Indications for Intra-operative Cholangiogram

Case Conference
SUNY Downstate Medical Center

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August 4, 2011
Case

37y/o M presented to the ER
- Known h/o gallstones
- Constant RUQ pain X 5days
- Jaundice

PMHx: Denies

PSHx: Denies
Physical Exam:
- VS: 97.7  69  17  123/80
- Scleral & dermal icterus
- Abdomen: soft, Nondistended, (+)RUQ tenderness; mild epigastric tenderness No Murphy's sign, No rebound or Guarding

Labs:
- WBC: 4.8  TBili 5.9  AlkP 255  AST 184  ALT 454  Amy 56  Lip 29
Ultrasound
Ultrasound

- Cholelithiasis
- No Pericholecystic fluid
- Gall Bladder Wall: 3.4mm
- CBD: 1.18cm.
Hospital Day # 2: MRCP

- Common Bile Duct Patent and of normal caliber without evidence of filling defects
- 2 to 4 mm layering filling defects are seen in the gallbladder fundus
- Gallbladder without evidence of wall thickening
- Labs: Tbili: 5.2, AlkP: 228
Hospital Day #3

Laparoscopic Cholecystectomy

- JP Drain Placed because of bile spillage from fundus of GB

- Evening Labs:
  - Tbili: 3.6, AlkP: 198

- AM Labs (POD#1):
  - Tbili: 3.3, AlkP: 204
  - Discharged home
POD # 3

Return to ED for Evaluation and Drain Removal
- **Labs:** Tbili: 2.2, AlkP: 217
- **Drain Removed**
POD #4

Returned to ER with RUQ Pain

- **Labs:** Tbili: 2.6, AlkP: 364
- Arrangements made for MRCP then ERCP if MRCP is abnormal
 Returned to Clinic

- Labs: Tbili: 2.6, AlkP: 521

MRCP: CBD normal caliber measuring 4 mm. No significant intrahepatic biliary ductal dilatation. No choledocholithiasis.
POD # 11

- Returned to ER for Labs
  - Labs: TBili: 1.3 AlkP: 262
  - Feels fine
Intraoperative Cholangiogram

Agenda:
- Anatomy
- History
- Routine vs. Selective use
- Preoperative predictors of Choledocholithiasis
- MRCP / EUS
- Algorithm
- Summary
Intraoperative Cholangiography

Anatomy:
Intraoperative Cholangiography

Anatomy:
Intraoperative Cholangiography

Anatomy:
Intraoperative Cholangiography

History

– Reich in 1918
  First to visualize the extrahepatic biliary tree
  Injected bismuth and petrolatum and defined a biliary fistula

– Mirizzi in 1932
  First series of intraoperative cholangiograms
  Using static films

– Berci and colleagues in 1978
  Mobile C-arm image intensifier using a TV monitor

Intraoperative Cholangiography

Arguments for Routine Intraoperative Cholangiography

- Detection of Bile Stones
  - 5%
- Detection of anatomical ductal abnormalities
  - 12%
- CBD injury without IOC
  - 0.4-0.6%
- CBD injury with IOC
  - 0.2-0.4%

Flum DR, Dellinger EP, Cheadle A, Chan L, Koepsell T. Intraoperative cholangiography and risk of common bile duct injury during cholecystectomy. JAMA. 2003 Apr 2;289(13) (Seattle)
Intraoperative Cholangiography

Arguments Against Routine Intraoperative Cholangiography

– Cannot be performed in 5%-9%
– Does not eliminate CBD injury

Only part of the process

– Meticulous dissection & visualization more important


Intraoperative Cholangiography

Arguments Against Routine Intraoperative Cholangiography (Cont’)

- Small stones that are not suspected clinically are likely to be insignificant
- False positives & False Negatives
- MRCP
- ERCP
- Increased Operating Time & Cost (?)


Intraoperative Cholangiography

**Indications for IOC:**

- Elevated preoperative liver enzymes
- Unclear anatomy during laparoscopic dissection
- Dilated CBD on preoperative imaging
- Gallstone Pancreatitis without endoscopic clearance of CBD
- Jaundice
- Many small stones in gall bladder
- Unsuccessful preoperative ERCP for choledocholithiasis

Intraoperative Cholangiography

Predictors of CBD Stones:
- Studies are all over the place

- Elevated Early On:
  - alanine aminotransferase (ALT)

