Common Bile Duct Exploration (CBDE)

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Laparoscopic Common Bile Duct Exploration

Definition

- Laparoscopic Exploration of the Common Bile Duct to Remove Stones
- *See Choledocholithiasis

Approaches

- *Transcystic Approach* – Through the Cystic Duct
  - Preferred Approach if Able – Protect Integrity of the Common Bile Duct
- *Choledochotomy* – Through the Common Bile Duct
  - Indicated if Transcystic Approach Fails or is Contraindicated

Comparison to Preoperative ERCP [1,2]

- Lap-CBDE Has Lower Risk of Technical Failure
- Lap-CBDE Has Lower Risk of Overall Complications
  - Lap-CBDE Has Lower Risk of Pancreatitis or Perforation
  - Lap-CBDE Has Higher Risk of Bile Leak
- Lap-CBDE Has Shorter Length of Stay
- Lap-CBDE Has Fewer Procedures Required

Indications [4]

- Choledocholithiasis Diagnosed Preoperatively by MRCP or US
- Choledocholithiasis Diagnosed Intraoperatively by Cholangiography
- Choledocholithiasis After Failed ERCP
- Choledocholithiasis with Altered Anatomy Unable to Undergo Traditional ERCP (Gastric Bypass, etc.)

Contraindications [4-6]

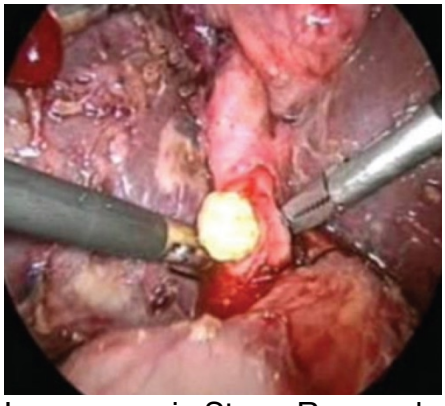
- Hemodynamic Instability
- Hostile Porta Hepatis
- Contraindications to a Transcystic Approach:
  - Friable Cystic Duct
  - Narrow or Tortuous Cystic Duct
  - Large Stones (> 1 cm)
  - Multiple Stones (> 8-10)
  - Common Hepatic Duct Stones
- Contraindications to a Choledochotomy:
  - Narrow Common Bile Duct (Diameter < 7 mm)

Transcystic Procedure

- Generally Attempt Stone Clearance by IOC with Glucagon/Flushing First
  - Proceed if Flushing Fails
  - *See Intraoperative Cholangiogram (IOC)
- Dilate the Cystic Duct to 4-6 mm for Instrumentation
  - Maximum 8 mm if Needed
- Retrieve Stones with Instrumentation Through the Cystic Duct Opening
  - *See Below
- Confirm Clearance with a Completion Cholangiography
- Close the Ductal Stump
  - Close Using an Endoloop (Not Clips) to Minimize the Chance of Leak Due to Edema

Choledochotomy Procedure

- Choledochotomy Incision
  - 1.0-1.5 cm Longitudinal Incision Below the Cystic Duct Insertion
  - Slightly Medial to Anterior Midline (Avoid Septum of Fused Cystic/CHD)
- Consider Stay Sutures on Either Side to Keep Open
- Retrieve Stones with Instrumentation Through the Common Bile Duct – Same Methods as Transcystic Approach
  - *See Below



Laparoscopic Stone Removal by Choledochotomy [7]

- Close Choledochotomy
    - Classically Use an Absorbable Monofilament Suture
    - May Consider Using an Absorbable Knotless Unidirectional Barbed Suture – Facilitates Easier Intracorporal Closure without Increased Complications [8-10]
    - May Consider Closing Over a T-Tube Although Falling Out of Favor [11,12]

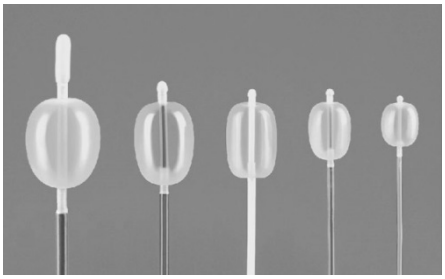
Options If Stone is Impacted and Unable to Remove Laparoscopically

