10: GALL BLADDER

Q1. GALL STONES

Basic Concept and Risk Profile

- Cholelithiasis = gallstone formation within gallbladder or biliary tract
- Multifactorial origin: metabolic + infective + mechanical
- Classical risk mnemonic: **Five Fs** → fat, fertile, forty, flatulent, female

Etiology

- **Metabolic factors**
  - ↑ cholesterol secretion: obesity, pregnancy, oral contraceptive use
  - ↓ bile salts: ileal resection, Crohn's disease
- **Stasis-related factors**
  - Progesterone-induced gallbladder hypomotility
  - Vagotomy-associated biliary stasis
  - Prolonged Total Parenteral Nutrition (TPN)
- **Infection / infestation**
  - Bacterial nidus: *E. coli, Salmonella*
  - Parasitic nidus: *Ascaris lumbricoides*
- **Hemolytic disorders**
  - Hereditary spherocytosis
  - Sickle cell anaemia
  - Malaria

Classification (Chemical Composition)

Type	Salient characteristics
Cholesterol stones	Solitary, large, radiolucent
Mixed stones	Most common (~90%), multiple, faceted
Pigment stones	Small, dark; black and brown varieties

Types and Morphology

- **Pure cholesterol stones**
  - 70–90% cholesterol content
  - Non-infected gallbladder
- **Mixed stones**
  - Cholesterol + bile pigments + calcium salts
  - Faceted appearance from mutual compression
- **Black pigment stones**

    - Calcium bilirubinate
    - Small, hard
    - Associated with cirrhosis, hemolysis
- **Brown pigment stones**
    - Soft, friable
    - Biliary stasis + infection
    - Often intra-ductal

Etiopathogenesis

- Admiron's triangular hypothesis
    - Equilibrium: cholesterol ↔ bile salts ↔ lecithin
- Supersaturation with cholesterol → lithogenic bile
- Nucleation phase → vesicle aggregation → crystals
- Accelerating factors: mucus glycoproteins
- Biliary stasis → prolonged crystal growth → stones

Clinical Features

- Silent stones ≈80%
- Flatulent dyspepsia: belching, bloating, fat intolerance
- Biliary colic
    - Sudden spasmodic RUQ/epigastric pain
    - Radiation to back or right shoulder
    - Postprandial onset
- Murphy's sign → inspiratory arrest
- Boas's sign → hyperaesthesia T9–T11 posteriorly

Investigations

- USG = investigation of choice
    - Echogenic calculus + posterior acoustic shadow
- Plain X-ray (≈10%)
    - Mercedes-Benz sign
    - Porcelain gallbladder
- HIDA / PIPIDA scan
    - Non-visualisation → cystic duct obstruction
- MRCP
    - Non-invasive biliary mapping
- ERCP
    - Diagnostic + therapeutic for CBD stones

Management

- Asymptomatic stones

    - Observation
    - Surgery indicated in porcelain GB, diabetics, stones >2.5 cm
- Symptomatic stones
    - Laparoscopic cholecystectomy = gold standard
- Acute cholecystitis
    - NPO, IV fluids, analgesics, antibiotics
    - Interval cholecystectomy after 3–6 weeks
- Dissolution therapy
    - Ursodeoxycholic acid for small radiolucent cholesterol stones

Complications (By Site)

Location	Complications
Gallbladder	Colic, acute/chronic cholecystitis, empyema, mucocele, gangrene, perforation
Bile ducts	Choledocholithiasis, ascending cholangitis, gallstone pancreatitis
Intestine	Cholecystoduodenal fistula, gallstone ileus

Q2. OBSTRUCTIVE JAUNDICE / Surgical Jaundice

Basic Concept

- Obstructive jaundice = mechanical blockage of biliary outflow → conjugated hyperbilirubinaemia
- Also called **surgical jaundice**
- Causes: benign vs malignant

