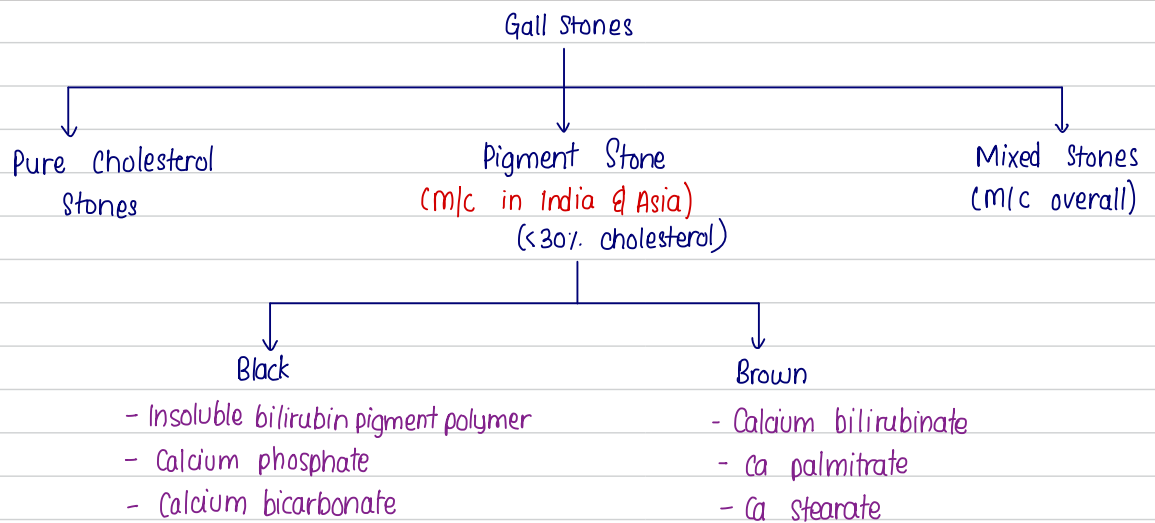


The background features a repeating geometric pattern of thin, light brown lines forming a grid of squares. Each square is further divided by diagonal lines into four triangles. At various intersections of these lines, there are solid brown circles of a medium size. The pattern is consistent across the entire page.

Gall bladder

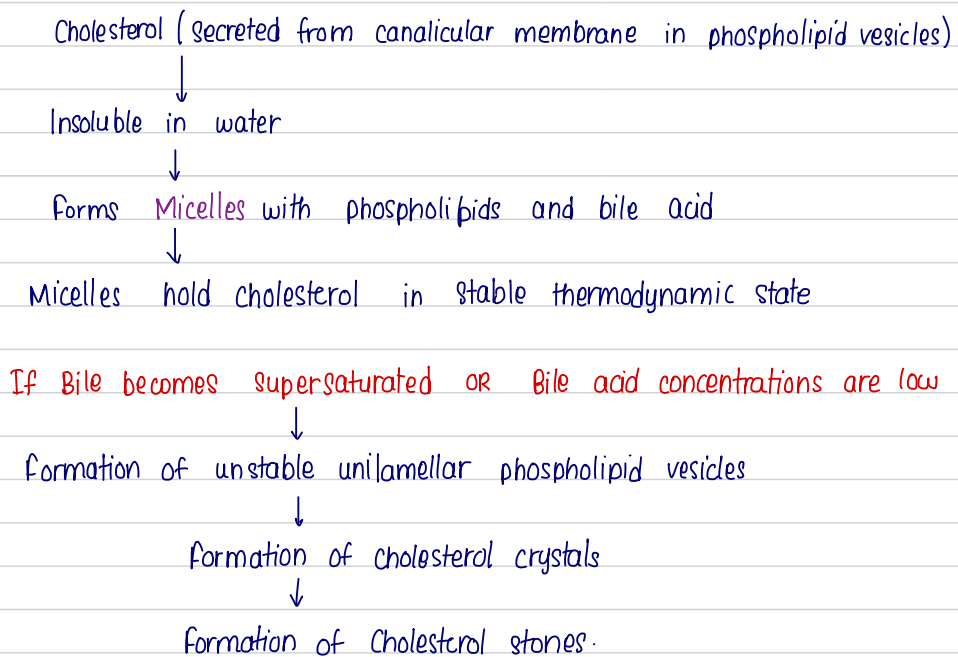
Cholelithiasis

• Types



• Aetiology

1) Cholesterol Stones:



- 2) Black Stones: Associated with hemolysis
- Hereditary spherocytosis
 - Sickle cell disease

- 3) Brown Stones: Related to Bile Stasis and Infected bile.

