

Stop Jaundice Genetic Defects involving
conjugation

Start Jaundice: conjugated hyperbilirubinemia

Jaundice

Elevated Total
Bilirubin

~~Unconjugated
Hyperbilirubinemia~~

Conjugated
Hyperbilirubinemia

Step One: Is it conjugated or unconjugated?
>50%

Total Bilirubin	7.9	H	0.3-1.2 mg/dL
Direct Bilirubin	5.1	H	0.0-0.4 mg/dL

Conjugated
Hyperbilirubinemia

Extrahepatic
Biliary Obstruction

Stones
Tumors

Intrahepatic
Cholestasis

Ductal Diseases:
Primary Biliary Cirrhosis
Sclerosing Cholangitis

Hepatocellular
(Transaminase Predominant)

Acute Injury:
Viral Hepatitis
Toxin (APAP/Etoh)
Reye's
Shock

Chronic Injury:
NAFLD/NASH
Viral Hepatitis
HH
A1AT
Wilson's/Cu
HCC
Cirrhosis

Conjugated
Hyperbilirubinemia

Transaminase
predominant



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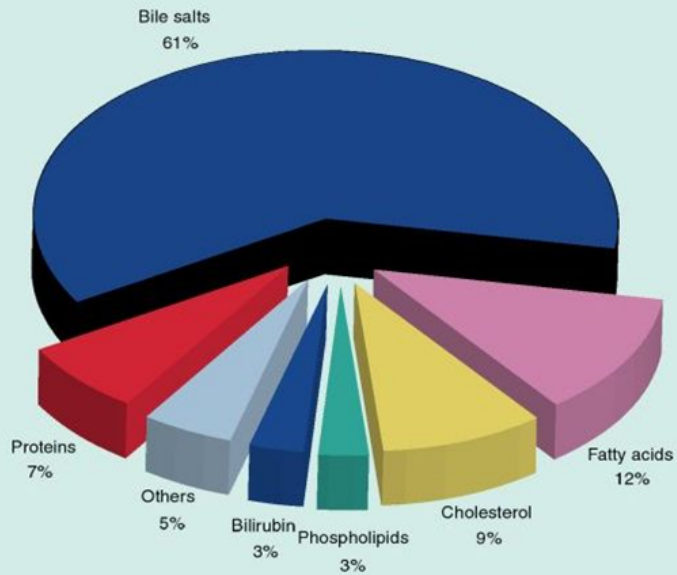
Similar lab parameters: (+) Alk Φ

Stone Language:
4F and RUQ Pain after fatty meal
↑ Alk Φ & Bilirubin

Language:
Pain radiating to (right) shoulder
(what it's not?: PUD, pancreatitis, etc.)



Medscape



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Bile Salts

Cholesterol

Bilirubin

What would cause that imbalance?

Stone Language:

