Management of Choledocholithiasis

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SUNY DOWNSTATE MEDICAL CENTER
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Case Presentation 1/18

- 45 y/o male, presented with abdominal pain radiating to the back x 1 day, associated with nausea and vomiting

- **PMH** - Depression, Neuropathy, GS pancreatitis, Stage IV rectal CA with bladder invasion, s/p neoadjuvant chemo-XRT.


- **Allergy** - NKDA

- **Meds** - Gabapentin, Naproxen, Oxycodone

- **SH** - no ETOH, no smoking or drugs
Physical Exam

- VS: T 97.7  BP 127/87  HR 79   RR 20   O2
- AAOx3, scleral icterus
- Abdomen- obese, soft, + RUQ/epigastric tenderness, colostomy and urostomy.
Labs

- CBC: 9.5/13.8/41.4/160
- BMP: 139/3.5/104/27/18/0.9/192
- LFTs: 7.5/4.0/159/166/140/5.1
- Lipase: 32322
- Lactic acid: 2.2
Imaging

- **RUQ son** - limited (body habitus)
- **CT abdomen** - Cholelithiasis, Pancreatitis
- **MRCP** - Gall bladder impacted with stones, extrahepatic ductal system dilated up to 9 mm, containing numerous gallstones.
Hospital Course

- **HD#1** NPO, Aggressive IV hydration, pain control, ERCP scheduled for 1/22.
  
  LFTs- 6.9/3.6/125/170/144/4.2 lipase- 9510

- **HD#3** LFTs trending down, tolerated clears
  
  LFTs- 6.3/3.0/45/97/115/3.9 lipase- 922

- **HD#4** s/p failed ERCP, unable to cannulate the ampulla, zosyn started for cholangitis ppx
  
  LFTs- 6.1/2.8/27/76/110/1.7 Lipase- 263
Hospital Course

- **HD#5** Repeat MRCP showed the extra-hepatic ductal system is slightly less dilated, CBD measuring 6-9mm, with numerous intraductal calculi present similar to previously.

- **HD#6** LFTs WNL, started on clears, surgery scheduled for 1/26
HD#8 s/p open cholecystectomy, CBD exploration, stones retrieval and T-Tube placement.

- Right subcostal incision
- GB resected in retrograde fashion
Surgery

- 1.5 cm longitudinal CBD incision
- Many stone retrieved from CHD & CBD using fogarty catheter
- T-tube placed
- JP drain
- Pt. extubated in OR
Postoperative Course

- **POD#2** tolerated diet, LFTs WNL
- **POD#7** t-tube cholangiogram, no residual stones, t-tube clamped.
- **POD#9** discharged home 2/4
Goals

- Introduction
- Clinical Manifestations
- Types of CBD stones
- Diagnosis
- Treatment options
- Summary
Introduction

- Over 20 million Americans have GB disease, 60%-80% are asymptomatic.
- 650,000 to 700,000 cholecystectomies are performed every year.
- 5-20% of patients have choledocholithiasis at the time of cholecystectomy.
- AOC still carries a mortality rate of 10–20%.
98% of all biliary tract disorders are in some way related to gallstones.

In Western countries, bile duct stones in most cases are secondary.

Primary bile duct stones are much more common in patients of Asian descent.
Clinical Manifestations (uncomplicated choledo.)

- Nausea and vomiting
- RUQ pain and tenderness
- Jaundice
- Courvoisier’s sign
- Symptoms resolution-> passed the GS
Clinical Manifestations (complicated choledo.)

- Gallstone Pancreatitis (elevated A/L)
- Cholangitis (charcot’s triad) -> (Reynolds pentad)
- Cirrhosis (long standing biliary obst.)
**CBDS Types**

- **Primary (de novo) stones**
  - Brown stones (higher in bilirubin, lower in cholesterol)
  - Associated with biliary stasis and infection.
  - Common with aging, Asian descent, PSC, AIDS, primary hypothyroidism

- **Secondary stones**
  - Cholesterol stones (75%) from biliary stasis
  - Black stones (25%) Ca bilirubinate, from hemolytic disorders, cirrhosis, prolonged fasting and TPN

Current Surgical Therapy 10th edition Cameron
Diagnosis

- Laboratory tests
- RUQ U/S -> 1st line, 25-68 % sensitivity for CBD stones
- MRCP (sent./spec. 95%- 97%)
- CT with contrast (sent./spec. 87%- 97%)
- EUS (sent./spec. 95%- 98%)
- ERCP (sent./spec. 95%-98%)- invasive
- Intaoperative ultrasonography (sent./spec. 90%- 93%)
- Intraoperative cholangiography (sent./spec. 98%- 94%)
ASGE 2010 Guidelines