Etiology

- **Benign:** biliary tree stones (most common)
- **Malignant:** carcinoma of pancreatic head, periampullary carcinoma
- **Luminal obstruction:** stones, parasites (*Ascaris lumbricoides, Clonorchis sinensis*)
- **Mural obstruction:** strictures (post-inflammatory, surgical), primary sclerosing cholangitis
- **Extrinsic compression:** pancreatitis, tumors, lymphadenopathy
- **Congenital:** biliary atresia, choledochal cysts
- **Intrahepatic:** hepatocellular disease (viral/drug-induced hepatitis)

Clinical Features

- Yellow-green scleral & skin discoloration
- Severe **pruritus**, especially back/forearms
- **Acholic stools** (absent stercobilinogen), **tea-colored urine** (conjugated bilirubin)
- **Biliary colic** if stones present
- Fever, chills → ascending cholangitis

- **Courvoisier's Law**: palpable GB → usually not stones
- **Reynolds' Pentad**: Charcot triad + shock + altered mental status

Biochemical & Laboratory Investigations

Test Type	Findings
Serum	↑ Direct bilirubin, ↑ ALP, ↑ GGT, prolonged PT
Urine/Stool	Fouchet positive (bile pigments), Hay positive (bile salts), Ehrlich negative (no urobilinogen), acholic stools

Imaging

- **USG**: initial screening, dilated ducts, stones
- **MRCP**: non-invasive gold-standard for biliary mapping
- **ERCP**: site localization + therapeutic sphincterotomy/stone extraction
- **PTC**: high strictures or failed ERCP → percutaneous stenting
- **CT Scan**: malignant tumour operability assessment

Management

- **Preoperative**: correct dehydration (**5–10% dextrose** IV), coagulopathy (**Vitamin K 10 mg IM ×5 days**, FFP), **IV Mannitol** to prevent hepatorenal syndrome
- Pre-op biliary decompression if bilirubin >30 mg% (ERCP/PTC)

Definitive Treatment

Cause	Management
Stones	ERCP stone extraction or choledocholithotomy
Malignancy	Whipple's operation; palliative stenting/triple bypass
Strictures	Endoscopic stenting or Roux-en-Y hepaticojejunostomy
Congenital	Kasai procedure (biliary atresia), excision + reconstruction (choledochal cyst)

- Goal: relieve obstruction, prevent cholangitis, restore bile flow, and manage underlying cause

Q3. CHOLEDOCHAL CYST

Basic Concept

- Choledochal cyst = congenital dilatation of extrahepatic and/or intrahepatic biliary tree
- Etiology: biliary wall weakness, often associated with **pancreaticobiliary maljunction** (>2 cm

common channel)

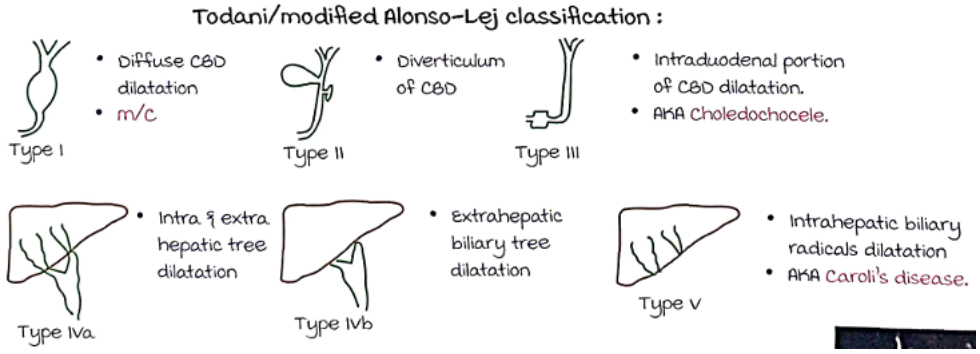
- Female predominance 4:1; high prevalence in Asia (esp. Japan)