4F and RUQ Pain after fatty meal

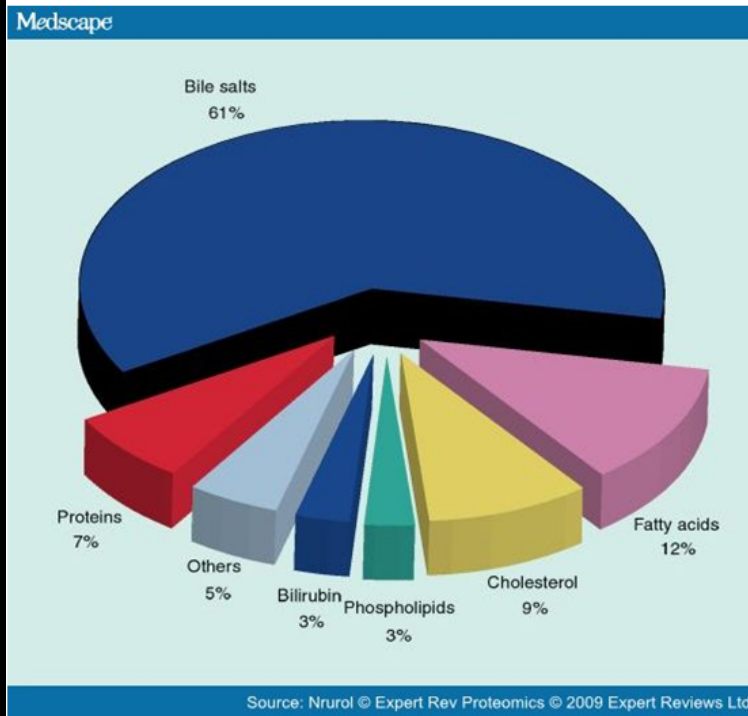
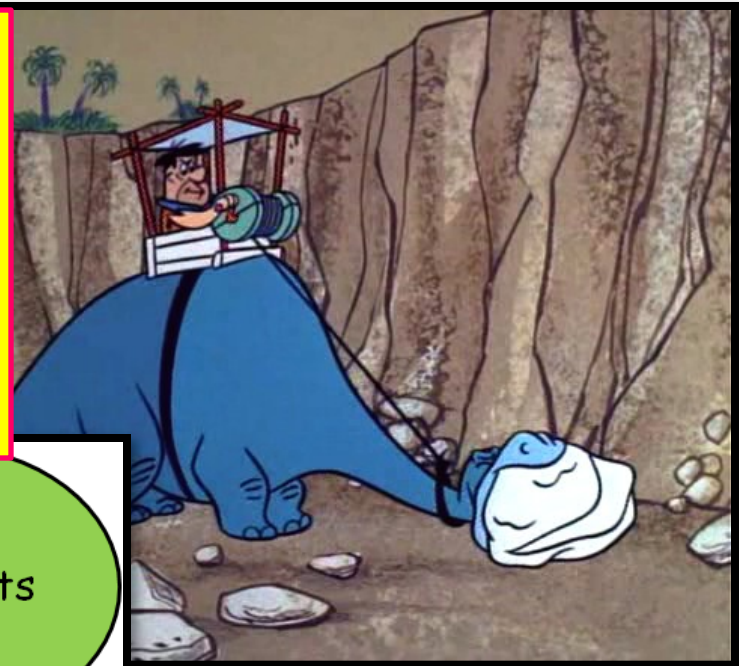
Alk Φ & Bilirubin

Bile Salts/PPL \downarrow

Cholesterol \uparrow

Bilirubin \uparrow : Black (pigment) stones

HIDA, US/CT, AXR (lucent v opaque)



Bile Salts

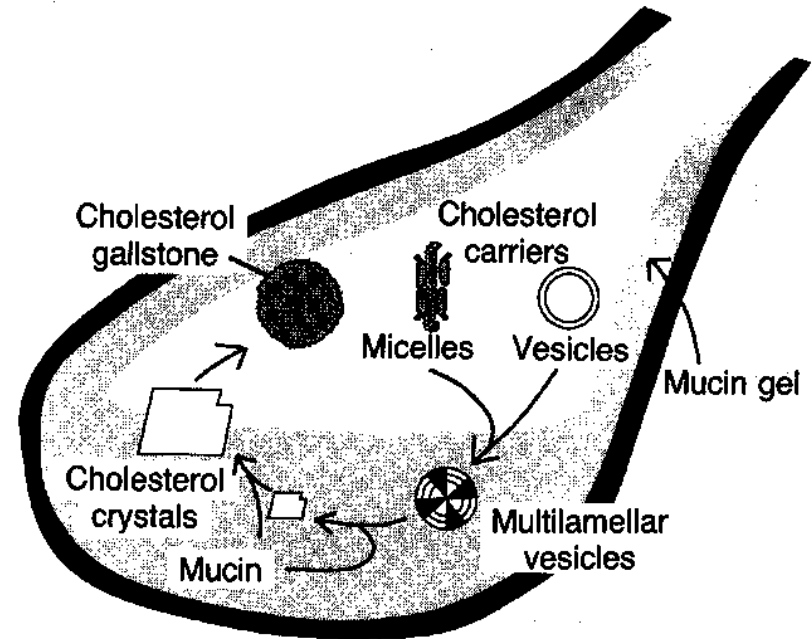
Cholesterol

Bilirubin

What would cause that imbalance?

