

## GALLSTONES

### EPIDEMIOLOGY

Age: >40s Gender: 2/3F Race: Mediterranean Prevalence: 10% of women >40  
40,000 cholecystectomies and 4000 CBD stones need clearance annually

### STONE TYPES:

1. **CHOLESTEROL**= radiating crystal on yellow cut surface; greasy (20%)

**Cholesterol supersaturation:** diet/HMGCoA/E<sub>2</sub>

**Abnormal bile constituents:** bacteria/sloughed mucosa/mucous acts as nidus and traps crystals

**Lack of solubilisation factors:** bile salts (loss of TI to disease/resection/bact overgrowth/cholestyramine)

**Crystallisation factors:** bacteria/mucous/lipoproteins

**Stasis:** somatostatin/diabetes/vagotomy/multiparity/P4<sub>(preg/OCP)</sub>

*\*lithogenic bile deposits on/in GB wall → strawberry gallbladder\**

2. **PIGMENT**= stones with <30% cholesterol content (5%)

**Black:** polymerised Ca<sup>2+</sup> bilirubinate/carbonate/phosphate *\*sterile bile; hyperbilirubinaemia\**

**Brown:** unpolymerised Ca<sup>2+</sup> bilirubinate/palmitate/stearate/etc *\*infected bile/stasis/duct disease\**

3. **MIXED**= alternating laminae of precipitated **cholesterol** and **pigment** (75%)

### PATHOLOGICAL EFFECTS OF GALLSTONES

1. Silent: 85%

2. Impaction: (i)GB<sub>(large stones)</sub> → biliary colic → chem then bact cholecystitis/mucocoele/empyema/gangrene/perforation

(ii)Duct<sub>(small stones)</sub> → biliary colic → choledocholithiasis (+fat malabsorption) → cholangitis/pancreatitis/stricture

3. Gallstone ileus: erodes through GB wall into duodenum → TI impaction with mech obstruction (pneumobilia on AXR)

4. GB carcinoma

### CLINICAL FEATURES

**1. Biliary colic:** large stone in CD/HP or small stone in CBD

Severe epigastric colic → radiates to tip of left scapula; rolling in agony; N&V

**2. Acute Cholecystitis:** chemical then bacterial infection<sub>(G- = E. coli, klebsiella, pseudomonas, enterobacter)(G+ = enterococc, strep)(Anaerobes: Clostridium, bacteroides)</sub>

Fever (39°C)/ RUQ pain/Palpable GB, Murphy's sign/Jaundice in Mirizzi's syndrome

Empyema = severe toxemia → perforation → peritonitis

*Acalculous cholecystitis: E. coli/typhoid in well; opportunists, pseudomonas, enterobacter, clostridia and bacteroids, staphs in critically ill*

*Emphysematous cholecystitis: anaerobic gas-forming organisms → gas in GB wall*

**3. Chronic Cholecystitis:** thickened, fibrosed GB due to repeated episodes of infection/inflammation

Flatulent dyspepsia

Recurrent colic

**4. Choledocholithiasis:** stone passes along CBD and (i)**impacts in duct** (obstructive jaundice/cholangitis) or (ii)**AoV** (pancreatitis)

Ascending cholangitis: infected obstructive jaundice (Charcot's triad: intermittent fever/RUQ tender/obstructive jaundice)

(Reynold's pentad: Charcot's + hypotension + obtundation)

Enlarged GB: appears below tip of CC9; smooth hemi-ovoid; no space between it and liver; moves with resp; dull to percuss

Jaundice: malignant (pancreatic Ca/cholangioCa/AoV) \*Mirizzi's?\* || Non-jaundice: benign (mucocoele/empyema)

*Courvoisier's Law: If in a case of jaundice the gallbladder is palpable, the cause is unlikely to be gallstones*

(i)stones cause incomplete obstruction (ii)Fibrotic GB doesn't distend

Exceptions: (i)double pathology ie stone in CD + CBD/AoV/pancreatic head Ca (ii)Mirizzi's (mucocoele/empyema)

## INVESTIGATIONS

- LFTs
- US:** GB wall thickness/periucholecystic fluid/stones<sub>(size)</sub> and polyps/CBD dilatation/CBD stones
- MRCP:** no stones on US but (i)duct dilatation (ii)obstructive LFTs (NICE) \*CBD stone: 95% sensitivity, 89% specificity\*
- ERCP:** (i)Dx: high sensitivity/specificity for ductal stones (ii)Tx trawl/stent/sphincterotomy \*stones risk = age>55, dilated ducts, bili>30\*
- EUS:** If (i)MRCP negative (ii)sample bile
- CT:** only 10% stones are radio-opaque; 75% sensitive for obstructing CBD stones (better than US); chol stones isodense with bile
- HIDA:** (Technetium-labelled hydroxyl-imino-diacetic acid) (i)patency of tree (ii)biliary-enteric comms

