
<td>17 (81%)</td>
<td>0.724</td>
</tr>
<tr>
<td>Success rate after cross-over, n (%)</td>
<td>21 (91.3%)</td>
<td>19 (85.7%)</td>
<td>0.658</td>
</tr>
<tr>
<td>Cannulation time</td>
<td>172 sec</td>
<td>394 sec</td>
<td>&lt;0.001</td>
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<tr>
<td>Pancreatitis</td>
<td>4</td>
<td>1</td>
<td>0.666</td>
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<tr>
<td>Bleeding</td>
<td>2</td>
<td>2</td>
<td>1.000</td>
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<tr>
<td>Perforation</td>
<td>0</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Cholangitis</td>
<td>2</td>
<td>0</td>
<td>0.489</td>
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</tbody>
</table>

Cannulation Techniques - EUS-assisted ERCP
Precut Papillotomy versus EUS-guided Rendezvous Technique

<table>
<thead>
<tr>
<th>TABLE 1. Patient characteristics</th>
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</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Median age (interquartile range)</td>
</tr>
<tr>
<td>Male (%)</td>
</tr>
<tr>
<td>Indication</td>
</tr>
<tr>
<td>Ampullary cancer</td>
</tr>
<tr>
<td>Malignant biliary strictures</td>
</tr>
<tr>
<td>Benign biliary stricture</td>
</tr>
<tr>
<td>CBD stone</td>
</tr>
</tbody>
</table>

Precut Papillotomy versus EUS-guided Rendezvous Technique


Challenges in ERCP Cannulation

1. Difficulty in reaching the ampulla
   - Pyloric stenosis
   - Duodenal stricture

2. Difficulty arising from the ampullary anatomy
   - Ampullary mass
   - Periampullary diverticulum

3. Difficulty arising from altered anatomy
   - Billroth II anatomy
   - Post-pancreaticoduodenectomy
   - Roux-en-y
   - Post-percutaneous drainage
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Etiology of GOO

- Pancreatic cancer - the most common cause
- Other cancers
  - Gastric cancer
  - Duodenal cancer
  - Lymphoma
  - Hepatocellular carcinoma
  - Metastatic tumors from distant primary
Sites of Duodenal Obstruction

Enteral SEMS

- Simple, outpatient procedure
- Low morbidity and mortality
- Less expensive than gastrojejunostomy
- Shorter time to oral intake than gastrojejunostomy

Combined Stenting For Duodenal and Biliary Obstruction

- Access to the ampulla
  - By balloon dilation of duodenal stricture

- By placement of duodenal stent
Combined Stenting For Duodenal And Biliary Obstruction

- Cannulation of CBD
  - Presence of duodenal stent may interfere with biliary cannulation
  - Separation of wire mesh*
  - Placement of a duodenal stent with unfixed central structure**

**Moon JH et al Gastrointest Endosc 2009;70:772-7

Percutaneous Approach
<table>
<thead>
<tr>
<th></th>
<th>EUS-CD (N=13)</th>
<th>PTCBD (N=12)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical success</td>
<td>100 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Clinical success</td>
<td>100 %</td>
<td>100%</td>
</tr>
<tr>
<td>7-day decrease in bilirubin</td>
<td>16.4 to 3.3</td>
<td>17.2 to 3.8 (P=0.2)</td>
</tr>
<tr>
<td>Complication rate</td>
<td>2/13 (15.3%)</td>
<td>3/12 (25%) (P=0.44)</td>
</tr>
<tr>
<td>Cost</td>
<td>$ 5,673</td>
<td>$7,580 (P=0.39)</td>
</tr>
</tbody>
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Artifon et al. J Clin Gastroenterol 2012;46(9):768-74
Challenges in ERCP Cannulation

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Ampullary Mass
Ampullectomy

• What are the alternatives?
  – Local surgical resection
  – Radical surgical resection
  – Observation?
## Ampullectomy