Pathogenesis of Gallstones:

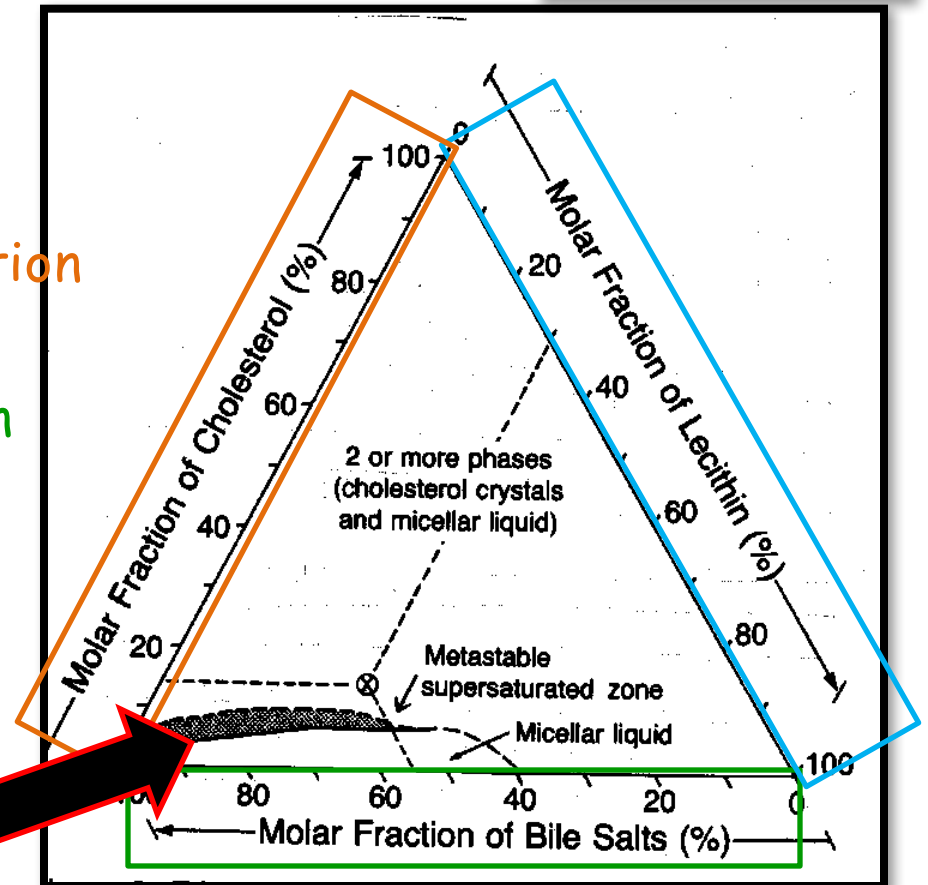
- **Supersaturation of bile**
- Crystal formation
- Entrapment in mucus
- **Stasis (acalculous cholecystitis)**
 - TPN
 - Starvation



