Surgical Management of Choledocholithiasis
Case Presentation

• 81yo male presented to ambulatory surgery for robotic cholecystectomy.

• PMHx: Hypertension, CVA, CAD
• PSHx: Denies
• Allergies: NKDA
• Social Hx: History of alcoholism (quit in 6 months ago), denies cigarettes or illicit drug use
Case Presentation

• Previous admission – 3 months prior
  – Choledocholithiasis
  – Gallstone pancreatitis
  – Ascending cholangitis

Amylase 295
Lipase 769
Case Presentation

• CT A/P
  – Cholelithiasis and choledocholithiasis causing obstruction
  – Secondary intra- and extra- hepatic ductal dilatation
  – Pancreatic ductal dilatation
  – CBD 1.4cm

• Intervention
  – IV antibiotics
  – ERCP
    • removal of 2 large gallstones
    • stent placement
Case Presentation

• Operation
  – Robotic converted to open cholecystectomy
  – Common bile duct exploration
  – Omental patch of duodenotomy
Case Presentation

• Intra-operative findings:
  – Dense adhesions involving transverse colon and duodenum
  – Contracted gallbladder
  – Choleduodenal fistula
  – Impacted stones within the CBD
Common Bile Duct Exploration

- Expose anterior CBD
- Lateral stay sutures
- Vertical incision of the CBD
- Irrigation with catheter
- Balloon catheter fogerty
- Basket
- Stone forceps
- Choledochoscope
- T-tube placement
- Close choledochotomy
Case Presentation

• Post-operative course
  – Urinary retention
  – Delirium
  – Bile duct evaluation
  – Discharged home
    POD#11
Questions?

How's Business?

Kidney Stones  Gallstones  Dopamine

theAwkwardYeti.com
Surgical Management of Choledocholithiasis
Outline

• Gallstones
• Gallstone syndromes
• Choledocholithiasis
• Sequelae of choledocholithiasis
• Diagnostic imaging
• Treatment options
• Refractory stones
Gallstones

- **Cholesterol stones**
  - >70% cholesterol + calcium + bile pigments

- **Black stones**
  - Small, brittle stones
  - Hemolytic disorders

- **Brown stones**
  - Bacterial infections – E Coli beta-glucuronidase
Gallstones

- **Risk factors**
  - Female
  - Fertile
  - Obesity
  - Diet
- **Disease states**
  - s/p terminal ileum resection
  - s/p gastric resection
  - Crohn’s disease
  - Pregnancy
Gallstone Syndromes

- Asymptomatic cholelithiasis
- Biliary colic
- Acute cholecystitis
- Choledocholithiasis
- Gallstone pancreatitis
- Ascending Cholangitis
Asymptomatic Cholelithiasis

- Incidentally found gallstones WITHOUT symptoms
- 11-36% general population
- 3% go on to have symptoms annually
- No surgical indication
Biliary Colic

- AKA chronic cholecystitis
- Presentation – episodic post-prandial RUQ pain
- Due to transient cystic duct obstruction
- Gallbladder can appear normal, inflamed or contracted/fibrosed
- Dx tests
  - US, CT scan
  - Normal labs
- Tx – cholecystectomy
Acute Cholecystitis

- Due to persistent cystic duct obstructing gallstones, sludge, or stricture, mass
- Can lead to ischemic or necrotic gallbladder
- Presentation – persistent RUQ pain, N/V, SIRS, elevated LFT’s
- Dx tests – US, HIDA scan, CT
- Tx – antibiotics, hydration, cholecystectomy
Choledocholithiasis

- Gallstone in common bile duct
  - Primary stones – brown
  - Secondary stones – cholesterol > black
  - Retained stones – immediately
  - Recurrent stones
Choledocholithiasis

• 6-12% patients with cholelithiasis have choledocholithiasis as well
• 20-25% patients >60yo with symptomatic gallstone disease

• Presentation – transient or persistent RUQ pain, N/V, SIRS, jaundice
• Labs – elevated total bilirubin, LFT’s, leukocytosis
Sequelae of Choledocholithiasis

