Cholecystectomy

- Carl Langenbuch performed the first chole in Berlin, Germany in 1882
- Erich Muhe performed the first lap chole in Germany in 1985
- By 1992, 90% of chole in the US were being performed laparoscopically
To plan the surgical procedure, assess the likelihood of conversion and determine which patients are at high risk for CBD stones.

- Must incorporate data from patient’s history, imaging studies and lab tests.
Pre-op Data

• History
  - always ask about previous episode of jaundice, pancreatitis or cholangitis

• Imaging
  - ultrasonography can be invaluable
  - ERCP, MRCP, EUS
Choledocholithiasis

- Goal is to clear the duct with the least number of procedures and lowest risk of morbidity

- Classify patients into one of three groups
  - high risk
  - moderate risk
  - low risk
High Risk

- Obvious clinical jaundice or cholangitis
- Dilated CBD or CBD stones on pre-op ultrasound
- Risk > 50%
Moderate Risk

- h/o of jaundice or pancreatitis
- Moderately elevated AP or bilirubin
- Ultrasonographic evidence of multiple small gallstones
- Risk 10 to 50%
Low Risk

- Large gallstones
- No h/o jaundice or pancreatitis
- Normal LFTs
- Risk < 5%
Options

• High risk patients
  – pre-op ERCP with sphincterotomy
  – IOC with CBDE

• Moderate risk patients
  – MRCP
  – EUS
  – IOC
Options

- Low risk patients
  - do not require routine cholangiography

- Laparoscopic CBDE and post-op ERCP
  - equally effective in clearing stones from the CBD
Intra-op Cholangiography

• Routine use of IOC remains controversial
• Advocates believe that it enhances understanding of the biliary anatomy, reducing risk of bile duct injury
• There is no confirmatory objective data
• Should not be a substitute for meticulous dissection
• CBD injuries can occur prior to IOC
Intra-op Cholangiography

- Potential for catheter-induced injuries and perforations of the CBD exists
- IOC can be misinterpreted
- Allows for identification of injuries during the operation enabling prompt repair
- Helps develop the skills required for more complex biliary tract procedures
- Identifies unsuspected CBD stones
Complications
Post-op

- Complains of a great deal of abdominal pain necessitating systemic narcotics
- High or prolonged fever
- Ileus
- Jaundice
Fluid Collection

- Significant fluid collection should be aspirated.
- If the fluid is blood and the patient is stable and requires no transfusion, observation is sufficient.
- If the fluid is bile and the patient is stable, ERCP is best – Dx and Tx.
Abnormal LFTs

- Injury to biliary tree or retained CBD stone
- Cholangiography is required
- If MRCP or ERCP is normal = observation
- Retained stones should be removed
- If the duct is in continuity, endoscopic and radiologic techniques – viable options
- If the duct is interrupted, early re-operation – best option
Conversion

- Factors predictive of increased probability of conversion
  - acute cholecystitis, either at the time of surgery or at any point in the past
  - age > 65
  - male
  - gb wall thickening to > 3 mm
CBD Stones
Options

• Laparoscopic transcystic duct exploration
• Laparoscopic choledochototomy + CBDE
• Open CBDE
• Post-op ERCP
• A single small stone can often be flushed into the duodenum + glucagon
Lap Transcystic CBDE

- Size of cystic duct
- Site where cystic duct inserts into CBD
- Size and location of CBD stones
- Contribute to success or failure of this procedure
Lap CBDE

- Indicated for large stones (> 1 cm)
- CHD stones
- Uses choledochotomotomy + choledochoscope
Technique

- Appropriate retraction and exposure are crucial
- Perform adequate Kocher maneuver
- Anterior surface of the duct is exposed over 1 to 2 cm
- Two stay sutures are placed and the duct opened with a scalpel
Technique

- Incision is extended with a Potts scissors with care to avoid the arterial blood supply to the duct.
- Stones can then be removed with stone forceps or biliary Fogarty catheters.
- Choledochoscope can ensure clearing of the ducts.
- T-tube
Considerations

• Before embarking on any biliary tract operation

• Must accurately define the relevant anatomy and

• Extent of disease
Imaging Studies
Ultrasound

- Biliary dilatation
- Duplex – assess vascular involvement
- User dependent
- Less helpful for determining resectability or level or cause of obstruction
CT

- Mass lesions
- Ductal dilatation
- Extent and level of duct obstruction
- Extent of vessel involvement
- Arterial, portal and venous anatomy
MRI – MRCP