Pathogenesis of Gallstones: Supersaturation of Bile



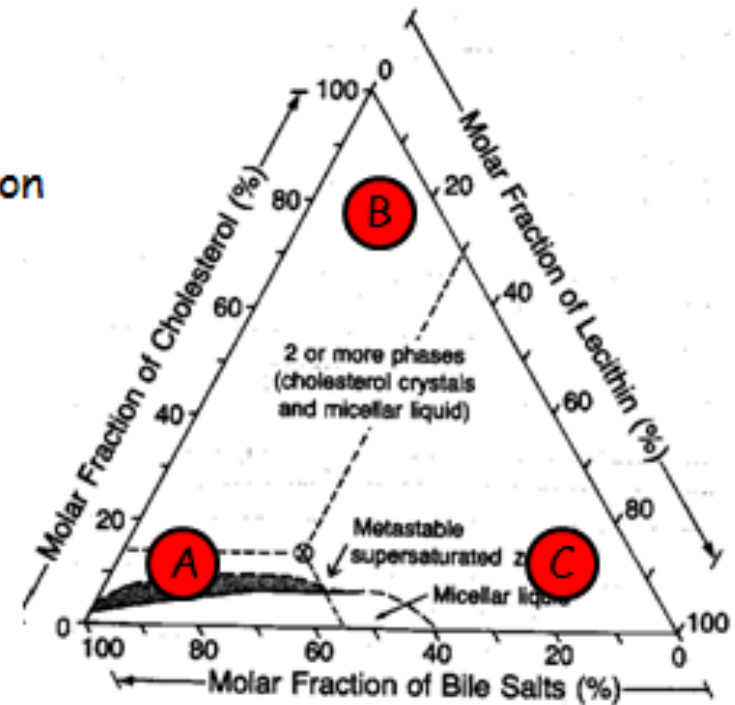
- Cholesterol stones:
 - Increased cholesterol secretion
 - Decreased bile salt secretion
 - Decreased phospholipids



Happy Zone (no stones):
↑ Bile salts, PPL; ↓ Cholesterol

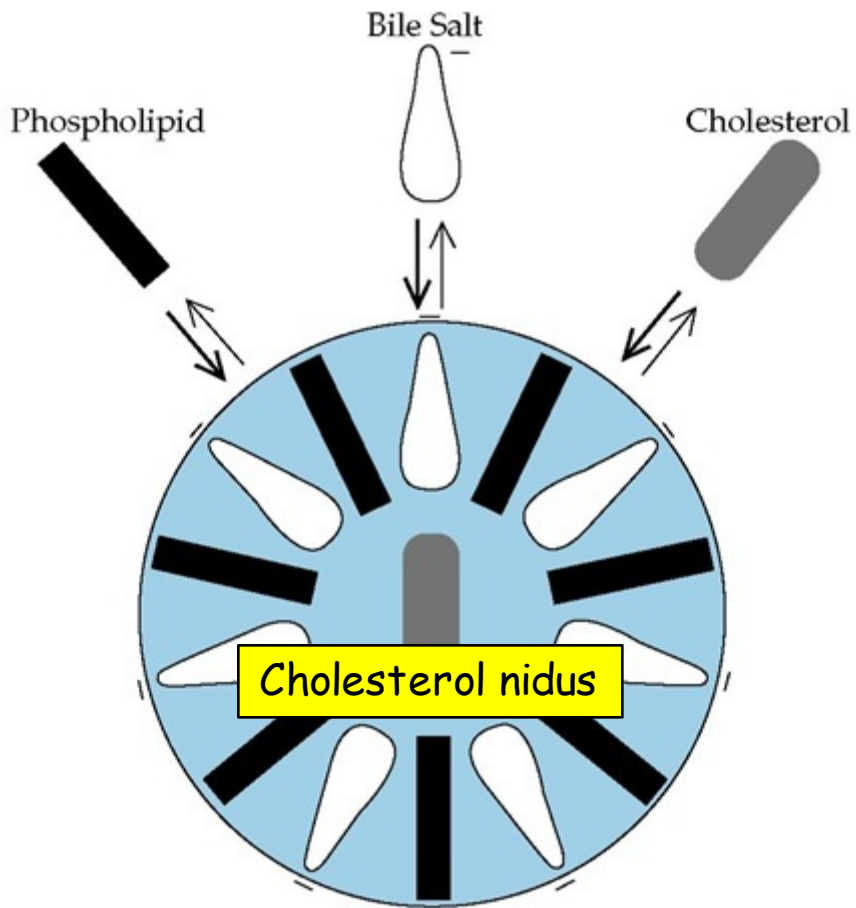
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Least lithogenic region?

