

## GALL BLADDER:

### CHOLELITHIASIS (GALL STONES)

stones in the lumen of gall bladder or extrahepatic biliary tree.  
majority of them are silent

### CLASSIFICATION:

cholesterol stones - Pure cholesterol stones, Mixed cholesterol stones.

Pigment stones: Black pigment stones, Brown pigment stones

#### CHOLESTROL STONES

> 50% crystalline cholesterol monohydrate

→ Pure cholesterol: contain > 90% of pure cholesterol stones.

Remaining: calcium bilirubinate & calcium carbonate.

- Radiolucent:

Role

→ Mixed cholesterol stones: 70-90% cholesterol

mixture of cholesterol calcium bilirubinate, calcium carbonate

If they contain Ca → not Radiopaque.

#### PIGMENT GALLSTONES:

Predominantly composed of bilirubin calcium salts

may also contain calcium carbonate & 20% cholesterol.

⇒ Black pigment: common in India

occurs in cirrhosis, chronic hemolytic states (↑ unconjugated bilirubin)

Radiopaque because 50-75% calcium salts

Consist of calcium Bicarbonate, Bilirubinate, calcium salt, PO<sub>4</sub>

⇒ Brown pigment:

They form in bile duct associated with bile stones & infections of gall bladder & biliary tree.

Consist of calcium Bilirubinate & calcium palmitate, mucus glycoprotein,

CaCO<sub>3</sub> & cholesterol present

are Radiolucent

- depending on the location
- Intrahepatic stones → Mostly brown pigment stones.
  - Gall bladder stones →
  - cholelithiasis (bile duct stones) - composed mixed cholesterol stones.

## RISK FACTORS:

For cholesterol stones:

- Advancing Age
- Female sex hormone: pregnancy, parity And oral contraceptives.
- Familial predisposition / Genetic predisposition.
- Environmental factors - Drugs, obesity, metabolic syndrome.

For pigment stones:

- 1) Chronic hemolysis - sickle cell anemia, hereditary spherocytosis.
- 2) Demography.
- 3) Adv. age
- 4) Pernicious Anemia
- 5) Alcoholic cirrhosis.

## PATHOMECHANISMS:

of cholesterol stones:

Supersaturation → It is complex multifactorial process.

① supersaturation of Bile with cholesterol.

→ Excretion of excess cholesterol from body is by

formation of bile  
cholesterol is excreted by hepatocytes as vesicles or micelles  
Vesicles: spherical structure surrounded by cholesterol but no bile salt.

Micellation: It is a process of conversion of vesicle into complex aggregation water soluble molecules.

Sequestration: cholesterol conc. of bile exceed the solubilizing capacity of Bile.

Cholesterol supersaturation is due to ↑ cholesterol solubility or ↓ bile Acid synthesis  
 ↓ or ↓ bile secretion  
 due to

mutation of LDLTAI gene, OCP

## ② Gallbladder Hypomotility

→ Normal motility of gall bladder empties and completely  
 exceeds its bile along with all supersaturated crystals.

due to  
MDR3 gene  
 mutation

This motility does not allow stone formation.

→ Abnormally cause gallbladder stasis → cholesterol crystal

## ③ Hyperscretion of Mucus in Gallbladder

→ Accelerate the growth of precipitations of cholesterol  
 monohydrate crystals.

## ④ Accelerated cholesterol crystal nucleation

Nucleation: with supersaturated cholesterol become insoluble

↓  
 ut stops  
 gallbladder function

↓  
 lithomellax cholelithiasis → lithomellax cholelithiasis

↓  
 They nucleate to form cholesterol monohydrate crystals

This accelerated is lithogenic bile

↓  
 Accelerated  
 due to excess of  
 liponucleating And (mucus like)  
 def of Antinucleating (Anti)  
 factors.

S F. of cholesterol stone

- Fat
- Fertilite
- Fosty
- female
- ...

→ suspension of precipitate of cholesterol monohydrate crystals.  
 → Gall stone → microne → macroscopic gallstone

## PATHOGENESIS OF PIGMENT STONES:

Pigment stone develop in setting of haemolysis or parasitic infection

### Black Pigmented stones:

→ ↑ production of <sup>liver</sup> unconjugated Bilirubin (Bilirubin, secreted from liver)  
 precipitate as Ca Bilirubinate  
 around nuclei of mucinous glycoprotein  
 to form black pigment stones.

### Brown Pigment stones

conjugate bilirubin → phosphatidylcholine → phosphatidylcholine  
 ↓ Bac glucuronidase ↓ Bac phospholipase ↓ conjugate BS  
 free unconjugated bilirubin → free fatty acid → free conjugated bilirubin

### Accelerated factors

- Sluggish gut
- Dead bacteria
- Parasite eg. Ascaris, bilvi.

conjugate with calcium

Calcium precipitate

brown pigment stones

## MORPHOLOGY:

Choleliths - i.e. : gall bladder.

Appearance depends on its content.

PURE CHOLESTROL STONES : - Radiolucent.   
 single  $\rightarrow$  pale yellow, Round to ovoid, evenly nodular, large.   
 Its surface - glistening bluish-white color, long thin radiating cholesterol monohydrate crystals.

Mixed  $\rightarrow$  contains cholesterol then pure monohydrate   
 cholesterol + calcium, poly bilirubin. (most common)

$\rightarrow$  multiple, gray-white to black, smaller, Rounded or faceted.   
 cut section  $\rightarrow$  laminated cut surface with dark core.

PIGMENT & GALLSTONES : Black stone  $\rightarrow$  whole gall bladder   
 Brown - infected.

Black  $\rightarrow$  Casal of Un Bilirubin, calcium, phosphorus, mucin glycoprotein,   
 multiple - inverse relation b/w size & number.   
 Usually irregular, spiculated (jet-like), quite friable.   
 Radiopaque  $\rightarrow$  whole GB.

Brown  $\rightarrow$  Casal of bilirubin with cholesterol.   
 multiple, dull brown, lamined soft to touch.   
 greasy consistency (due to FFA)   
 easy to crush endoscopically   
 Radiolucent.   
 Associated with infection.

C.R.

bilary colic, epigastric pain,

# Complications:

- Perforation of GB
- Abscess
- Hydrops of GB → distended with fluid
- Empyema of GB → distended with pus
- Cholecystitis
- Biliary obstruction
- Gallstone obstruct SI → Bouveret's syndrome

It is a rare complication of cholecystitis. It is characterized by the presence of a large gallstone in the duodenum or the jejunum.

It is caused by a large gallstone which has passed through the gallbladder neck and is now lodged in the duodenum.

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C.B

placed in the duodenum