ERCP and EUS:
What’s New and What Should We Do?

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EUS/ERCP in 2015

- **The Basics**
  - ERCP 101
  - EUS 101
  - Management of Bile Duct Stones

- **Safety and Quality**
  - Duodenoscope Reprocessing
  - Preventing Post-ERCP Pancreatitis
  - Quality in EUS and ERCP

- **New Techniques and Technology**
  - Cholangioscopy
  - Transmural Drainage
Endoscopic Retrograde Cholangiopancreatography (ERCP) 101

- Standard ERCP requires a specialty endoscope, called a *duodenoscope*.

- The optics of the duodenoscope allows the endoscopist to visualize and work upon the ampulla.
ERCP 101
What is the Role for ERCP in 2015?

- MRI/MRCP provides non-invasive visualization of the biliary system and the remaining abdomen
- As the quality of MRCP images has improved, prior indications for ERCP no longer are appropriate
Endoscopic Ultrasound (EUS) 101

- The major limitation of transcutaneous ultrasound is artifact from air
- 1980s – Development of Endoscopic Ultrasound (EUS)

- EUS was developed to better visualize lesions within and adjacent to the wall of the gastrointestinal tract
- Ultrasound quality is superior as air within the GI tract can be suctioned during the procedure
EUS – Radial and Curvilinear
The Intersection of EUS and ERCP

- EUS has supplemented and supplanted ERCP for many indications including:
  - Patients with low-moderate risk of bile duct stones
  - Exclusion and evaluation of biliary strictures
  - Tissue diagnosis of pancreas neoplasms
  - Evaluation of pancreas cystic lesions
# ERCP versus EUS versus MRCP

<table>
<thead>
<tr>
<th></th>
<th>ERCP</th>
<th>MRCP</th>
<th>EUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Invasive?</strong></td>
<td>Invasive</td>
<td>Non-Invasive</td>
<td>Minimally Invasive</td>
</tr>
<tr>
<td><strong>Use</strong></td>
<td>Therapeutic and Diagnostic</td>
<td>Diagnostic Only</td>
<td>Diagnostic and Some Therapeutic</td>
</tr>
<tr>
<td><strong>Risks</strong></td>
<td>Risks of Pancreatitis, Perforation and Anesthesia</td>
<td>No significant risks</td>
<td>Low (Similar to Upper Endoscopy)</td>
</tr>
<tr>
<td><strong>Limitations</strong></td>
<td>1. Cannulation rates are variable nationwide</td>
<td>1. Variable Quality</td>
<td>1. Not widely available</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Poor visualization of distal CBD</td>
<td>2. Often requires subsequent ERCP</td>
</tr>
<tr>
<td><strong>Diagnostic?</strong></td>
<td>Biopsies and Brushings can be acquired for diagnosis</td>
<td>Requires biopsy for confirmation</td>
<td>Cytology/Histology of any pancreaticobiliary pathology</td>
</tr>
</tbody>
</table>

*Northwestern Medicine*
How to Approach Suspected Bile Duct Stones?

- The management of the patient with suspected bile duct stones must balance value and safety.
- Diagnostic options include:
  - ERCP
  - EUS
  - MRCP
  - Intraoperative Cholangiogram
### Predictors of Choledocholithiasis

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Very Strong</th>
<th>Strong</th>
<th>Moderate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBD Stone Visualized</td>
<td>CBD dilation (&gt; 6 mm on ultrasound) without</td>
<td>Abnormal liver chemistry tests other than bilirubin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cholecystectomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical ascending cholangitis</td>
<td>Bilirubin 1.8-4 mg/dL</td>
<td>Age &gt; 55</td>
<td></td>
</tr>
<tr>
<td>Bilirubin &gt; 4 mg/dL</td>
<td></td>
<td>Clinical gallstone pancreatitis</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical Suspicion</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Very Strong Predictor Or BOTH Strong Predictors</td>
<td>One Strong Predictor Or Any Moderate Predictors</td>
<td>No Predictors</td>
</tr>
<tr>
<td>High</td>
<td>Intermediate</td>
<td>Low</td>
</tr>
</tbody>
</table>
Management of Suspected Choledocholithiasis

Probability of CBD Stones

- Low
  - Laparoscopic Cholecystectomy
  - No IOC

- Intermediate
  - Laparoscopic IOC or Ultrasound

- High
  - Pre-Operative EUS or MRCP
  - Or
  - ERCP

Positive

ASGE Guidelines, 2011
IMPROVEMENTS IN THE QUALITY AND OUTCOMES OF ERCP
Duodenoscope Reprocessing