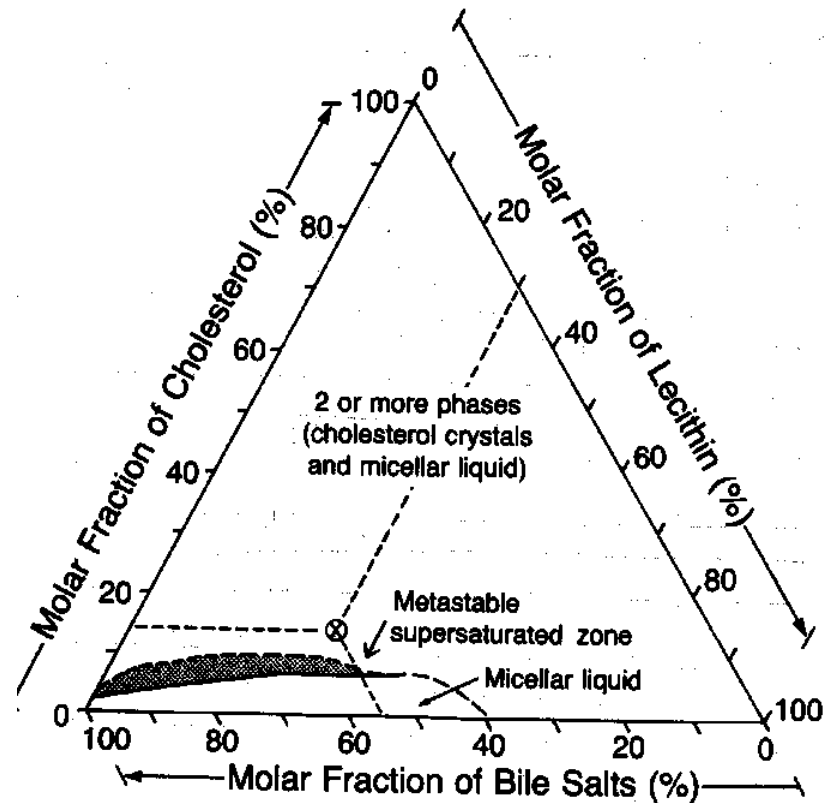


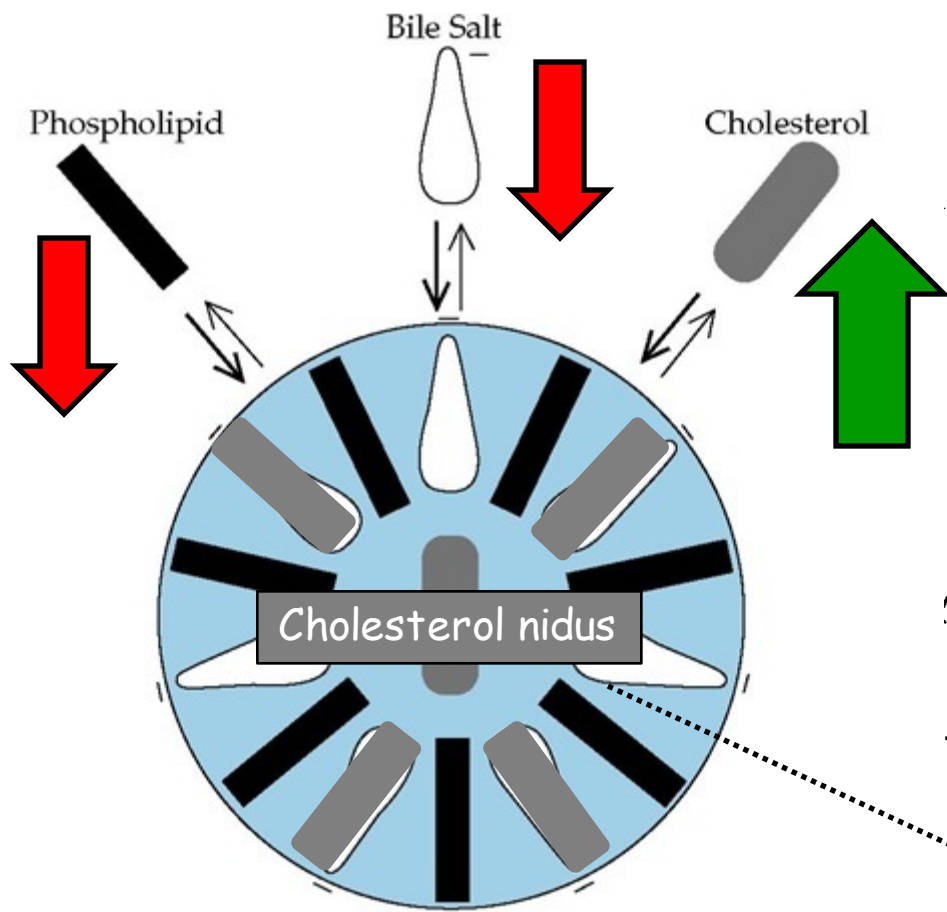
- A.
- B.
- C.