Pathogenesis

- **Babbitt theory:** pancreatic juice reflux → enzymatic destruction → cyst formation
- Abnormal early bile duct canalisation
- ↓ postganglionic autonomic neurons distal to cyst

Classification (Todani/Modified Alonso-Lej)

Type	Description
I	Extrahepatic dilatation (Ia: cystic, Ib: saccular, Ic: fusiform)
II	Extrahepatic diverticulum
III	Choledochocele (intraduodenal CBD)
IV	Multiple dilatations (IVa: intra+extrahepatic, IVb: extra only)
V	Intrahepatic only (Caroli's disease)



Clinical Features

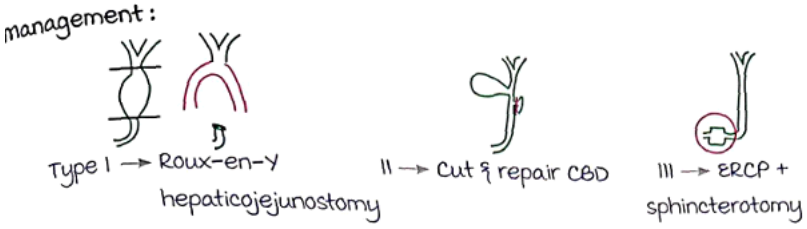
- Age: infancy → adulthood
- Classic triad (10%): RUQ pain, obstructive jaundice, palpable mass
- Infants: failure to thrive
- Mass may appear/disappear clinically

Investigations

Modality	Use
MRCP	IOC; maps ducts, identifies maljunction
Ultrasound	Initial, especially in infants; unilocular cysts
CT Scan	Evaluates intrahepatic ducts accurately
ERCP	Distal anatomy, site of obstruction

Management

- Main strategy: excision + cholecystectomy + **Roux-en-Y hepaticojejunostomy**
- Type-specific:
  - I: complete excision + hepaticojejunostomy
  - II: diverticulum excision + primary CBD repair
  - III: endoscopic sphincterotomy or surgical excision
  - IV: extrahepatic resection + Roux-en-Y; intrahepatic: hepatectomy or liver transplant
  - V: liver transplantation or localised resection
  - Lilly's operation: outer wall left if adherent to portal vein, mucosa removed



Complications

- Malignancy: cholangiocarcinoma (10–30%)
- Biliary cirrhosis, portal hypertension
- Pancreatitis (esp. Type III)
- Gallstones/CBD stones
- Cyst rupture → biliary peritonitis
- Infection → suppurative cholangitis

Caroli's Disease

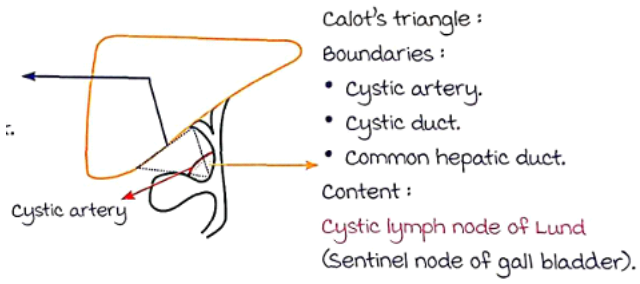
- Type V choledochal cyst: intrahepatic saccular dilatations + stenotic segments → bile stasis, stones, recurrent cholangitis
- Associations: congenital hepatic fibrosis, medullary sponge kidney
- Clinical: recurrent fever, jaundice, abdominal pain, portal hypertension
- Investigations: MRCP (IOC), USG/CT, ERCP, LFTs (cholestatic)
- Management: antibiotics, endoscopic stenting, hepatectomy (localized), liver transplant (diffuse)
- Complications: hepatolithiasis, portal hypertension, cholangiocarcinoma (7–10%)

Feature	Key Point
Imaging	MRCP → anatomical roadmap; USG/CT → ductal & renal evaluation