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Number of patients</td>
<td>103</td>
<td>106</td>
<td>102</td>
</tr>
<tr>
<td>Overall Success rate</td>
<td>80 %</td>
<td>73 %</td>
<td>84 %</td>
</tr>
<tr>
<td>Complication rate</td>
<td>10 %</td>
<td>13 %</td>
<td>21 %</td>
</tr>
<tr>
<td>Pancreatitis W/O PD stent</td>
<td>3 vs. 17%</td>
<td>11 (total) vs. 14%</td>
<td>10 vs. 13%</td>
</tr>
<tr>
<td>Recurrence rate</td>
<td>20 %, all &lt;1 year</td>
<td>15 %</td>
<td>8 % &lt; 14 months</td>
</tr>
</tbody>
</table>
Periampullary Diverticulum

- Found in 9-32% of patients who undergo ERCP
- Location of the ampulla in relation to diverticulum
  - Inside, in the margin, or near
- Higher failure rate of cannulation (3.5 vs. 10.2%; p=0.021, OR 2.94)
- No increase in complication
- Clip-assisted ERCP
- Needle-knife papillotomy with a PD stent in place
- Technique with two devices in one channel


Fujita et al, Gastrointest Endosc 1998

Courtesy of Mark Topazian, MD
Challenges in ERCP Cannulation

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   - Roux-en-Y
   - Post-percutaneous drainage
Billroth II Anatomy

- 91% success rate in 120 patients
- Cap-fitted forward-viewing endoscopy
- Sphincterotomy with large balloon dilation (10-15mm)
- Large dilating balloon to allow endoscope insertion

Lee TH et al. Gut Liver 2012

Courtesy of Mark Topazian, MD
Post-Pancreaticoduodenectomy

- 88 ERCPs in 51 patients
  - 37 for pancreatic indications
  - 44 for biliary indications
  - 7 for both
- Technical success in 45/88 (51%)
- Complications, 2%
  - Self-contained perforation
  - Mallory-Weiss tear
- Single balloon enteroscopy
- Double balloon enteroscopy

Wang AY, et al. Gastrointest Endosc 2010
Post-Roux-en-Y Anatomy

- Single-balloon enteroscopy
- Double-balloon enteroscope-assisted ERCP
- Percutaneous gastrostomy tube placement followed by ERCP

Wang AY, et al. Gastrointest Endosc 2010  
ERCP in Altered Anatomy: Single Balloon Enteroscopy

- N=13 (16 procedures)
  - 3 Pancreaticoduodenectomies
  - 3 Hepaticojejunostomies
  - 1 Billroth II
  - 9 Roux-en-Y
- Diagnostic ERC, successful in 13 of 16 (81.3%)
- Therapeutic ERC, successful in 9 of 10 (90%)
- Complications:
  - 2 pancreatitis
  - 1 bleeding

Wang AY, et al. Gastrointest Endosc 2010

ERCP in Altered Anatomy: Double-balloon Enteroscopy

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Diagnostic Success</th>
<th>Therapeutic Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pancreaticoduodenectomy</td>
<td>26/26 (100%)</td>
<td>26/26 (100%)</td>
</tr>
<tr>
<td>Billroth II</td>
<td>22/22 (100%)</td>
<td>22/22 (100%)</td>
</tr>
<tr>
<td>Roux-en-Y total gastrectomy</td>
<td>52/52 (96%)</td>
<td>50/50 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>98/100 (98%)</td>
<td>98/98 (100%)</td>
</tr>
</tbody>
</table>

- Complications in 5/103 procedures (all in Roux-en Y)
  - 1 retroperitoneal air
  - 3 perforations
  - 1 subcutaneous air and pneumothorax

Post-PTBD ERCP

• Interventional Radiology
  – Recommends 6 weeks before manipulating the biliary drainage catheter

• Attempt cannulation with PTBD in place
  – If not successful, use a guidewire through PTBD
  – Grab the guidewire with a snare
  – Unlock the string
  – Cut the sutures on the skin and pull PTBD

THANK YOU!