Choledocholithiasis

Michael Klein, MD
David Radvinsky, MD
SUNY Downstate Medical Center
July 23, 2015
Choledocholithiasis

Presence of stones within the hepatic or common bile ducts
Pop Quiz

The vast majority of choledochal stones are:

a. Primary stones
b. Secondary stones
Pop Quiz

The vast majority of choledochal stones are:

a. Primary stones
b. Secondary stones

© The Awkward Yeti
Risk Factors

- Female gender
- Age > 40 (30?)
- Pregnancy (prior or current)
- Obesity / rapid weight loss
- Estrogen exposure
- Prolonged fasting
- Hemolysis
- Biliary strictures/infection
Diagnosis

Suggested by US showing dilated CBD; rarely, a stone may been seen in the CBD on ultrasound.
Diagnosis

MRCP:
- 95% sensitivity
- 89% specificity

Safe, noninvasive
Nontherapeutic
Diagnosis

ERCP:
Gold standard

Diagnostic and therapeutic
Invasive
<table>
<thead>
<tr>
<th>Imaging Procedure</th>
<th>Diagnostic or Therapeutic Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plain abdominal radiograph</td>
<td>Calcified gallstone&lt;br&gt;Air in the biliary tree&lt;br&gt;Air in the gallbladder wall or lumen</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>Stones in the gallbladder (possibly in duct)&lt;br&gt;Thickened gallbladder wall&lt;br&gt;Dilation of intrahepatic and extrahepatic ducts&lt;br&gt;Liver lesion&lt;br&gt;Pancreatic mass</td>
</tr>
<tr>
<td>Radionuclide scan (HIDA scan)</td>
<td>Filling of gallbladder&lt;br&gt;Filling of bile ducts&lt;br&gt;Passage of bile into the duodenum</td>
</tr>
<tr>
<td>Computed tomography (CT)</td>
<td>Pancreatic mass&lt;br&gt;Dilation of intrahepatic and extrahepatic ducts&lt;br&gt;Liver lesion&lt;br&gt;Stones in the gallbladder or bile ducts</td>
</tr>
<tr>
<td>Magnetic resonance cholangiography (MRC)</td>
<td>Stones in gallbladder or bile ducts&lt;br&gt;Dilated or structured bile ducts&lt;br&gt;Masses in liver, pancreas, or ducts</td>
</tr>
<tr>
<td>Transhepatic cholangiogram (PTC)</td>
<td>Detecting bile duct obstruction&lt;br&gt;Draining obstructed bile duct&lt;br&gt;Bypassing bile duct obstruction with stent&lt;br&gt;Obtaining cytology specimen&lt;br&gt;Detecting bile leak from ducts&lt;br&gt;Extracting bile duct calculus</td>
</tr>
<tr>
<td>Endoscopic retrograde cholangiopancreatography (ERCP)</td>
<td>Detecting bile duct obstruction&lt;br&gt;Draining obstructed bile duct&lt;br&gt;Inserting stent to bypass obstruction or control bile leak&lt;br&gt;Detecting pancreatic duct obstruction&lt;br&gt;Obtaining cytology specimen&lt;br&gt;Detecting bile leak from ducts&lt;br&gt;Extracting bile duct calculus&lt;br&gt;Obtaining biopsy of a neoplasm&lt;br&gt;Performing sphincterotomy</td>
</tr>
</tbody>
</table>
So there are stones in the CBD. Now what?
Bad things happen...

May cause complete or incomplete CBD obstruction, and:

- Nausea
- Vomiting
- RUQ pain
- Icterus
- Pancreatitis
- Fever
- Jaundice
- Epigastric pain
Bad things happen...