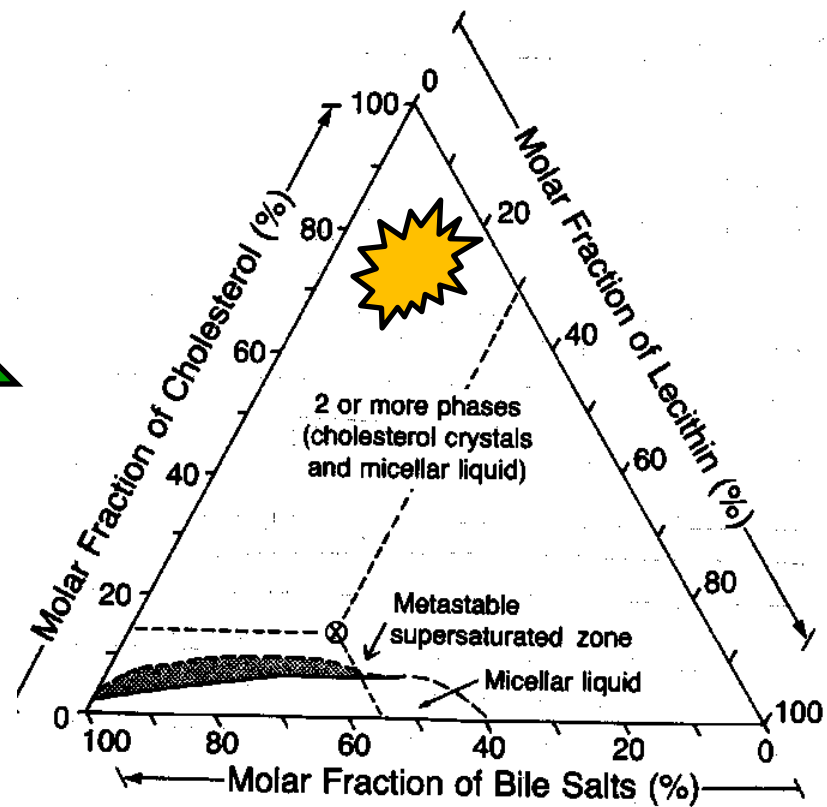


Mixed 'Biliary Micelle'