- Conversion to an Open Common Bile Duct Exploration
- Leave T-Tube
- Postoperative ERCP
- If Preoperative ERCP Failed:
    - Transduodenal Sphincteroplasty
    - Biliary-Enteric Drainage (Side-to-Side Choledochoduodenostomy)

Stone Retrieval Techniques

Fogarty/Balloon Catheter

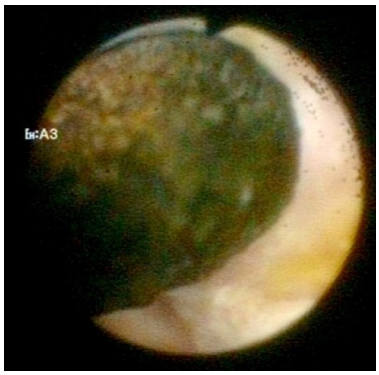
- Use a 4-Fr or 5-Fr Fogarty Catheter
- Balloon Catheter Fed Past the Stone into the Duodenum
- Balloon Inflated and Slowly Retracted Pulling the Stone Retrograde
- Stone Pulled Out Through the Ductal Opening



Fogarty Balloon Catheters [13]

Balloon Sphincteroplasty

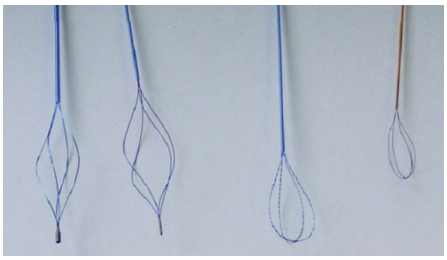
- Use a Balloon Catheter Under Fluoroscopic Guidance to Dilate the Sphincter of Oddi
- First Gain Guidewire Access into the Duodenum
- Advance a Balloon Catheter Over the Guidewire into the Duodenum
- Inflate Balloon in the Duodenum and Retract Under Fluoroscopic Guidance
    - Determine Location of the Sphincter
- Slightly Deflate, Retract Balloon into the Sphincter, then Reinflate for 3-5 Minutes
    - Larger Balloon Sizes (≥ 10 mm) Prevent Pancreatitis – Limits Postoperative Sphincter Spasm
- Can Then Facilitate Antegrade Stone Clearance – Done by Flushing, Pushing with a Choledochoscope, or Pushing with a Balloon Catheter Over a Guidewire



Large CBD Stone Seen by Choledochoscope [3]

Choledochoscope-Guided Wire Basket

- Choledochoscope Insert Through the Ductal Opening
    - May Use Ureteroscope if Dedicated Choledochoscope is Unavailable
- Continuous Saline Infusion to Dilate the Lumen & Permit Visualization
- Wire Basket Passed Beyond the Stone & Opened
- Ensnare Stone by Retracting Basket with Rotation
- Stone Pulled Out Through the Ductal Opening



Various Wire Baskets [14]

Fluoroscopic-Guided Wire Basket

- Performed Under Fluoroscopic Guidance
- Guidewire Passed into the Duodenum Through the Ductal Opening
- Wire Basket Fed Over the Guidewire
- Ensnare Stone by Retracting Basket with Rotation
- Stone Pulled Out Through the Ductal Opening

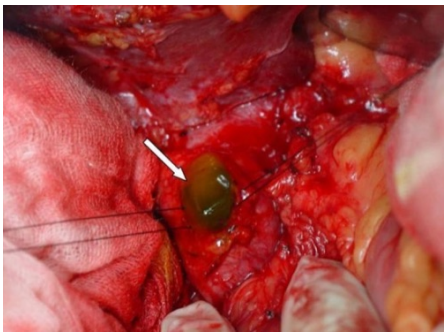
Novel Approaches

- *Lithotripsy*
- *Antegrade Sphincterotomy* – Sphincterotome Inserted Through the Cystic Duct to Create a Sphincterotomy