- **Very strong predictors**
  1. Positive CBD stone on U/S
  2. Clinical acute cholangitis
  3. Serum bilirubin >4 mg/dl

- **Strong predictors**
  1. Dilated CBD > 6mm
  2. Serum bilirubin 1.8-4 mg/dl
ACGE 2010 GUIDELINES

- **Moderate predictors**
  1. Abnormal liver biochemical test other than bilirubin
  2. Age older than 55 years
  3. Clinical gallstone pancreatitis
Risk stratification

- **High risk**  at least one very strong predictor and/or Both strong predictors, >50% -> ERCP and then elective cholecystectomy

- **Intermediate risk**  One strong predictor and/or at least one moderate predictor, 10-50% -> MRCP and EUS, If negative -> cholecystectomy, if MRCP negative but suspicion if high -> EUS or IOC, if positive -> ERCP

- **Low risk**  no predictors-> cholecystectomy
CBDS Treatment

Intervention or Surgery
Treatment options

- ERCP with or without endoscopic biliary sphincterotomy (EST)
- Laparoscopic CBD exploration (transcystic or transcholedochal)
- Laparotomy with CBD exploration (by T-tube, C-tube insertion, or primary closure)
- Biliary Drainage procedures
Treatment options

- Stone removal depends on when the stone is discovered.
  - Before cholecystectomy -> ERCP
  - During Cholecystectomy -> LCBDE - trans-cystic duct, if it fails alternate approaches such as intraoperative or postoperative ERCP/EST, laparoscopic choledochototomy, or open CBDE
ERCP/EST

- Side viewing endoscope
- First ERCP 1968
- First sphincterotomy 1973
- Pre. or Post-operative ERCP is used for clearance of retained CBDSs
- Morbidity and mortality rates of 5% to 11% and 0.7% to 1.2%, respectively
- Recurrence rate 6-21%
- Biliary stenting as a bridge or as a definitive treatment
LCBDE-Trans-Cystic Approach.

- Stone <6 mm, cystic duct >4mm, CBD <6mm, stone distal to cystic duct/CBD j., less than 6 stones with CBD.
- Flush small stones after relaxing sphincter of oddi with 1-2 mg glucagon together with intraop. cholangiogram
- Fluoroscopic balloon cath. and wire basket sweep
- If stones 4-8mm, use choledochoscope
- If stone >1cm, choledochotomy
- LCBDE is as effective as ERCP 88-100% success rate
LCBDE-Trans-Ductal Approach.

- Failed trancystic approach, stones >6mm, cystic duct <4mm, multiple stones, stones to cystic duct/CBD J.
- After the stones are removed under endoscopic visualization, the ductotomy is usually closed either primarily or over an appropriately sized T-tube.
- T-tube insertion is decompression of the duct in patients with residual distal obstruction, ductal imaging in the postoperative period and providing an access route for the removal of residual CBD stones.
T-Tube Management

- Fluid & electrolytes disturbance, Bacteremia, dislodgment of the tube, obstruction, or fracture of the tube, biliary stricture, biliary peritonitis, biliary fisulas. T-T Morbidity 10-20%
- Repeat cholangiogram through T-tube
- If no stones, removal of T-tubes has been suggested as early as 5–6 days postoperatively and as late as 4–5 weeks after surgery
- Retained stones -> stone retrieval percutaneously after 4-6 weeks.
Open CBD exploration

- Failed ERCP, failed laparoscopic attempts, surgeon’s comfort
- 1-2 cm incision in CBD anterior wall with 2 stay sutures
- Arterial supply at 3 & 9 o’clock
- Use forceps, fogarty, wire baskets and dilators
PTC

- Previous gastric surgery
- Cholangiohepatitis with distal obstructing CBDS that failed ERCP
- Extensive intrahepatic stone disease.
Choledochal Drainage Procedures

- Transduodenal sphincterotomy
- Choledochoduodenostomy
- Choldochojejunostomy
Choledochal Drainage Procedures Indications

- Dilated CBD $\geq 1.5$ cm with multiple stones
- Irremovable, impacted, distal CBD stones
- Recurrence after previous duct exploration
- Recurrence after EST
- Distal CBD obstruction from tumor or stricture
Transduodenal Sphincterotomoy

- Stone impacted in ampulla of vater, papillary stenosis, multiple stenosis particularly in non-dilated duct, CBD exploration failure
- Kocherize duodenum
- Cannulate ampulla by passing fogarty into CBD
- Longitudinal duodenotomy over ampulla