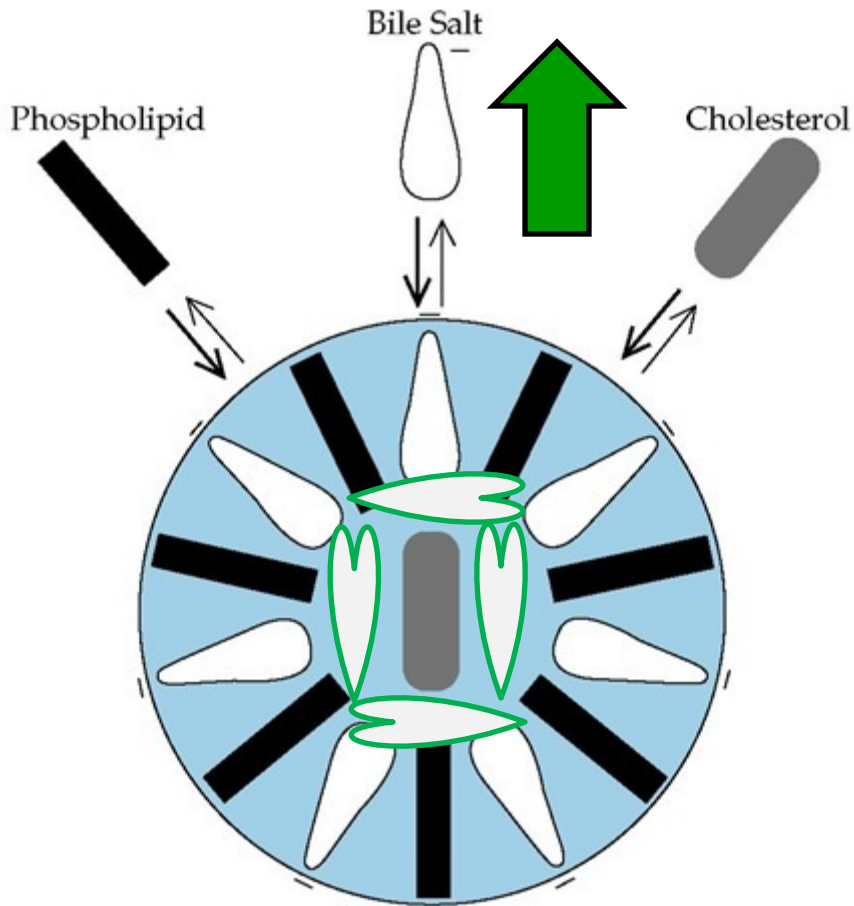




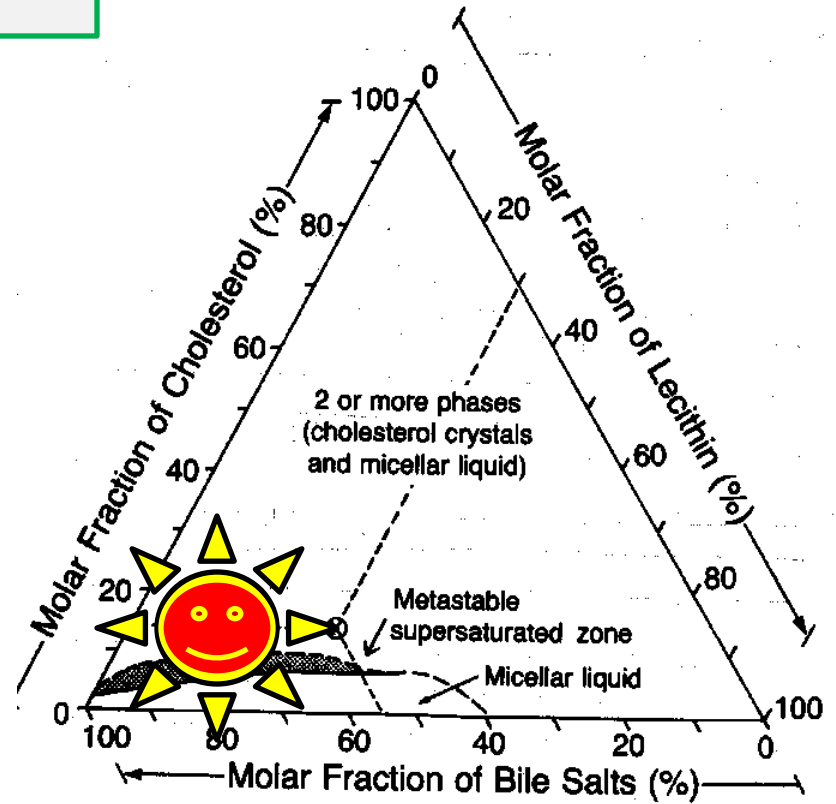
Mixed 'Biliary Micelle'