Labs	LFTs → ↑ALP, cholestatic pattern

Treatment	Indication
Antibiotics	Active cholangitis
Endoscopic stent	Temporary drainage
Hepatectomy	Localized disease
Liver transplant	Diffuse/severe disease

Q4. CALOT'S TRIANGLE



- Cystohepatic triangle: surgical landmark for cholecystectomy

- Boundaries:
  - cystic duct (lateral),
  - common hepatic duct/artery (medial),
  - cystic artery (superior/base);
  - apex at cystic–common hepatic junction

- Contents:
  - cystic artery,
  - cystic lymph node (Lund),
  - accessory ducts/arteries

- Surgical: Critical View of Safety → only cystic duct + artery entering gallbladder

Q5. ACUTE CHOLECYSTITIS

Etiology & Pathogenesis

- Calculous: Stone impacted in Hartmann's pouch/cystic duct → bile stasis, wall oedema, secondary bacterial infection (E. coli 85%, Klebsiella, Pseudomonas, Proteus, Clostridium welchii)

- Chemical: Bile salt mucosal toxicity → necrosis, potential perforation
- Vascular: Thrombosis of appendicular artery → ischaemic necrosis
- Acalculous: ICU, TPN, trauma/burns → stasis, ischaemia

Clinical Features

- Sudden RUQ/epigastric pain, radiates to back/right shoulder
- Fever, nausea, vomiting, anorexia
- Murphy's Sign: mid-inspiratory arrest on palpation
- Boas's Sign: hyperaesthesia 9th–11th ribs posteriorly
- Tender RUQ mass (~25%), jaundice if CBD involvement

Tokyo Guidelines (Diagnosis & Grading)

- Local: Murphy's, RUQ tenderness; systemic: fever, ↑CRP/WBC
- Grade I: Mild, healthy patient
- Grade II: WCC >18,000/mm³, palpable mass, >72h, local complications
- Grade III: Organ dysfunction

Investigations

- USG: stones, wall thickening >3 mm, pericholecystic fluid
- HIDA/PIPIDA: non-visualisation → blocked cystic duct
- CT: perforation, emphysematous changes
- Labs: leukocytosis, neutrophilia, deranged LFTs

Management

- Conservative: NPO, NG aspiration, IV fluids, analgesics, broad-spectrum antibiotics (cephalosporins + metronidazole)
- Surgery: laparoscopic cholecystectomy (early <72h or interval 3–6 weeks)
- Cholecystostomy: for septic/elderly/unstable patients

Complication	**Feature**
Empyema/Gangrene	Pus or patchy wall necrosis
Perforation	Biliary peritonitis, abscess
Mirizzi Syndrome	Cystic duct stone compressing CHD
Fistula/Ileus	Cholecystoduodenal fistula → gallstone ileus

Q6. ACUTE ACALCULOUS CHOLECYSTITIS

Definition & Epidemiology

- Inflammation of gallbladder **without stones**
- Accounts for 10–20% of acute cholecystitis
- More severe and fulminant than calculous type

Etiology & Risk Factors

- **Biliary stasis + ischaemia** → inflammation

Risk Group	Mechanism
ICU/Trauma/Burns	Stasis + ischaemia
TPN	Biliary stasis
Post-surgery (e.g., CABG)	Local inflammation
Sepsis/Immunodeficiency	Systemic inflammation

Clinical Features

- Sudden RUQ/epigastric pain, fever, nausea, vomiting, anorexia
- **Murphy's Sign**: mid-inspiratory arrest on deep palpation
- **Boas's Sign**: hyperaesthesia 9th–11th ribs posteriorly
- Toxic appearance due to underlying critical illness

Investigations

Investigation	Key Findings
USG (IOC)	Wall thickening >3 mm, pericholecystic fluid, no stones
HIDA/PIPIDA	Non-visualisation → blocked cystic duct
Labs	Leukocytosis, raised CRP