Schwartz’s principles of surgery, 10th Edition
Transduodenal Sphincterotomy

- Sphincterotomy at 11 o’clock with sequential sutures
- Biliary dilator the size of CBD
- Close duodenotomy in transverse direction
- Place a drain
Choledochoduodenostomy

- Recurrent stones, impacted giant stones, ampullary stenosis.
- Kocherize duodenum
- 1-2 cm distal choledochotomy
- Clear CBD stones
- Longitudinal duodentomy
- A diamond-shaped anastomosis is performed with interrupted absorbable sutures, side to side single layerd anastomosis
- Place a drain
Choledochoduodenostomy

Complications

- Cholangitis 0-6%
- Sump syndrome
- Wound infection
- Anastmotic leak
- Intrabdominal abscess
- 70-80% asymptomatic after 5 years
Roux-en-y loop Choledochojejunostomy

- Retrocolic 45- 60 cm roux-en-y end to side anastomosis
- Interrupted absorbable sutures
- Protect against intestinal reflux & secondary cholangitis
- Place a drain

Schwartz’s principles of surgery, 10th Edition
Other Treatment Modalities

- Electrohydraulic Lithotripsy (EHL), rarely used
- Extracorporeal Shockwave Lithotripsy (ESWL), before an ERCP (90% success rate)
- Laser Lithotripsy (64-97% success rate)
Primary closure after laparoscopic common bile duct exploration versus T-tube
Zhi-Tao Dong, MD, Guo-Zhong Wu, MD, , Kun-lun Luo, MD, Jie-Ming Li, MD

- Single center randomized prospective study from 2001-2012
- 194 patient
- Group A, 101 ( LCBDE with primary closure)
- Group B, 93 ( LCBDE with T-tube drainage)
- Inclusion Criteria : CBDS>6mm, CD<4mm, numerous stones, dilated CBD>6, stones in CHD.
- All pts had intraop. Cholagiography and choledochoscopy
- Results: intraoperative findings, complications, LOS, Hospital expenses
<table>
<thead>
<tr>
<th>Complications</th>
<th>Group A (N = 97)</th>
<th>Group B (N = 90)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postoperative bleeding</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Pancreatitis</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bile leakage</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Retained stone in CBD</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Stricture of bile duct</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Complications related to T-tube</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bile peritonitis after T-tube removal</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Dislocation of drain</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Wound infection</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Outcome measures</td>
<td>Group A (N = 101)</td>
<td>Group B (N = 93)</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
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<tr>
<td>Diameter of CBD (mm)</td>
<td>11.75 ± 3.5</td>
<td>11.34 ± 4.1</td>
</tr>
<tr>
<td>Conversion to open surgery (%)</td>
<td>4 (3.96)</td>
<td>3 (3.23)</td>
</tr>
<tr>
<td>Operating time (min)</td>
<td>102.6 ± 15.2</td>
<td>128.6 ± 20.4</td>
</tr>
<tr>
<td>Intraoperative blood loss (mL)</td>
<td>35.2 ± 14.5</td>
<td>45.2 ± 17.4</td>
</tr>
<tr>
<td>Interval between surgery and getting out of bed (hr)</td>
<td>13.5 ± 4.8</td>
<td>15.3 ± 5.3</td>
</tr>
<tr>
<td>Interval between surgery and recovery of GI function (hr)</td>
<td>21.3 ± 5.6</td>
<td>25.9 ± 9.8</td>
</tr>
<tr>
<td>Postoperative hospital stay (d)</td>
<td>3.2 ± 2.1</td>
<td>4.9 ± 3.2</td>
</tr>
<tr>
<td>Hospital expenses (REN MIN BI)</td>
<td>11,278.9 ± 479.1</td>
<td>12,436.7 ± 879.3</td>
</tr>
<tr>
<td>Complications (%)</td>
<td>13 (12.87)</td>
<td>15 (16.13)</td>
</tr>
</tbody>
</table>
Summary

- Most patients with choledocholithiasis are symptomatic, although occasional patients are asymptomatic.
- U/S, MRCP are diagnostic modalities for CBDS.
- ERCP followed by cholecystectomy for patients with high risk of CBD stones.
- LCBDE (trans-cystic or trans-ductal) is a standard method with a high efficacy and low morbidity and mortality for the treatment of CBDS.
Summary

- ERCP should be performed as a first step and in the event of failure LCBDE can be performed
- Open approach (Biliary drainage procedures) always remains as a final option when other modalities have failed
References

2. Schwartz’s principles of surgery, 10th Edition
3. ASGE Standards of Practice Committee, Maple JT, Ben-Menachem T, et al. The role of endoscopy in the evaluation of suspected choledocholithiasis. Gastrointest Endosc 2010; 71:1
Thank You