- Gallstone pancreatitis
- Ascending cholangitis
Sequelae of Choledocholithiasis

- Gallstone pancreatitis
- Ascending cholangitis
- Pancreatic duct obstruction
- Presentation – epigastric pain radiating to the back/scapula, hyperamylasemia
- Tx – cholecystectomy, ERCP
Sequelae of Choledocholithiasis

• Gallstone pancreatitis
• Ascending cholangitis

• Bile stasis with bacterial infection
• Charcot’s triad – RUQ pain, fever, jaundice
• Reynold’s pentad – Charcot’s triad + leukocytosis and AMS
• Tx – ERCP, cholecystectomy, PTC
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic cholangiography
- HIDA scan
- MRCP
- ERCP
- Intra-operative cholangiogram
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic cholangiography
- HIDA scan
- MRCP
- ERCP
- Intra-operative cholangiogram

- Operator-dependent
  - 90% sensitive for stones
  - Dilation of CBD >8mm
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic
- Operator-dependent
- 92-100% sensitive
- Periampullary and pancreatic tumors
- Biopsy
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic cholangiography
- HIDA scan
- MRCP
- ERCP
- Intra-operative cholangiogram

- Risk of bleeding, cholangitis, bile leak
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic cholangiography
- HIDA scan
- MRCP
- ERCP
- Intra-operative cholangiogram

- Tc99 cleared by kupffer cells of liver → bile
- Normal – filling of gallbladder and CBD then duodenum at 60 minutes
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic cholangiography
- HIDA scan
- MRCP
- ERCP
- Intra-operative cholangiogram
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic cholangiography
- HIDA scan
- MRCP
- ERCP
- Intra-operative cholangiogram

- Gold standard for diagnosis
- 99% successful
- Therapeutic – stent, sphincterotomy

- Risks – pancreatitis, cholangitis, duodenal perforation, bleeding
ERCP

- Cannulate papilla
- Contrast injection to evaluate the biliary tree
- Interventions
  - Sphincterotomy
  - Removal of gallstones
  - Biopsy/brushings
  - Stent placement
Evaluation of Choledocholithiasis

- RUQ US
- EUS
- Percutaneous transhepatic cholangiography
- HIDA scan
- MRCP
- ERCP
- Intra-operative cholangiogram

- Indications – abnormal LFT’s, pancreatitis, jaundice, dilated CBD, failed pre-op ERCP
- Risks – bleeding, CBD injury, pancreatitis, infection
Treatment of Choledocholithiasis

• Objectives
  – Remove CBD obstruction
  – Remove gallbladder
Treatment of Choledocholithiasis

CBD stone

ERCP

Removal of CBD stone

Laparoscopic Cholecystectomy

Removal of gallbladder
Treatment of Choledocholithiasis

- CBD stone
- Removal of CBD stone
- ERCP
- Laparoscopic Cholecystectomy
- IOC
- Removal of gallbladder
Treatment of Choledocholithiasis

- CBD stone
- Lithotripsy
- Dissolution
- Drainage Procedure
- ERCP
- Laparoscopic Cholecystectomy
- Removal of CBD stone
- Removal of gallbladder
- www.downstatesurgery.org
Treatment of Choledocholithiasis

CBD stone

Percutaneous Cholecystostomy

Removal of CBD stone

Removal of gallbladder
Treatment of Choledocholithiasis

- Lithotripsy
- Dissolution
- Common bile duct exploration
- Drainage procedure
Treatment of Choledocholithiasis

- Lithotripsy
- Dissolution
- Common bile duct exploration
- Drainage procedure
- Electrohydraulic lithotripsy

- ESWL – sound waves, uncommonly used
- Intra-corporeal laser 64-97% effective
Treatment of Choledocholithiasis

- Lithotripsy
- Dissolution
- Common bile duct exploration
- Drainage procedure

- ursodeoxycholic acid
  - decreases cholesterol saturation and gallbladder function
  - 70% effective
- methyl tert-buthyl ether MBTE
Treatement of Choledocholithiasis