Management

- **Supportive Care**: NPO, IV fluids, analgesics, broad-spectrum IV antibiotics
- **Definitive Treatment**:
  - Stable/fit → **laparoscopic cholecystectomy**
  - Unstable/poor PS → **tube cholecystostomy or percutaneous drainage**

Q7. Cystic Duct: Anatomy, Variations, and Clinical Relevance

Normal Anatomy

- Length: ~3 cm; Diameter: 1–3 mm
- Lumen: Spiral valves of Heister
- Junction with gallbladder: Surrounded by Sphincter of Lutkens
- Lateral boundary of **Calot's Triangle**

Variations in Length & Insertion

Variant	Description	Clinical Significance
Long Cystic Duct, Low Insertion	Courses parallel to CHD, joins low near ampulla	Risk of iatrogenic CBD injury
High Insertion	Joins CHD or right hepatic duct	Altered surgical landmarks
Absent Cystic Duct	Gallbladder drains directly into CBD	High risk of bile duct injury

Variations in Number & Accessory Ducts

Type	Description	Clinical Relevance
Double Cystic Duct	Two ducts from one gallbladder	Rare; increased surgical complexity
Multiple Gallbladders	Two or three gallbladders with separate or fused ducts	Anatomical challenge
Duct of Luschka	Small accessory duct from liver bed (segments IVB/V)	Post-op bile leak if missed

Pathological Considerations

- **Mirizzi Syndrome**: Stone in cystic duct/Hartmann's pouch → extrinsic CBD compression → obstructive jaundice or fistula
- **Mucocele**: Cystic duct obstruction → gallbladder distension with sterile mucus
- **Critical View of Safety**: Clear Calot's Triangle fat/fibrous tissue; only cystic duct & artery entering gallbladder visible before clipping

Surgical Significance

- Variations increase risk of **bile duct injury** during cholecystectomy
- Knowledge of **anatomical anomalies** prevents post-op complications like **bile leak, fistula, or peritonitis**

Q8. ENDOSCOPIC RETROGRADE CHOLANGIO-PANCREATOGRAPHY (ERCP)

Procedure

- Side-viewing gastroduodenoscope via mouth → 2nd part of duodenum
- Prone position, head turned right
- Cannulation at 11 o'clock of ampulla of Vater
- Water-soluble iodine contrast injected → fluoroscopic visualization

Indications & Diagnostics

Indication	Key Points
Obstructive Jaundice	Localizes stones/tumours
Chronic Pancreatitis	"Chain-of-lakes" duct appearance
Malignancy	Brush biopsy, cytology
Biliary Disorders	Choledochal cyst, biliary atresia

Therapeutic Applications

Intervention	Purpose
Sphincterotomy	Facilitate bile/instrument passage
Stone Extraction	Dormia basket/balloon catheter
Stenting	SEMS or polyethylene stents
Pseudocyst Drainage	Transpapillary stent
Nasobiliary Drainage	External bile diversion

Clinical Contexts & Complications

- Gallstone pancreatitis, biliary sepsis, ductal trauma
- Risks: Post-ERCP pancreatitis (5%), duodenal perforation, haemorrhage, infection, contrast reactions
- Contraindications: Hemodynamic instability, acute pancreatitis (unless obstruction), altered anatomy (Billroth II)

CHOLEDOCHOLITHIASIS

Classification:

- **Primary:** Biliary stasis, dyskinesia, stricture, choledochal cyst, sclerosing cholangitis
- **Secondary:** GB stones pass via cystic duct → impacted in CBD

Clinical Features: Biliary colic, jaundice, fever/chills, steatorrhoea, pruritus, Charcot's triad (pain + fever + jaundice)

Complications: Biliary cirrhosis, white bile, liver dysfunction, pancreatitis

Differentials: Pancreatic head carcinoma, biliary tree carcinoma

Investigations: USG, CT, MRCP, ERCP, LFTs

Treatment: Correct PT (Vit K/FFP), hydration, IV mannitol, ERCP (sphincterotomy + stone extraction), transduodenal sphincteroplasty, choledochojejunostomy

