Laparoscopic Exploration of the Common Bile Duct
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Goals
• Briefly define the problem
• Discuss the history of the management on choledocholithiasis
• Discuss the importance of being able to perform laparoscopic bile duct exploration
• Discuss the laparoscopic equipment and techniques available to manage common bile duct stones
• Discuss outcomes of laparoscopic clearance of CBD stones in the era of ERCP

Choledocholithiasis: The Problem
• Up to 18% of patients undergoing cholecystectomy can have CBD stones
• CBD stones can be suspected by preop labs, jaundice, pancreatitis, dilated duct, etc
• 25% of CBD stones are found unexpectedly

Choledocholithiasis: Historical management
• Non-operative management for hundreds of years
• Bobbs in 1867 performed cholecystostomy and milked stones into gallbladder and/or duodenum
• 1889 first reports of CBD exploration
• 1899 Halsted performed first choledochoduodenostomy - rec CBD exploration in every patient
Choledocholithiasis: Historical management

- 1931 Mirizzi performed IOC
  - Negative CBD exploration dropped from 50% to 6%
  - Retained CBD stone dropped from 25% to 11%
  - Morbidity and mortality dropped significantly
- Choledochoscopy introduced 1963
  - Retained CBD stones drop to 3%

- 1974 ERCP introduced
  - Preop clearance did not improve outcomes or LOS in era of open choledocholithiasis
  - Pt management was simple
    - Open Chole if suspected CBD stone cholangiogram done
    - If cholangiogram show CBD stone pt had CBD exploration
    - If residual CBD stone found postop ERCP performed

Choledocholithiasis: Role of Laparoscopic Common Bile Duct Exploration (LCBDE)

- LCBDE offers advantage of 1 stage procedure
- If in an area with no/poor ERCP availability can prevent pt from having open CBD exploration
- With increased numbers of LRYGB patients ERCP can be difficult/impossible
- Can expedite patient discharge

- Who gets preop ERCP? Who gets IOC? What to do if positive?
  - Difficult to predict who has CBD stones
  - Expensive
  - Sphincterotomy carries risk of strictures
  - Chole with postop ERCP?
  - Intrasp CBD exploration? Lap or Open?
Techniques

- Transcystic approach
- Laparoscopic choledochotomy

Transcystic Options

- Glucagon with lavage
- Balloon trolling
- Fluoroscopy-guided wire basket stone retrieval
- Ampullary balloon dilation with lavage
- Endoscopic stone retrieval with wire basket

Glucagon with lavage

- Appropriate for stones 4mm or less and mobile on cholangiogram
- 1-2mg of glucagon given IV
- Wait 5 minutes
- Forcibly flush the CBD with saline (min 50mL)
- Repeat cholangiogram
Balloon Trolling
- Can be done blindly or under fluoro
- Little skill required
- Can potentially force distal CBD stone into proximal bile ducts necessitating choledochotomy
- 4 Fr Fogarty balloon is passed distal to stones, inflated, pulled back to bring stones into abdominal cavity

Fluoroscopy-guided wire basket stone retrieval
- Little skill required
- Potential for perforation of CBD
- No direct visualization of CBD stone

Ampullary balloon dilation with lavage
- Can be performed in patients with small/fragile cystic ducts not amenable to balloon dilation
- No 5 balloon catheter passed over guide wire is passed into cystic duct
- Under fluoro balloon is centered at the sphincter of Oddi
- Balloon dilated to size of largest CBD stone
- Forceful irrigation

Endoscopic stone retrieval with wire basket- Procedure of Choice
- Direct visual retrieval of stones
  - Less risk of perforation
- No ampullary manipulation
- Can be performed in 80-90% of cases
- Do not need to worry about closing a choledochotomy
Endoscopic stone retrieval with wire basket - Limitations

- Multiple stones
- Small or fragile cystic ducts
- Stones proximal to the cystic duct/CBD junction
- Stones larger than 8mm