## MANAGEMENT

### NICE

- Asymptomatic: **reassurance** (symptoms develop <2%/yr)
- Laparoscopic cholecystectomy: (i)**symptomatic** gallstones (ii)within a week of acute **cholecystitis** (ii)asymptomatic **CBD stone**
- Percutaneous cholecystostomy: **empyema** if (i)conservative management unsuccessful (ii)surgery contraindicated/high risk

### AUGIS (symptomatic gallstone disease)

1. Normal LFTs, normal ducts: 5% CBD stone → LC +/- OTC (6wks)
2. Normal LFTs, dilated ducts/Abnormal LFTs, normal duct: LC +/- OTC ; if stones → lap/open BDE or intra/post-op ERCP (1-2wks)
3. Abnormal LFTs, dilated ducts: 30% CBD stone → MRCP → (i)LC +/- if no stones; (ii)ERCP or LC + BDE if stones

### AUGIS (emergency presentation)

1. Biliary colic: LC within 6 weeks
  2. a Acute cholecystitis: analgesia/antibiotics/fat-free → cholecystectomy within a week (*also NICE*)  
→ 24hr persistent pain = (i)LC w/in 72 hrs<sub>(AUGIS)</sub> (ii)cholecystostomy if unfit  
b Empyema: cholecystostomy (surgery contraindicated/high risk and conservative management failed)
  3. Chronic cholecystitis: LC within 6 weeks
  - 4 Cholelithiasis
    - a Obstructive jaundice: ERCP < 48-72hrs
    - b Ascending Cholangitis: urgent ERCP then LC
    - c Acute Pancreatitis : (i)mild: LC on same admission | ERCP and sphincterotomy if unfit \*64% remain stone free\*  
(ii) severe: recover and LC | ERCP if cholangitis or increasing jaundice (AUGIS)
- NICE: lap chole + duct clearance (BDE/ERCP → trawl/stent) in symptomatic and asymptomatic duct stones*

Complications of LC: conversion <1%, bile leak <3%, BDI 0.3% -0.7%, retained stone

### Non-surgical witchcraft

#### **Gallstone dissolution: oral chenodeoxycholic/ursodeoxycholic acid (2° bile salts)**

3 Requisites: (i)non-calcified ie pure cholesterol (ii)multiple small as SA>large stone (iii)functional gallbladder  
6-12 mths to dissolve but recur rapidly

#### **Lithotripsy: US-shockwave destruction of stones**

Passage of fragments (painful) or retain them as niduses for more stones

## CHOLECYSTOSES

Chronic inflammation and hyperplasia of all tissue elements

1. Cholesterosis: strawberry gallbladder (yellow specks due to submucous cholesterol esters and crystals)
2. Cholesterol polyposis
3. Cholecystitis glandularis proliferans
4. Gallbladder diverticulosis
5. Typhoid Gallbladder → acalculous cholecystitis

## EMERGENCIES

### ACUTE ACALCULOUS CHOLECYSTITIS

Critically ill patients; 10% of acute cholecystitis; high mortality

Pathology: (i) ischaemia → Bacterial translocation (ii) biliary stasis (eg TPN)

Features: vague as patients often critically ill; perforation

Investigations: Bloods/cultures (usuals + opportunists/pseudomonas, enterobacter, staps, anaerobes, fungi)/USS +/- cholecystostomy/CTAP

Management: cholecystectomy/cholecystostomy temporarily if too unwell

### BILE LEAK POST CHOLECYSTECTOMY

Presentation: pain + sepsis after cholecystectomy (0.3-2.7% incidence)

Differential: bile/blood/bowel content/pus

Aetiology: CD stump leak (clip falls off; blows if CBD stone)/accessory duct/bile duct injury/duodenal injury

Approach (manage sepsis + leak): (i) Resus + abx (ii) History = operation note/clear duct?; examine = degree of illness/peritonitis?  
(iii) Scan (fluid, CBD calibre) (US) (iv) Manage leak

Management options: (i) US drain = patient well and has a clear duct → IR drain → MRCP → await resolution/ERCP if ongoing  
(ii) Lap washout/drain +/- definitive tx = (a) sick so can't wait for IR drain/MRCP/ERCP or (b) leak continues  
(iii) MRCP → ERCP (drain while waiting) = patient well enough to wait with drain /need it if CBD stone