- Later:
  - Bilirubin, AlkP, GGT

Intraoperative Cholangiography

Meta-Analysis of 22 studies

**TABLE 3 -- Sensitivity and Specificity**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Sensitivity</th>
<th>95% CI</th>
<th>Specificity</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBDS on US</td>
<td>0.38</td>
<td>0.27-0.49</td>
<td>1.00</td>
<td>0.99-1.00</td>
</tr>
<tr>
<td>Cholangitis</td>
<td>0.11</td>
<td>0.02-0.19</td>
<td>0.99</td>
<td>0.99-1.00</td>
</tr>
<tr>
<td>Preop jaundice</td>
<td>0.36</td>
<td>0.26-0.45</td>
<td>0.97</td>
<td>0.95-0.99</td>
</tr>
<tr>
<td>Dilated CBD on US</td>
<td>0.42</td>
<td>0.28-0.56</td>
<td>0.96</td>
<td>0.94-0.98</td>
</tr>
<tr>
<td>Amylase</td>
<td>0.11</td>
<td>0.02-0.20</td>
<td>0.95</td>
<td>0.93-0.98</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>0.10</td>
<td>0.08-0.12</td>
<td>0.95</td>
<td>0.93-0.97</td>
</tr>
<tr>
<td>Jaundice</td>
<td>0.39</td>
<td>0.29-0.49</td>
<td>0.92</td>
<td>0.88-0.97</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>0.69</td>
<td>0.48-0.90</td>
<td>0.88</td>
<td>0.84-0.92</td>
</tr>
<tr>
<td>Alk phos</td>
<td>0.57</td>
<td>0.46-0.69</td>
<td>0.86</td>
<td>0.78-0.94</td>
</tr>
<tr>
<td>Cholecystitis</td>
<td>0.50</td>
<td>0.11-0.89</td>
<td>0.76</td>
<td>0.45-1.00</td>
</tr>
</tbody>
</table>

Intraoperative Cholangiography

Retrospective - 1002 patients who underwent laparoscopic cholecystectomy for cholelithiasis

Met indication for ERCP

Found to have CBD stone on ERCP

<table>
<thead>
<tr>
<th>Table 1 Predictors of common bile duct stones in patients undergoing laparoscopic cholecystectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical predictors</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>ERCP, n = 199</td>
</tr>
<tr>
<td>Sonography, n = 926</td>
</tr>
<tr>
<td>CT scan, n = 232</td>
</tr>
<tr>
<td>MRI, n = 32</td>
</tr>
<tr>
<td>CBD diameter, n = 994</td>
</tr>
<tr>
<td>Serum amylase, n = 304</td>
</tr>
<tr>
<td>GGT, n = 1002</td>
</tr>
<tr>
<td>ALP, n = 1002</td>
</tr>
<tr>
<td>TB, n = 1002</td>
</tr>
<tr>
<td>ALT, n = 1002</td>
</tr>
<tr>
<td>AST, n = 1002</td>
</tr>
<tr>
<td>GGT+ALP+TB+ALT+AST, n = 1002</td>
</tr>
</tbody>
</table>

GGT: gamma glutamyl transferase, ALP: alkaline phosphatase, TB: total bilirubin, ALT: alanine aminotransferase, AST: aspartate aminotransferase, CT: computed tomography, MRI: magnetic resonance imaging, ERCP: endoscopic retrograde cholangiopancreatography, CBD: common bile duct, GGT+ALP+TB+ALT+AST: at least one abnormal elevation of five biochemical values

Intraoperative Cholangiography

MRCP / EUS

- MRCP
  - Meta-analysis of 67 studies (4711 patients)
    - Pooled sensitivity of 95%
    - Pooled specificity of 97%

- EUS
  - Meta-Analysis of 27 studies with 2673 patients
    - Sensitivity of 94 percent
    - Specificity of 95 percent


Intraoperative Cholangiography

MRCP / EUS

Pooled analysis of 301 patients from five randomized, prospective, blinded trials.

– Compared EUS with MRCP,

  no significant difference in:
  – sensitivity (93 versus 85 percent)
  – specificity (96 versus 93 percent)

Ledro-Cano D. Suspected choledocholithiasis: endoscopic ultrasound or magnetic resonance cholangio-pancreatography? A systematic review. Eur J Gastroenterol Hepatol 2007; 19:1007 (Spain)
Intraoperative Cholangiography

MRCP / EUS

– The question of slice thickness

Six studies

– MRCP slice thickness $\geq 5$ mm
  - Sensitivity - 40%
  - Specificity – 80%

– MRCP slice thickness $\leq 3$ mm or 3D-MRCP sequences.
  - Sensitivity - 87%
  - Specificity - 90%

McMahon CJ. The relative roles of magnetic resonance cholangiopancreatography (MRCP) and endoscopic ultrasound in diagnosis of common bile duct calculi: a critically appraised topic. Abdom Imaging. 2008 Jan-Feb;33(1):6-9 (Ireland)
Intraoperative Cholangiography

MRCP / EUS

- MRCP is preferred to EUS
  
  - Noninvasive

  However:
  
  - Sensitivity of MRCP may be lower for small stones (<6 mm)
  - MRCP cannot detect biliary sludge → EUS can
  - EUS for patients in whom the suspicion for choledocholithiasis remains despite a "negative" MRCP

Intraoperative Cholangiography

Algorithm

Intraoperative Cholangiography

Summary

- Good evidence for routine IOC
- Good Evidence for selective IOC
- Good Evidence for rare IOC
- As less invasive diagnostic and therapeutic modalities become better the roll for operative interventions become less indicated.
Intraoperative Cholangiography

Summary
- My Opinion...
  - Routine IOC
THANK YOU!

www.downstatesurgery.org

Flum DR, Dellinger EP, Cheadle A, Chan L, Koepsell T. Intraoperative cholangiography and risk of common bile duct injury during cholecystectomy. JAMA. 2003 Apr 2;289(13)