• Lithotripsy
• Dissolution
• Common bile duct exploration
• Drainage procedure
Common Bile Duct Exploration

- **Laparoscopic transcystic**
  - <6mm stones
  - Large cystic duct >4mm
  - CBD <6mm
  - Distal stone
- **Laparoscopic transductal**
  - >6mm stones
  - Small cystic duct <4mm
  - Dilated CBD
  - Proximal stone
- **Open**

[www.downstatesurgery.org](http://www.downstatesurgery.org)
Common Bile Duct Exploration

• T-tube
  – Longitudinal cut
  – Shortest route to skin
  – Cholangiogram after 1-2 weeks
  – Remove in 2 weeks if no stones
  – Remove in 4-6 weeks if +stones
• T-tube versus primary CBD closure
• End points
  – Positive bile culture
  – Blood culture
  – Duration of tachycardia
  – Duration of post-operative fever
• Conclusion
  – Primary closure may be superior to T-tube placement

• Criticisms
  – Small sample size
  – Few end points
Treatment of Choledocholithiasis

- Lithotripsy
- Dissolution
- Common bile duct exploration
- Drainage procedure
- Transduodenal sphincteroplasty
- Choledochoduodenostomy
- Choledochojejunostomy
Transduodenal Sphincteroplasty

- Indications
  - Persistent CBD obstruction in NON-dilated CBD

- Duodenotomy → cannulate ampulla → sphincterotomy at 11 o’clock → dilator into CBD → closure with drain
Choledochoduodenostomy

- Indications
  - Persistent CBD obstruction in dilated CBD >1.2cm
- Kocher → choledochotomcy → longitudinal duodenotomy → side-to-side anastomosis → drain
Choledochojejunostomy

- Indications
  - Palliative
  - CBD stricture

- 45cm roux-en-Y limb end-to-side anastomosis
Summary

• Beware of choledocholithiasis
• Variety of diagnostic tools – invasive and non-invasive
• Variety of treatment options - invasive and non-invasive
Which of the following regarding the management of choledocholithiasis is TRUE?

A. ERCP is associated with higher morbidity than laparoscopic CBD exploration.
B. Stone impaction, periampullary diverticula, and Mirizzi syndrome increase the possibility of failure of ERCP.
C. Predictors of successful stone clearance include proximal stones, large stones, and numerous stones.
D. Laparoscopic CBD exploration is less effective in clearing common bile duct stones than ERCP.
E. Surgical common bile duct exploration requires placement of a T-tube.
Questions

Which of the following regarding the management of choledocholithiasis is TRUE?

A. ERCP is associated with higher morbidity than laparoscopic CBD exploration.
B. Stone impaction, periampullary diverticula, and Mirizzi syndrome increase the possibility of failure of ERCP.
C. Predictors of successful stone clearance include proximal stones, large stones, and numerous stones.
D. Laparoscopic CBD exploration is less effective in clearing common bile duct stones than ERCP.
E. Surgical common bile duct exploration requires placement of a T-tube.
26yo female presents to the ED with RUQ abdominal pain x 12 hours. On exam, she is afebrile, anicteric, and has mild RUQ tenderness, negative Murphy’s sign. Labs are significant for WBC7, AST/ALT 28/32, AP 331 and total bilirubin 3.2. RUQ US is completely normal. Which test is the most sensitive and least invasive for diagnosing choledocholithiasis?

A. HIDA scan
B. CT scan
C. MRCP
D. ERCP
E. Endoscopic US
26yo female presents to the ED with RUQ abdominal pain x 12 hours. On exam, she is afebrile, anicteric, and has mild RUQ tenderness, negative Murphy’s sign. Labs are significant for WBC7, AST/ALT 28/32, AP 331 and total bilirubin 3.2. RUQ US is completely normal. Which test is the most sensitive and least invasive for diagnosing choledocholithiasis?

A. HIDA scan
B. CT scan
C. MRCP
D. ERCP
E. Endoscopic US
Thank you!

Goodbye Gallbladder