CD leak: (i) laparoscopy and clip (unwell and duct clear) (ii) Drain and ERCP (patient well/stone in duct)

Accessory duct: suture + drain

BDI:

Duodenal injury:

### CHOLECYSTITIS IN PREGNANCY

Risks:

Consider (a) risks to baby/mother (b) technical feasibility

(i) T1: teratogenesis risk up until 10 weeks

(ii) T2: teratogenesis risk negligible and uterus small → window for laparoscopic cholecystectomy

(iii) T3: teratogenesis risk negligible but big uterus → GOR → aspiration/hypoxia (small FRC)/big uterus in way of instruments

## SPECIAL SITUATIONS

### SICKLE-CELL ANAEMIA

Risk: VOC (cold, infection, acidosis, hypoxia, dehydration)

Perioperative: Pre-op: HRA assessment/haematology (transfuse to Hb 10/exchange transfusion?)

Intra-op: keep warm, hydrated and avoid hypoxia/acidosis +abx

Post-op: vigilance for acute chest syndrome (fever/cough/chest pain with infiltrates triggered by LRTI)

### OPERATIVE CBD INJURY

Risk: 0.3-0.7% lap, 0.13% open +/- RHA injury

Mechanism: clip/cut/burn/ischaemia; most common = complete CBD transection (misidentify as CD)

Consequences: complete obstruction (jaundice), stricture (jaundice/cholangiocarcinoma), leak (peritonitis)

Avoidance: (i) critical windows before clipping (ii) retrograde (iii) cholangiogram (iv) subtotal (v) cholecystostomy and bail out

Presentations: jaundice; peritonitis; cholangitis/carcinoma; liver atrophy/cirrhosis

Investigations: 1. MRCP +/- ERCP (site of leak) 2. CTA (RHA injury) 3. LFTs

Classifications: (i) Strasbourg: A = CD leak B = occlusion C = transection D = lateral injury E = CHD transection

(ii) Bismuth: 1 = low CHD stricture 2 = high CHD stricture 3 = hilar stricture 4 = confluence destroyed 5 = aberrant R sectoral

Management: (i) intraoperative = stop dissecting, wash, drain → refer to HPB/candour/MDU

(ii) post-operative = abx/imaging/refer to HPB + talk to patient/MDU

## CBD STONES

1°: within CBD due to stasis (dysmotility/diverticulum/ampullary stenosis) → choledochojej as recur in 41% otherwise

2°: from gallbladder either (i)before (ii)within 2 yrs of cholecystectomy

1. ERCP (sphincterotomy/stone trawl/stent/lithotripsy)

Pre-op (CBD stone on imaging), intra-op (uncommon), post-op (known stones but emergency, failed or can't BDE)

2. Transcystic CBDE: 70% successful (small, near CD, few stones)

3. Choledochotomy (close primarily or over T-tube): (i)failed transcystic or (ii)large, distal, many stones \*need dilated CBD>8mm\*

4. Open choledochotomy: Mirizzi's type 2-4

RETAINED STONE:

RECURRENT STONE: primary/CBD>16mm/periampullary diverticulum + less if choledochotomy/choledochojej

## HAEMOBILIA

1. Liver trauma 2. Neoplasia 3. HA aneurysm 4. Hepatic abscess 5. Stone 6. Parasites

Quicke's triad: UGIB + JAUNDICE + RUQ PAIN

Ix: OGD first

Tx: TAE

## BENIGN BILIARY DISEASE

### CHOLEDOCHAL CYST

Todani classification: I= solitary (fusiform dilatation) IV= extend into IHDs

II=CBD diverticulum

V=IHD cysts alone (merges with Caroli's disease)

III=Choledochocoeles

Features: present usually in first year of life with pain/sepsis/pancreatitis/cancer risk 12%

Management: hepjej + roux-en-Y recon

### BILIARY ATRESIA

Failure of biliary lumen to develop in all/part of extrahepatic biliary tree

Aetiology: unclear

Features: prolonged neonatal jaundice

Management: Kasai's procedure

### PRIMARY SCLEROSING CHOLANGITIS

Aetiology: unclear but 70% have UC

Pathology: progressive obliterative fibrosis of biliary tree

Features: asymptomatic early then jaundice → liver failure → cholangiocarcinoma

Investigations: LFTs/ANCA/MRCP/ERCP

Management: ursodeoxycholic acid/stricture dilatations/liver transplant

Colectomy doesn't retard progression

### SPHINCTER OF ODDI DYSFUNCTION

Management: CaChB/Nitrate/Botox || ERCP + sphincterotomy || Surgical sphincterotomy