May cause complete or incomplete CBD obstruction, and:

- Nausea
- Vomiting
- RUQ pain
- Icterus
- Pancreatitis
- Fever
- Jaundice
- Epigastric pain
FIGURE 2 Algorithm for management of choledocholithiasis. CBD, common bile duct; CBDE, common bile duct exploration; ERCP, endoscopic retrograde cholangiopancreatography; IOC, intraoperative cholangiography; Lap, laparoscopy; Lap chole, laparoscopic cholecystectomy; MRCP, magnetic resonance cholangiopancreatography; PTC, percutaneous transhepatic cholangiography.
FIGURE 2  Algorithm for management of choledocholithiasis. CBD, common bile duct; CBDE, common bile duct exploration; ERCP, endoscopic retrograde cholangiopancreatography; IOC, intraoperative cholangiography; Lap, laparoscopy; Lap chole, laparoscopic cholecystectomy; MRCP, magnetic resonance cholangiopancreatography; PTC, percutaneous transhepatic cholangiography.
FIGURE 2 Algorithm for management of choledocholithiasis. CBD, common bile duct; CBDE, common bile duct exploration; ERCP, endoscopic retrograde cholangiopancreatography; IOC, intraoperative cholangiography; Lap, laparoscopy; Lap chole, laparoscopic cholecystectomy; MRCP, magnetic resonance cholangiopancreatography; PTC, percutaneous transhepatic cholangiography.
Cholangioscopy
FIGURE 2 Algorithm for management of choledocholithiasis. CBD, common bile duct; CBDE, common bile duct exploration; ERCP, endoscopic retrograde cholangiopancreatography; IOC, intraoperative cholangiography; Lap, laparoscopy; Lap chole, laparoscopic cholecystectomy; MRCP, magnetic resonance cholangiopancreatography; PTC, percutaneous transhepatic cholangiography.
What if the duct still can’t be cleared?
FIGURE 2 Algorithm for management of choledocholithiasis. CBD, common bile duct; CBDE, common bile duct exploration; ERCP, endoscopic retrograde cholangiopancreatography; IOC, intraoperative cholangiography; Lap, laparoscopy; Lap chole, laparoscopic cholecystectomy; MRCP, magnetic resonance cholangiopancreatography; PTC, percutaneous transhepatic cholangiography.
Open CBD Exploration
The case of the stubborn stone

You still can’t remove the stone. Do you:

A. Leave the stone, drain the CBD via T-tube, and retry ERCP in 2-3 weeks
B. Leave the stone and perform a choledochoduodenostomy
C. Leave the stone and perform a choledochojejunostomy
D. Remove the stone with a transduodenal sphincteroplasty
The case of the stubborn stone

You still can’t remove the stone. Do you:

A. Leave the stone, drain the CBD via T-tube, and retry ERCP in 2-3 weeks
B. Leave the stone and perform a choledochoduodenostomy
C. Leave the stone and perform a choledochojejunostomy
D. Remove the stone with a transduodenal sphincteroplasty
What’s the difference between a recurrent stone and a retained stone?
What's the difference between a recurrent stone and a retained stone?

If I did the case, it’s a recurrent stone. If you did the case, it’s a retained stone.
Choledochoduodenostomy
Transduodenal sphincteroplasty
“An oblique anterolateral incision is made in the second part of the duodenum. Stay sutures are then inserted in the medial wall of the duodenum … the duodenotomy incision is then closed in a single layer. Supraduodenal T-tube drainage is not normally necessary following this procedure.”

-Farquharson’s, 9th edition
T-tube drainage versus primary closure after open common bile duct exploration (Review)

Gurusamy KS, Koti R, Davidson BR
Meta-analysis

- All RCTs comparing 1º closure vs. T-tube placement until April 2013 (6 RCTs, N=359)
  - 181 primary closure, 178 T-tube drainage
  - No biliary stents