Investigations	Key Findings
USG	Gallstones, dilated ducts
CT	Stone location, stricture
MRCP	Biliary anatomy, obstruction
ERCP	Site of obstruction, therapeutic

Treatment Steps	Notes
Vit K / FFP	Correct coagulopathy
Hydration	Correct dehydration
IV Mannitol	Prevent hepatorenal syndrome
ERCP	Papillotomy, stone fragmentation & removal
Surgery	Choledochojejunostomy / sphincteroplasty

Q9. PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY – PTC

Purpose & Indications

- Invasive biliary imaging via liver puncture
- Evaluates obstruction site/extent when ERCP fails

Indication	Key Points
ERCP Failure	Proximal lesions or inaccessible ducts
High Strictures	Hepatic confluence lesions
Malignancy	Klatskin tumours, stenting
Biliary Decompression	PTBD catheter/prosthesis placement

Technique

- Fluoroscopy/USG/CT guided

- Needle: Chiba/Okuda (15 cm × 0.7 mm), right 8th ICS midaxillary line
- Bile aspiration → culture/cytology → contrast injection

Prerequisites & Safety

- Correct PT/INR (Vitamin K 10 mg IM ×5d or FFP)
- Consent, antibiotics, transfusion ready

Complications

Complication	Notes
Haemorrhage	Liver/vessel injury
Biliary Peritonitis	Leak from puncture site
Sepsis	Infected bile/septicaemia

Q10. HIDA scan

(Hepatobiliary Iminodiacetic Acid Scan)

Mechanism

- Dynamic scintigraphy with Tc-99m IDA/PIPIDA
- Uptake by hepatocytes → excretion into bile
- Normal: Gallbladder → small bowel in ~30 min (90% cases)

Clinical Indications

Indication	Key Diagnostic Finding
Acute Cholecystitis	Non-visualisation of GB → cystic duct obstruction
Acute Acalculous Cholecystitis	Blocked/non-functioning cystic duct
Extrahepatic Biliary Atresia	Patency assessment in neonates
Bile Leak	Localisation of post-op/traumatic leak

Diagnostic Value

- Confirms functional obstruction not seen on USG
- Complements anatomical imaging

Advantages & Pearls

- Non-invasive, functional assessment

- High sensitivity for cystic duct obstruction
- Useful when USG inconclusive

Q11. SAINTS TRIAD

- Gallstones
- Diverticulosis of Colon
- Hiatus hernia

Q12. MUCOCELE OF GB (hydrops GB)

Etiology & Risk Factors

Cause	Notes
Gallstone	Impacted in Hartmann's pouch or GB neck (most common)
Polyps / Carcinoma	Extrinsic compression possible
Congenital / Parasites	Ascaris, duct narrowing
TPN / Pediatric	Kawasaki, typhoid, nephritic syndrome

Pathophysiology

- Total cystic duct obstruction → bile absorbed
- Mucous secretion continues → sterile distension
- No acute systemic inflammation

Clinical Features

- Painless, soft, globular RUQ mass
- Moves with respiration, horizontal mobility
- Dyspepsia may occur

Investigations

Investigation	Key Finding

USG	AP diameter >5 cm, IOC
CT / MRCP	Obstruction site, relation to surrounding structures
LFTs	Usually normal, rules out ductal involvement

Management

- Laparoscopic cholecystectomy (definitive)
- Percutaneous decompression/cholecystostomy if large/severe