- Detailed images of biliary anatomy
- 100% accuracy for determining location of biliary obstruction
- 95% accuracy for determining cause of biliary obstruction
PTC – ERCP

• Additional information about ductal anatomy

• Tissue for diagnosis – brush cytology

• Allows drainage of the biliary tree
Operative Planning
Biliary Anastomoses

- Preservation of adequate blood supply
- Avoidance of tension
- Accurate placement of sutures with mucosa-to-mucosa apposition
- Construction of anastomoses of adequate caliber
Preparation

• Define adequate margins while avoiding excessive dissection that might compromise blood supply to the duct

• For acute injuries – resect crushed or devitalized tissue

• For late repairs – not necessary to resect all scar tissue
Technique

• Absorbable, synthetic monofilament suture
• Single layer – bile duct wall has only one layer
• Interrupted or continuous
• Know your options for difficult anastomoses
Small Duct

- Incise the small CBD anteriorly and trim the sharp corners
- If cystic duct is present alongside the CBD, can incise shared wall to create single larger lumen
- If the confluence has been resected, 2 small ducts can be brought together and sutures placed into adjoining wall to form single larger lumen
Choledochoduodenostomy
Uses

- Most commonly used in patients with multiple CBD stones
- Concern about leaving residual stones at the time of CBDE
- Recurrent bile duct stones when endoscopic sphincterotomy cannot be done or has failed
Advantages

- Simpler and safer than transduodenal sphincteroplasty
- Useful for benign distal biliary obstruction
- Works best if CBD is at least 1 cm
- Contraindicated in patients with actual or potential duodenal obstruction
Technique

• Wide Kocher maneuver

• Expose the CBD

• Make longitudinal incisions in both the duodenum and the duct

• Allows for a larger anastomosis
Cholecystojejunostomy
Uses

• Malignant biliary obstruction in selected patients
• Lesions found to be unresectable at operation
• Short life expectancy
• As an out for trauma
Disadvantages

• Cystic duct must be patent

• No evidence of cholecystitis

• Not the preferred procedure for long-term decompression
Choledochochojejunostomy
Uses

• One of the most commonly performed biliary tract procedures

• 60 cm Roux-en-Y limb reduces likelihood of reflux of intestinal contents into biliary tree

• Provides biliary drainage
  – after CBD resection
  – repair of a ductal injury
  – relief of obstruction
Choledochal Cyst
Considerations

- Categorized according to the Todani classification
- > 80% are Type I that involve the CBD in its accessible portion
- Most are associated with an abnormal junction of the PD and distal CBD
Considerations

• Pre-op cholangiography is important to clarify anatomy and prevent potential injury to the PD

• Symptoms arise as a result of stones within the cyst, infection or malignancy

• Increased risk for bile duct malignancy
Surgical Principles

- Remove the cyst completely
- Remove the gallbladder
- Remove any stones that remain in the bile ducts proximal to the cyst
- Restore biliary-enteric drainage
Repair of Biliary Injuries
Biliary Injuries

• Occur in 0.4 to 0.6% of lap choles

• In as many as 50% of cases, the injury may be discovered at the time of operation

• General surgeons should be able to repair Strasberg type A and D injuries
Biliary Injuries

- Type A injuries include cystic duct stump leaks or leakage from small ducts in the liver bed (duct of Luschka)

- A type D injury is a lateral injury to a major duct

- May be amenable to primary repair
Primary Repair

- < 25% of duct circumference is involved
- Injury is not thermal
- Duct is of sufficient caliber to allow insertion of a T tube
Injuries

• Type B injuries usually involve ligation of an aberrant right hepatic duct
  – rarely detected at the time of surgery
• Type C involve transection, but not ligation, of an aberrant (usually right hepatic) duct
• Type E parallel the Bismuth classification
  – occur higher in the biliary tree
  – may be very complex
  – often accompanied by a vascular component
Reflection

• When complex injuries are discovered, must honestly assess your expertise

• Do not worsen the injury

• Control hemorrhage, drain, close and transfer
Delayed Injuries

• Those not discovered at the time of operation may present days, weeks or even years later.

• Signs and symptoms vary depending on the nature of the injury and whether there is obstruction or bile leakage.

• Repair requires adequate pre-op planning.
What You Need to Know

• Know your anatomy and variants
• It is always better to have more information
• Make sure you know your options before embarking in unfamiliar territory
• There is no shame in calling for help
• A man’s got to know his limitations
A man's got to know his limitations.