Bacterial β -glucuronidase $\longrightarrow$ deconjugation of bilirubin glucuronide $\longrightarrow$ Insoluble Unconjugated bilirubinate precipitates

- Associated with presence of foreign bodies in bile duct like:
 - Endoprostheses (stents)
 - Parasites [*Clonorchis sinensis* ; *Ascaris lumbricoides*]

• Risk factors

- 1) Females > males
- 2) Obesity
- 3) Drugs - OC pills, Clofibrate
- 4) Ileal resection
- 5) Post vagotomy (stasis)

• Radiology

- IOC - USG abdomen - Posterior acoustic shadow
- Radiolucent - 90%
- Radiopaque - 10%
 - On Xray
 - Biradiate - Seagull sign
 - Triradiate - Mercedes Benz sign

• Effects & Complications

- Biliary Colic
- Acute Cholecystitis
- Chronic Cholecystitis
- Empyema of Gall Bladder
- Mucocele
- Perforation
- Biliary Obstruction
- Acute Cholangitis
- Acute pancreatitis
- Gallstone ileus

• Mx

- i) Asymptomatic: Conservative management.
 - Indications of cholecystectomy:
 - i) Diabetes mellitus
 - ii) Stone with porcelain gall bladder
 - iii) Stone > 2 cm or multiple small stones
 - iv) Stone with gall bladder polyps
 - v) In patients undergoing bariatric surgery

2) Acute cholecystitis

• C/F

- Right upper quadrant or epigastric pain which may radiate to the back.
 - Colicky
- Dyspepsia
- Nausea / Vomiting
- Intolerance to fatty food.

• On examination:

1) Tenderness in right upper quadrant.

2) Murphy's sign: Sudden catching of breath at height of inspiration when finger is kept in Right hypochondrium and patient is asked to take a deep breath.
- This is due to inflamed gall bladder coming in contact with abdominal wall under fingers.

3) Boas' Sign: An area of hyperaesthesia between 9th and 11th rib posteriorly on the right side.

• Dx

• Blood: 1) CBC - ↑ TLC

2) Blood sugar estimation

• X ray erect: May be used to demonstrate radiopaque stones (10%).
- Rule out other causes as perforated peptic ulcer (Air under diaphragm)

• IOC - USG abdomen

- Demonstrates stones (posterior acoustic shadow)

- Demonstrates inflamed thickened organ (>5-6 mm thickening is significant)

- Can detect gall bladder polyps.

• CT scan - If USG findings are unclear

- Can detect complications like perforation, CBD stones.

• Gold Standard: HIDA scan (Hepatic iminodiacetic acid)

- Dye reaches gall bladder in 30 minutes, bowel in 1 hour.

- In Acute cholecystitis → dye does not enter gall bladder due to oedema of cystic duct



Non visualization of Gall bladder

• Severity Grading

Based on Tokyo Consensus guidelines:

• Grade III : Severe

- Cholecystitis + Organ dysfunction (CVS, RS, CNS, Renal, Hepatic)

• Grade II : Moderate

- Any 1 of following: 1) Elevated TLC $> 18000 / \text{mm}^3$

2) Palpable tender mass under right upper quadrant

3) Duration of complaints > 72 hours

4) Marked local inflammation (Gangrenous, emphysematous)

• Grade I - Mild

• Mx

Conservative Mx :

1) Admission

2) Nil per oral and IV fluids till pain resolves

3) Administration of analgesics / Antispasmodics (Inj Morphine 10 mg IM)
(Inj Atropine 0.6 mg)

4) Broad Spectrum IV antibiotics with G-ve and anaerobic coverage.
(Cefazoline, cefuroxime)

• Subsequent Mx : Conservative management till symptoms subside.

↓

Discharge

↓

Elective interval Cholecystectomy.

• Emergency Cholecystectomy: In cases of

- Persisting symptoms despite conservative management

- High grade fever, sepsis, shock

- Perforation, peritonitis

Obstructive jaundice

Aetiology

Intraluminal

- 1) Stones in
 - Common bile duct
 - Pancreatic duct / CBD junction
- 2) Parasites
 - Hydatid cyst
 - Ascaris

Intramural:

- 1) Bile duct stricture
- 2) Stenosis of sphincter of oddi (papillary stenosis)
- 3) Biliary atresia
- 4) Klatskin's tumor
- 5) Cholangitis
- 6) Choledochal Cyst

Extraluminal:

- 1) Carcinoma head of pancreas
- 2) Chronic pancreatitis
- 3) Lymph nodes at porta hepatis obstructing biliary tree.