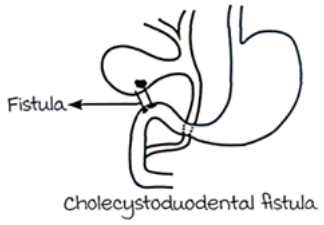
Complications

- Empyema, perforation, pseudomyxoma peritonei

Q13. GALLSTONE ILEUS

Etiology & Pathogenesis

Factor	Notes
Chronic Cholecystitis	Persistent inflammation → bilioenteric fistula (most commonly cholecystoduodenal)
Gallstone	Usually >2.5 cm passes through fistula into small bowel
Site of Obstruction	Terminal ileum (narrowest segment, last 60 cm)
Variant	Bouveret syndrome: stone impacted in pylorus/proximal duodenum → gastric outlet obstruction



Clinical Features

- Colicky abdominal pain, tenderness
- Vomiting (may be faeculent), abdominal distension
- Obstipation

Investigations

Investigation	Key Findings

X-ray (Erect/Supine)	Rigler's Triad: SBO + pneumobilia + radiopaque stone
CT Scan	IOC; identifies obstruction site and fistula

Management

- Emergency laparotomy
- Milking stone into colon if bowel viable
- Enterotomy for removal/crushing
- Resection & anastomosis if bowel necrotic
- Secondary surgery: cholecystectomy + fistula repair

Q14. COURVOISER'S LAW/SIGN

Principle

Palpable gallbladder + jaundice → likely malignancy, rarely gallstones.

Pathophysiology

Obstruction Type	Gallbladder Wall	Clinical Result
Malignant (Pancreatic head, periampullary tumor)	Healthy, thin	Distensible, smooth, soft, pyriform mass
Calculous (CBD stone)	Fibrotic, scarred	Shrivelled, impalpable

Clinical Features

- Progressive "surgical" jaundice
- Smooth, soft, non-tender mass in RUQ
- Moves with respiration, side-to-side mobility

Exceptions / Caveats

Condition	Mechanism
Double Impaction	Cystic + CBD stones → palpable gallbladder
Mirizzi Syndrome	Stone causes extrinsic compression/fistula
Oriental Cholangiohepatitis	Fluke infection → palpable gallbladder
CBD stones (~10%)	May still be palpable
Tumor growth	Cystic + CBD obstruction simultaneously

Significance

- Guides urgent workup for periampullary cancers: pancreatic head, ampullary, distal CBD, duodenal adenocarcinoma

Q15. LAPAROSCOPIC CHOLECYSTECTOMY

Positioning & Setup

- Reverse Trendelenburg + right tilt
- Surgeon & assistant on left
- Pneumoperitoneum: CO_2 12–14 mmHg

Ports & Instruments

Port	Size	Use
Umbilical	10 mm	Laparoscope entry
Epigastric	10 mm	Working channel
Subcostal (midclavicular, anterior axillary)	5 mm	Graspers/retraction

Landmarks & Safety

- Critical View of Safety → cystic duct + artery identified
- Rouviere's Sulcus → stay above R4U line
- Bailout → subtotal, fundus-first, or open

Indications & Contraindications

Indications	Contraindications
Symptomatic stones, cholecystitis, mucocele, empyema	End-stage cirrhosis, portal hypertension, severe coagulopathy

Complications & Recovery

- Shoulder pain (CO_2)
- Bile duct injury → Roux-en-Y if complete transection
- Accessory duct leaks
- Oral diet 24 h, discharge 24–48 h

Variations

- SILS → single umbilical incision, better cosmesis, ↑ hernia risk

INDICATIONS IN ASYMPTOMATIC CHOLELITHIASIS

Surgery indicated for:

Anatomical

Porcelain GB

Stones >2.5 cm

Polyps >1 cm / growing

Thickened wall

Medical / Clinical

S. typhi carriers

Diabetes / Immunosuppression

Haemolytic anaemia

Post-bariatric

Endemic zones

Q16. MURPHY'S SIGN

Acute cholecystitis

Manual Elicitation:

Method	Patient Position	Technique	Response
Original (Murphy)	Sitting/upright	Right hand under costal margin, deep breath	Mid-inspiratory arrest
Moynihan	Supine	Left hand on rib cage, thumb subcostal	Sharp pain, breath halt

Sonographic Murphy: Direct transducer pressure over gallbladder; ↑ sensitivity.