THE LANCET, APRIL 13, 1974

DISINFECTION OF GASTROINTESTINAL FIBRE ENDOSCOPES

A. T. R. Axon I. Phillips
P. B. Cotton S. A. Avery
St. Thomas's Hospital and Medical School,
London SE1 7EH

Pseudomonas Infection of the Biliary System Resulting From Use of a Contaminated Endoscope

JOHN I. ALLEN, MELODY O'CONNOR ALLEN, MARY M. OLSON,
DALE N. GERDING, CAROL J. SHANHOLTZER, PETER B. MEIER,
JACK A. VENNES, and STEPHEN E. SILVIS
Departments of Medicine, Surgery, and Laboratory Medicine and Pathology, Veterans Administration Medical Center, Minneapolis, Minnesota
Duodenoscopes and the “Superbug”

“bacterial contamination of duodenoscopes appeared to persist despite the absence of recognized reprocessing lapses (JAMA, 2014)

Deadly infections from medical scopes go unreported, raising health risks
ERCP and Risk of Infection
Current FDA Recommendations (8/4/15)

Beyond strict adherence to the manufacturer’s recommended cleaning protocol, facilities should consider at least one of the following:

- Microbiologic culturing
- Ethylene oxide sterilization
- Use of a liquid chemical sterilant processing system; and/or
- Repeat high-level disinfection
What to do in your practice?

While the risk of infection transmission cannot be completely eliminated, the benefits of these devices continue to outweigh the risks in appropriately selected patients.  
FDA Communication, August 4, 2015

- Reasonable to advise patients on the low risk of infection transmission associated with ERCP
- Advocate for appropriate use of ERCP
- Work with hospital infection preventionists on optimizing endoscope reprocessing to make infection transmission a “never” event

Keswani RN, Soper NJ. JAMA Surgery, 2015
Preventing Post-ERCP Pancreatitis
Stenting the Pancreas Duct

Pancreatitis may occur in up to 15% of patients after ERCP and may in part be due to:

- Papillary swelling after ERCP (possibly as a delayed result of sphincterotomy)
- Contrast injection into pancreas duct which independently increases the risk of pancreatitis
Preventing Post-ERCP Pancreatitis
Stenting the Pancreas Duct

- Multiple studies have shown that placement of a small pancreatic stent in at risk patients reduces the risk of post-ERCP pancreatitis.

CLINICAL GASTROENTEROLOGY AND HEPATOLOGY 2007;5:1354–1365

STATE OF THE ART

Pancreatic Stents for Prevention of Post–Endoscopic Retrograde Cholangiopancreatography Pancreatitis

MARTIN L. FREEMAN

Minnesota Pancreas and Liver Center, Division of Gastroenterology, University of Minnesota, Hennepin County Medical Center, Minneapolis, Minnesota
Physician Barriers to PD Stent Placement

Rectal Indomethacin Reduces Risk of Post-ERCP Pancreatitis

NNT=13

Elmunzer BJ, NEJM, 2012
Indomethacin protective across entire range of pancreatitis risk

<table>
<thead>
<tr>
<th>Subgroup</th>
<th>Control</th>
<th>NSAID</th>
<th>Relative Risk Reduction</th>
<th>No. Needed to Treat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no. of events/total no. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEP risk score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 or 2</td>
<td>17/134 (12.7)</td>
<td>8/125 (6.4)</td>
<td>49%</td>
<td>16</td>
</tr>
<tr>
<td>&gt;2</td>
<td>35/173 (20.2)</td>
<td>19/169 (11.2)</td>
<td>44%</td>
<td>11</td>
</tr>
<tr>
<td>Any score</td>
<td>52/307 (16.9)</td>
<td>27/294 (9.2)</td>
<td>46%</td>
<td>13</td>
</tr>
</tbody>
</table>
Aggressive IV hydration after ERCP may reduce post-ERCP pancreatitis

- 60 patients randomized 2:1 to aggressive vs standard hydration.
  - Aggressive hydration defined as 3.0 mL/kg/hour during procedure, 20mL/kg bolus after procedure, followed by 3 mL/kg/hour

<table>
<thead>
<tr>
<th></th>
<th>Standard Hydration</th>
<th>Aggressive Hydration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fluid within 24 hours</strong></td>
<td>2.2L</td>
<td>3.8L</td>
</tr>
<tr>
<td><strong>Pancreatitis</strong></td>
<td>17%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Buxbaum J et al, CGH, 2014*
Cannulation Success Rates Vary Widely

Variable Cannulation Success Rate – Findings from a Prospective Study of British Endoscopists

Williams EJ, Gut, 2007
Logistic regression analysis of predictors of ERCP success in 85 endoscopists (13,018 cases)

**Predictors of Deep Biliary Cannulation Success**

<table>
<thead>
<tr>
<th>Annual Procedure Volume</th>
<th>OR (CI)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤90</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>91-150</td>
<td>1.28 (0.72-2.29)</td>
<td></td>
</tr>
<tr>
<td>151-239</td>
<td>1.85 (0.95-3.60)</td>
<td></td>
</tr>
<tr>
<td>&gt;239</td>
<td>2.79 (1.45-5.31)</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Peng C et al, BMC Gastroenterology, 2013
As ERCP has become more complex, are we still comfortable with it?