• Courvoisier's law

Presence of palpably enlarged gall bladder in case of jaundice, the cause is unlikely to be gall stones.

• In case of stones, previous inflammation would have made gall bladder fibrotic and it usually is already shrivelled.

• Exception: Double impaction of gall stones - One stone in cystic duct and one in CBD.

• Investigations

- 1) CBC: Low Hb in malignancy
- 2) Liver Function tests: BT, CT, PT, Serum ALP
- 3) Urine: Urobilinogen is negative in obstructive jaundice
- 4) USG abdomen
- 5) CECT
- 6) Endoscopy & Endoscopic Ultrasound
- 7) Percutaneous trans hepatic cholangiography (PTC)
- 8) MRCP
- 9) ERCP (Endoscopic Retrograde Cholangio Pancreatography)
- 10) Diagnostic laparoscopy

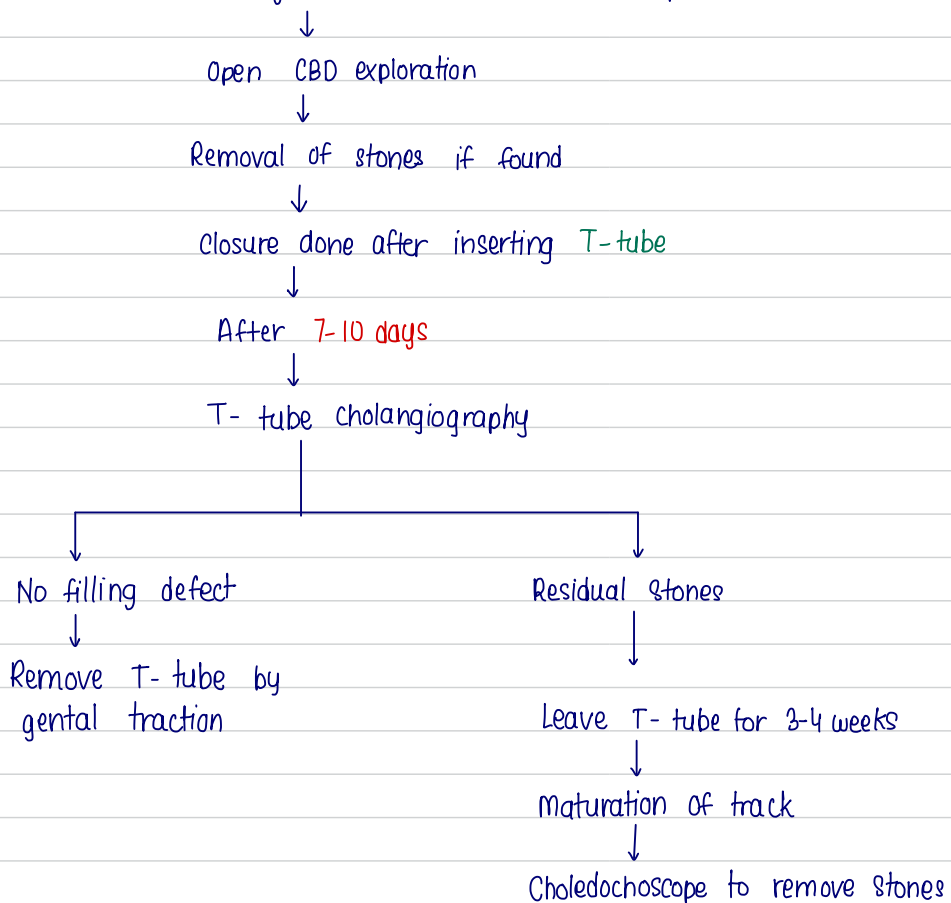
Choledocholithiasis

- Stone in CBD or biliary tree.