Diagnostic Points	Criteria
Sensitivity / PV	97% / 93%
Local sign	Right upper quadrant pain + fever + imaging
Associated	Boas's sign, WBC >18,000 → Grade II AC

Q17. CBD Exploration

Choledocholithiasis

Indications: Preoperative jaundice, dilated CBD >8–10 mm, raised ALP; intraoperative stones or positive IOC; Charcot's triad/Reynolds pentad.

Surgical Techniques: Laparoscopic CBD exploration (LCBDE) with T-tube; open choledocholithotomy using Desjardin's forceps, Bake's dilators.

T-Tube Management: Drainage, post-op cholangiogram 10–14 days, clamping, removal, residual stone extraction via Burhenne technique.

Internal Drainage: Choledochoduodenostomy (risk: Sump syndrome), Roux-en-Y choledochojejunostomy for high/complex strictures.

Complications: Bile leak, biliary peritonitis, septicaemia, stricture, iatrogenic injury → chronic jaundice, biliary cirrhosis.

Key Steps	Notes
LCBDE	During laparoscopic cholecystectomy
Open choledochotomy	Longitudinal incision, forceps extraction
T-tube cholangiogram	Confirms clearance; guides removal

Indications	Clinical Signs
Obstructive jaundice	Pre/post-op lab evidence
Charcot's triad	Pain + jaundice + fever
Reynolds pentad	Adds shock + altered mentation

SINGLE INCISION LAPAROSCOPIC SURGERY (SILS) in cholecystectomy

- Minimally invasive Surgery
- Operation through a single umbilical entry port
- Procedure – 2.5 cm vertical umbilical incision - 10mm telescope & two 5mm instruments can be passed
- Advantages – no visible scar, faster recovery
- Complications – umbilical hernia

EXTRAHEPATIC BILIARY ATRESIA

Neonatal Cholangiopathy

Etiology/Pathogenesis: Viral infections (CMV, rotavirus, reovirus, HPV) or embryogenic defects → inflammatory fibrosis, bile duct proliferation, bile plugs → cirrhosis, portal HTN.

Classification:

Type	Involved Structures	Notes
I	CBD only	Mildest
IIa	CHD, GB/CBD patent	Moderate
IIb	CHD, GB, CBD obliterated	Severe
III	Entire extrahepatic tree	Most common (88%)

Clinical Features: Jaundice, acholic stools, hepatosplenomegaly, pruritus, xanthomas, biliary rickets.

Diagnosis: USG ("triangular cord"), HIDA/PIPIDA, MRCP, liver biopsy, intra-op cholangiogram.

Management:

Type	Surgery
I	Hepaticojejunostomy
II/III	Kasai portoenterostomy (<8 weeks)
All	Liver transplant if Kasai fails or end-stage

Prognosis: Age at surgery, duct diameter >200 µm, postop cholangitis affect outcome; many progress to portal HTN.

ORAL CHOLECYSTOGRAM

Graham-Cole Test

Purpose: Identify radiolucent gallstones, assess GB contractility, evaluate chronic biliary disease.

Preparation/Procedure: Fat-free diet 3 days → iopanoic acid 500 mg ×6 (evening meal) → X-ray → fatty meal → second X-ray.

Interpretation: Visualisation + contraction = normal; non-visualisation = cystic duct obstruction or non-functioning GB; filling defects = stones.

Indications	Notes
Radiolucent stones	Not seen on plain KUB

GB dyskinesia	Assessed by contraction
Chronic cholecystoses	Functional assessment

Contraindications	**Notes**
Serum bilirubin >3 mg%	Dye excretion impaired
Acute cholecystitis	GB non-functional
Vomiting	Incomplete contrast intake