- ERCP is becoming technically more complex and training is no longer typically obtained in a standard GI fellowship.
- Thus, it is unclear whether these advances are translated to the general gastroenterologist or whether this has resulted in physicians performing procedures they do not feel comfortable with.
# Self-Reported Comfort Levels

<table>
<thead>
<tr>
<th>ERCP Indication</th>
<th>LV (&lt; 50)</th>
<th>MV (50-200)</th>
<th>HV (&gt; 200)</th>
<th>p value (LV vs. HV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small CBD Stone</td>
<td>231 (98.3%)</td>
<td>263 (99.6%)</td>
<td>121 (96.0%)</td>
<td>0.17</td>
</tr>
<tr>
<td>Bile leak</td>
<td>231 (97.5%)</td>
<td>263 (99.3%)</td>
<td>121 (96.0%)</td>
<td>0.41</td>
</tr>
<tr>
<td>Large CBD Stone</td>
<td>202 (86.0%)</td>
<td>256 (97.3%)</td>
<td>122 (96.8%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Hilar Stricture</td>
<td>147 (62.0%)</td>
<td>213 (81.3%)</td>
<td>113 (91.1%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>SOD II</td>
<td>84 (35.9%)</td>
<td>151 (57.2%)</td>
<td>110 (87.3%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>SOD III</td>
<td>9 (3.8%)</td>
<td>20 (7.6%)</td>
<td>39 (31.2%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pancreas Divisum</td>
<td>36 (15.3%)</td>
<td>115 (43.6%)</td>
<td>108 (85.7%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Pancreas Duct Stone</td>
<td>19 (8.1%)</td>
<td>74 (27.9%)</td>
<td>108 (86.4%)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

*Cote G, Keswani R, et al., GIE, 2011*
## Self-Reported Comfort Levels

<table>
<thead>
<tr>
<th>Variable</th>
<th>MD Volume, # Cases/yr (%)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LV (&lt; 50)</td>
<td>MV (50-200)</td>
</tr>
<tr>
<td><strong>Overall Comfort Level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Comfortable</td>
<td>136 (60.4%)</td>
<td>229 (89.8%)</td>
</tr>
<tr>
<td>Somewhat Comfortable</td>
<td>79 (35.1%)</td>
<td>25 (9.8%)</td>
</tr>
<tr>
<td>Somewhat Uncomfortable</td>
<td>8 (3.6%)</td>
<td>1 (0.4%)</td>
</tr>
<tr>
<td>Very Uncomfortable</td>
<td>2 (0.9%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td><strong>Enjoyment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enjoy ERCP</td>
<td>131 (58.2%)</td>
<td>226 (88.3%)</td>
</tr>
<tr>
<td>Perform Because Important Service But Find Stressful</td>
<td>84 (37.3%)</td>
<td>27 (10.6%)</td>
</tr>
<tr>
<td>Would Prefer an Alternative</td>
<td>10 (4.4%)</td>
<td>3 (1.2%)</td>
</tr>
</tbody>
</table>

NEW TECHNIQUES AND TECHNOLOGY
Advances in Cholangioscopy

- ERCP is traditionally performed by visualizing the biliary and pancreas ducts *indirectly* via fluoroscopy.
- Cholangioscopy and pancreatoscopy refer to the direct visualization of the bile duct (cholangioscopy) and pancreas ducts (pancreatoscopy).
Advances in Cholangioscopy

CASE PRESENTATION

- A 76-year-old female underwent a living related liver transplantation 5 years prior for primary biliary cirrhosis.
- Initially with a complex anastomotic stricture that was treated with endoscopic therapy (10 ERCPs over 2 years).
“Failed” ERCP
Case
Case
Transmural Metal Stents

- Potential to create stable anastomoses for
  - Gallbladder drainage
  - Biliary drainage
  - Gastrojejunostomies
  - Pancreatic fluid collections
Thank You!

Northwestern University
Interventional Endoscopy