• <u>Types</u>	1) Primary - Rare - Brown pigment stones 2) Secondary - Common - Black pigment, cholesterol or mixed stones.
• <u>CIF</u>	1) Asymptomatic 2) Obstructive jaundice 3) Charcot's triad: - Intermittent pain - Intermittent fever - Intermittent jaundice 4) Reynold's pentad: Charcot's triad + Septic shock + Altered mental status.
• <u>Investigations</u>	1) USG Abdomen - may show gallstones and dilated CBD (>1cm) 2) CT scan Abdomen 3) MRCP - Investigation of choice for CBD stones 4) Endoscopic ultrasound: loc for CBD microliths 5) ERCP - Diagnostic as well as therapeutic 6) PTC: In cases with previous gastrectomies or failed ERCP 7) Blood investigation: ↑ direct bilirubin, ↑ serum ALP. - Serum amylase to rule out pancreatitis
• <u>Rx</u>	<u>General measures:</u> • Inj Vitamin K 10 mg Im once a day X 5 days • IV antibiotics • Correction of dehydration - IV mannitol 200 ml bid to prevent hepato renal syndrome

• Surgery

- 1) ERCP + Endoscopic sphincterotomy and extraction of stones through Dormia basket or balloon catheter.
- 2) This is followed by Laparoscopic Cholecystectomy after 7-10 days.
- 3) This is followed by injection of water soluble radioopaque dye into cystic duct through a canula (On Table Cholangiogram [OTC])
- 4) If OTC shows a filling defect, Laparoscopic exploration of CBD is done.
- 5) If lap cholecystectomy and exploration fail and patient has residual stones.

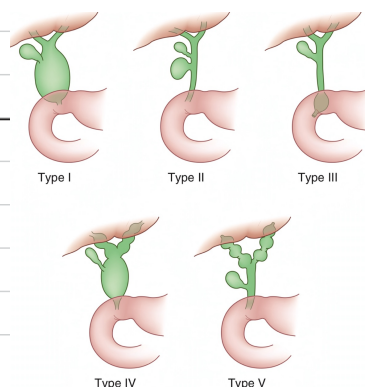


• Primary CBD stones

- 1) Transduodenal sphincteroplasty (open method)
- 2) Open choledochoduodenostomy
- 3) Open choledochojejunostomy

Choledochal Cysts

	- Choledochal cysts are congenital dilatations of intra and/or extrahepatic biliary system. - Exact pathogenesis is unknown but most accepted theory relies on presence of an Anomalous pancreaticobiliary junction.
• <u>Todani Classification</u>	Type I: fusiform dilatation, only involves extrahepatic tree. - Type II: Cysts appear as Saccular dilatation of CBD. - Type III: Choledochoceles: Cystic dilatation of intramural CBD within wall of duodenum. - Type IVa: Cysts involving intrahepatic and extrahepatic biliary tree - Type IVb: Cysts limited to extrahepatic biliary tree. - Type V: Caroli's disease; Involvement of intrahepatic ducts only.
• <u>C/F</u>	May present at any age but majority (60%) diagnosed before 10 years of age. - Females > Males (4:1) - Jaundice Fever - Abdominal pain - Right upper quadrant mass
• <u>Investigations</u>	- USG abdomen - Confirms presence of unilocular cyst - MRCP - IOC - CT - may be useful in detecting intra & extrahepatic dilatation. - ERCP - Useful for defining distal biliary tree and pancreatic duct - bile duct junction.



• Mx

- Resection of entire cyst and appropriate reconstruction.

Type I: Complete surgical excision + Roux-en-Y Hepaticojejunostomy

- Proximal extent of resection should continue to non dilated biliary tree and may require anastomosis to left and right hepatic ducts.

- Type II: Excision of diverticulum + Repair (suturing) of CBD

- Type III: ERCP + Sphincterotomy

- Type IV b: May be treated similar to type I with excision and hepatojejunostomy.
OR

Portoenterostomy (Kasai Procedure)

↳ Radical excision of all bile duct tissue upto Liver capsule and attaching Roux-en-Y loop of jejunum to exposed liver capsule above bifurcation of portal vein.

- Type IV a: Partial Hepatectomy and reconstruction
OR
Liver transplant

- Type V: Liver transplant needed in most cases (Resection depends on extent of disease)

• Complications

- Recurrent cholangitis

- Rupture of cyst

- CBD Stones

- ↑ risk of cholangiocarcinoma

Extrahepatic biliary Atresia

	• Destruction of extrahepatic bile ducts by an inflammatory process which starts around the time of birth. • Intrahepatic changes also occur eventually and result in biliary cirrhosis and Portal HTN. • If untreated, death by 3 years of age from consequences of liver failure. • Aetiology is unclear. • Incidence 1/12000 live births; ♂ = ♀
• <u>Types</u>	• Type I: Atresia restricted to CBD • Type II: Atresia of common hepatic duct • Type III: Atresia of right and left hepatic ducts.
• <u>CIF</u>	• Jaundice at birth - Meconium - Bile stained - Pale stools later - Dark urine • Severe pruritis - Clubbing may be seen • Osteomalacia (due to prolonged steatorrhea)
<u>Investigations</u>	• Serum bilirubin ↑, Serum ALP ↑. • Ioc: HIDA scan • Gold standard: Intraoperative cholangiogram
<u>Mx</u>	• Type I: Roux-en-Y Hepatojejunostomy - Type II and III: Kasai Procedure → fails → Liver transplant • Post op complications: 1) Bacterial cholangitis 2) Hepatic fibrosis