Transcystic Approach - Positioning

Instruments Necessary

- Glide Wires
- Balloon Dilators
- Balloon Inflator
- Choledochoscope (Ureteroscope) – working channel of 1.2mm and diameter between 2.7-3.2 mm
- Wire Baskets
- Saline pressure system
- Additional monitor or PIP system
- Fluoroscopy
Step 1- Balloon Dilation

- Do not transect cystic duct
- Dissect as close as possible to cystic/CBD junction to decrease amount of cystic duct needing dilation
- Insert guide wire through 5-8 french balloon
- Cannulate cystic duct with guide wire/balloon

Step 1- Balloon Dilation

- Pass balloon over guide wire into cystic duct
- Inflate balloon with inflator to recommended atmospheres pressure (approx 12) for 5 minutes
- If cystic tears stop inflation for 1 min and try again
- Dilate to the size of largest CBD stone

Step 2- Insert Choledochoscope

- Remove balloon
- Insert choledochoscope via guide wire, free hand, or with padded graspers
- Scope should be attached to warmed pressure saline system
- Explore CBD
Step 3 - Retrieve CBD stones

- Pass closed wire basket beyond the visualized stone
- Open basket and slowly withdraw under direct vision
- Once stone is in basket the basket is closed
- The entire apparatus including the scope is removed and the stone is brought out through the cystic duct

Laparoscopic Choledochotomy

- Benefits
  - Large stones (>8mm)
  - Multiple Stones
  - Small/fragile cystic ducts
  - Proximal stones
Laparoscopic Choledochotomy

- Limitations
  - Requires choledochotomy
  - T-tube
  - Suturing can be difficult
  - Large duct necessary (>1cm)
  - Inflammation may make dissection hazardous

Step 1- Preparing for the choledochotomy

- Gallbladder used to retract liver
- Dissect anterior wall of CBD from hepatic bifurcation to superior aspect of pancreas
- Expose a length of approx 2cm
- May need to aspirate bile to confirm CBD or intraop UTZ
- Place stay sutures going longitudinal on either side of planned choledochotomy

Step 2- Choledochotomy

- Micro scissors used to incise CBD while assistant holds up on retraction sutures
- Length of choledochotomy should be no longer than size of largest stone (5-6mm preferably)
Step 3 - Retrieve Stones

- Insert choledochoscope and irrigate with warm saline
- Wire basket/balloon retrieval can be performed under direct vision

Step 4 - T-tube placement

- 10-14 French T-Tube chosen
- One end cut longer than other
- Entire T-tube brought into abdomen
- Long end placed distal and short proximal
- T-tube laparoscopically sutured into place
  - 4.0 vicryl on CVS-23 needle
- T-tube brought out lateral 5mm trocar site
- Perform completion cholangiogram

LCBDE in the era of ERCP

- Why to do preop ERCP
  - Poor ERCP support if not facile at LCBDE
  - Cholangitis
  - Worsening pancreatitis
- Why NOT to do preop ERCP
  - Expensive if one has skills for LCBDE
  - 40-70% negative preop ERCP when CBD suspected
  - Pancreatitis
  - Long-term effects of sphincterotomy - stricture, bacterobilia, ? carcinoma
LCBDE in the era of ERCP

- **Why to do LCBDE**
  - 1 stage procedure
  - Studies including Cochrane review show no difference in stone clearance, morbidity, and mortality with LCBDE vs pre or postop ERCP
  - Inexpensive
- **Why NOT to do LCBDE**
  - Difficult to do if little experience
  - Time consuming

Summary

- LCBDE offers 1 procedure to take care of patients gallbladder and CBD stones with equivalent results to ERCP
- LCBDE is more cost effective than pre or postop ERCP
- LCBDE can be achieved via the cystic duct in the majority of cases and does not require substantial laparoscopic skills

Conclusion

- LCBDE via the transcystic approach is a safe and effective way of clearing the CBD of stones with minimal need for advanced laparoscopic skills
- If a surgeon cannot clear the CBD using transcystic technique, then they can attempt lap cholecystotomy, open choledochotomy, or postop ERCP depending on their skill level and local ERCP support