Primary outcome: overall & 30-day mortality
Secondary outcomes: OR time, LOS, return to work, recurrent/retained stones
<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Illustrative comparative risks* (95% CI)</th>
<th>Relative effect (95% CI)</th>
<th>No of participants (studies)</th>
<th>Quality of the evidence (GRADE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assumed risk</td>
<td>Corresponding risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary closure</td>
<td>6 per 1000</td>
<td>12 per 1000 (3 to 51)</td>
<td>RR 2.25 (0.55 to 9.25)</td>
<td>359 (6 studies)</td>
</tr>
<tr>
<td>T-tube drainage</td>
<td></td>
<td></td>
<td></td>
<td>+ + + + very low¹,²,³,⁴</td>
</tr>
<tr>
<td>Peri-operative mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious morbidity (rate)</td>
<td>66 per 1000</td>
<td>145 per 1000 (65 to 325)</td>
<td>Rate ratio 2.19 (0.98 to 4.91)</td>
<td>272 (4 studies)</td>
</tr>
<tr>
<td>Serious morbidity (proportion)</td>
<td>62 per 1000</td>
<td>158 per 1000 (18 to 1000)</td>
<td>RR 2.53 (0.29 to 21.98)</td>
<td>35 (1 study)</td>
</tr>
<tr>
<td>Operating time</td>
<td>The mean operating time in the control groups was 87.75 minutes</td>
<td>The mean operating time in the intervention groups was 28.9 minutes higher (17.18 to 40.62 higher)</td>
<td>40 (1 study)</td>
<td>+ + + + very low¹,²,³,⁴,⁵,⁶</td>
</tr>
<tr>
<td>Hospital stay</td>
<td>The mean hospital stay in the control groups was 9.12 days</td>
<td>The mean hospital stay in the intervention groups was 4.72 days higher (0.83 to 8.6 higher)</td>
<td>333 (5 studies)</td>
<td>+ + + + very low¹,⁴,⁷</td>
</tr>
</tbody>
</table>
T-tube drainage versus primary closure after laparoscopic common bile duct exploration (Review)

Gurusamy KS, Koti R, Davidson BR
### SUMMARY OF FINDINGS FOR THE MAIN COMPARISON

**T-tube drainage compared to primary closure after laparoscopic common bile duct exploration**

**Patient or population:** laparoscopic common bile duct exploration.
**Settings:** secondary or tertiary hospital.
**Intervention:** T-tube drainage.
**Comparison:** primary closure.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Illustrative comparative risks* (95% CI)</th>
<th>Relative effect (95% CI)</th>
<th>No of participants (studies)</th>
<th>Quality of the evidence (GRADE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assumed risk</td>
<td>Corresponding risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Primary closure</strong></td>
<td><strong>T-tube drainage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious morbidity (rate)</td>
<td>61 per 1000 (40 to 233)</td>
<td>Rate ratio 1.59</td>
<td>295 (3 studies)</td>
<td>1-2 3-4 very low</td>
</tr>
<tr>
<td>Serious morbidity (proportion of patients)</td>
<td>61 per 1000 (53 to 241)</td>
<td>RR 1.86 (0.87 to 3.96)</td>
<td>205 (3 studies)</td>
<td>1-2 3-4 very low</td>
</tr>
<tr>
<td>Operating time (minutes)</td>
<td>The mean operating time in the control groups was 106.48 minutes</td>
<td>The mean operating time in the intervention groups was 21.22 minutes higher (12.44 to 30 higher)</td>
<td>295 (3 studies)</td>
<td>1-2 very low</td>
</tr>
<tr>
<td>Hospital stay (days)</td>
<td>The mean hospital stay in the control groups was 3.93 days</td>
<td>The mean hospital stay in the intervention groups was 3.26 days higher (2.49 to 4.04 higher)</td>
<td>295 (3 studies)</td>
<td>1-2 very low</td>
</tr>
</tbody>
</table>

*The basis for the **assumed risk** is the overall control group risk across studies. The **corresponding risk** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: Confidence interval; RR: Risk ratio.
Conclusions

“There is no justification for the routine use of T-tube drainage after open common bile duct exploration in patients with common bile duct stones.”
STEM CELLS! Our Mission is sealed in this envelope!

Whatever we make will be an integral part of the overall system, and a permanent fixture for this body!

I hope we get to make the BRAIN! or the HEART!