Graham-Cole Test

- Oral cholecystogram
- This test is done to study function of gall bladder.
- Patient is advised fat free diet for 3 days

One night before test, 6 tablets of Iopanoic acid (Telepaque) is given orally. (1 tablet = 500 mg)

- On the day of OCg, plain X-ray abdomen is taken in erect posture to visualise gall bladder.
- Later, fatty meal is given and one more X-ray is taken to see size of gall bladder.
- The size should be less than in previous film as gall bladder contracts on stimulation with fat rich meal if it is functioning normally.
- Smooth filling defect signifies non-opaque stone.

Contraindications:

- 1) Patients with serum bilirubin $> 3 \text{ mg\%}$.
- 2) Acute cholecystitis
- 3) Vomiting

Ultrasonography

1) Transabdominal USG

- Initial imaging modality of choice in cholecystitis.
- It is non-invasive, quick to perform, readily available, and accurate.

- Uses:

A) In cholecystitis:

- 1) Determine size of gall bladder and measure thickness of wall.
- 2) Demonstrate presence of stones and polyps.
- 3) Detect presence of inflammation around gall bladder.

B) In obstructive jaundice:

- 1) Detect intra and extrahepatic biliary dilatation.
- 2) Detect level and cause of obstruction.
- 3) Detect lesion in wall suggestive of cholangiocarcinoma.

- Disadvantages:

- 1) Operator dependent.
- 2) May be compromised due to excessive body fat and intraluminal bowel gas.

2) Endoscopic USG:

- Accurate in imaging the bile duct and detecting presence of choledocholithiasis.
- Diagnosing and staging both pancreatic and periampullary cancers.

Endoscopic Retrograde Cholangiopancreatography

- Used widely as both a diagnostic and a therapeutic modality.

• Procedure:

- Using a side view endoscope, the ampulla of Vater can be identified and cannulated
- Injection of water soluble contrast directly into the bile duct provides excellent images of ductal anatomy.

• Uses:

- Visualise ductal anatomy
- Identify causes of obstruction such as calculi or malignant strictures.

• Indications:

- Diagnostic: Limited due to new techniques like MRCP.

- 1) Stones in CBD
- 2) Strictures in biliary tree
- 3) Congenital anomalies
- 4) Chronic Pancreatitis - Chain of lakes appearance
- 5) Choledochal cyst
- 6) Endoluminal brushings can be taken from stricture and tumor sites.
- 7) Aspirates can be sent for cytological and microbiological examination.

- Therapeutic:

- 1) Endoscopic sphincterotomy and removal of CBD stones.
- 2) Placement of stents.

• Complications:

- Pancreatitis
- Duodenal injury, perforation
- Cholangitis
- Sphincter stenosis
- Bleeding from pancreaticoduodenal artery

• Relative Contraindications:

- 1) Acute pancreatitis
- 2) Previous gastrectomy

Endoscopic Retrograde Cholangiopancreatography

- Used widely as both a diagnostic and a therapeutic modality.

• Procedure:

- Using a side view endoscope, the ampulla of Vater can be identified and cannulated
- Injection of water soluble contrast directly into the bile duct provides excellent images of ductal anatomy.

• Uses:

- Visualise ductal anatomy
- Identify causes of obstruction such as calculi or malignant strictures.

• Indications:

- Diagnostic: Limited due to new techniques like MRCP.

- 1) Stones in CBD
- 2) Strictures in biliary tree
- 3) Congenital anomalies
- 4) Chronic Pancreatitis - Chain of lakes appearance
- 5) Choledochal cyst
- 6) Endoluminal brushings can be taken from stricture and tumor sites.
- 7) Aspirates can be sent for cytological and microbiological examination.

- Therapeutic:

- 1) Endoscopic sphincterotomy and removal of CBD stones.
- 2) Placement of stents.

• Complications:

- Pancreatitis
- Duodenal injury, perforation
- Cholangitis
- Sphincter stenosis
- Bleeding from pancreaticoduodenal artery

• Relative Contraindications:

- 1) Acute pancreatitis
- 2) Previous gastrectomy