Open Common Bile Duct Exploration

Indications

- Choledocholithiasis During an Open Cholecystectomy
- Choledocholithiasis After Failure of Laparoscopic Common Bile Duct Exploration
- Choledocholithiasis if Endoscopy & Laparoscopy are Unavailable



Open Choledochotomy with Retention Sutures [15]

Procedure

- Ligate Proximal Cystic Duct
- Choledochotomy Incision
    - 1.5 cm Longitudinal Incision Just Above Duodenum
- Use Stay-Sutures on Either Side to Keep the Choledochotomy Open
- May Require Kocher Maneuver to Mobilize the Duodenum
- Retrieve Stones
    - *See Below

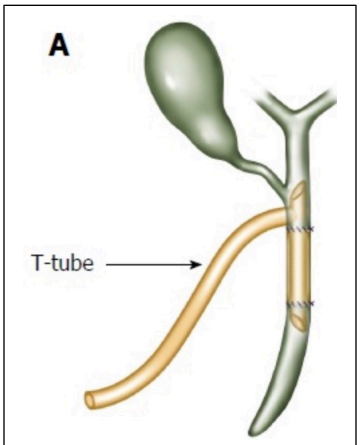
- Consider T-Tube if Suspect Residual Stones or Concern for Stricture
- Close with Absorbable Monofilament Suture

Methods to Retrieve Stones

Desjardins Gallstone Forceps

- Manual Expression
  - Generally Preferred as the Initial Method
- Forceps Removal
  - Classically Using Desjardins Gallstone Forceps
- Fogarty/Balloon Catheter
- Choledochoscope-Guided Wire Basket

Closure Options



Biliary T-Tube [16]

- Primary Closure
  - Use an Absorbable Monofilament Suture
  - Historically Concerned for Risk of Biliary Stricture but Recently Being Disproven [11]
- Closure Over a T-Tube
  - Historically the Gold Standard Closure but Now Falling Out of Favor
  - Increased Risk of Complications, Leaks, Longer Operating Time, and Longer Hospital Length of Stay [11,17]
- Less Common Options:
  - C-Tube (Through the Cystic Duct Stump)
  - Antegrade Stenting

Postoperative Management of a T-Tube

- Repeat Cholangiogram at 24-48 Hours
  - If Normal: Keep Clamped & Flush with Saline Once-Twice Per Day
  - If Obstructed/Retained Stone: Leave Open to Drain
- Repeat Cholangiogram at 10-14 Days
  - If Normal: Remove
  - If Obstructed/Retained Stone: ERCP or IR Intervention per T-Tube

Options If Stone is Impacted and Unable to Remove

- Leave T-Tube
- Postoperative ERCP
- If Preoperative ERCP Failed:
  - Transduodenal Sphincteroplasty
  - Biliary-Enteric Drainage (Side-to-Side Choledochoduodenostomy)

Transduodenal Sphincteroplasty

Definition

- Sphincteroplasty Performed in an Open Fashion Made through an Incision in the Duodenum
- *Fallen into Disuse with Modern Endoscopic Interventions

Indications

- Impacted Stone After Common Bile Duct Exploration (Generally Only if Postoperative ERCP is Otherwise Contraindicated – i.e. Failed Preoperatively)
- Sphincterotomy Otherwise Indicated but Endoscopic Approach is Contraindicated:
    - Recurrent Stricture After Endoscopic Sphincterotomy
    - Ampulla Endoscopically Inaccessible
    - Pancreatic Divisum

Transduodenal Sphincteroplasty [18]

Procedure

- Kocher Maneuver to Mobilize the Duodenum
- Longitudinal Duodenotomy On the Lateral Side
- Insert a Soft Catheter, Probe, or Right-Angle into the Common Bile Duct Through the Ampulla of Vater
- Use a Pott's Scissors or Scalpel to Cut the Papilla at the 11 O'clock Position
    - Cut 15 mm in Length
- Clear the Common Bile Duct Stone
- Suture the Bile Duct Wall to the Duodenal Mucosa
    - Start with the Apical Suture and Continue Along the Sides in Interrupted Fashion
    - Use a 4-0 or 5-0 Absorbable Monofilament Suture
- Close the Duodenotomy Transversely

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