Med Rx: Ursodeoxycholic Acid

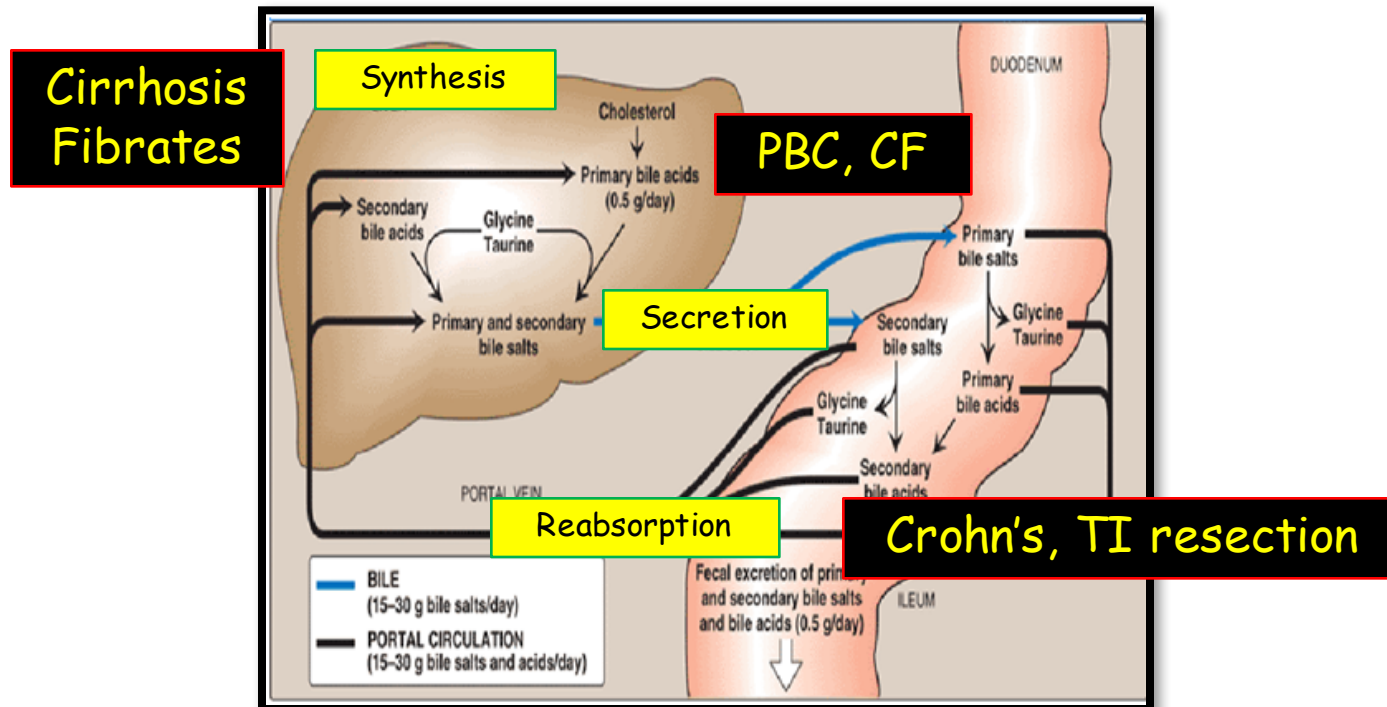


Mixed 'Biliary Micelle'



Gallbladder, Cholelithiasis

- Types: cholesterol, **mixed** & pigment
- Cholesterol stones
 - ↑Cholesterol: Estrogen increases cholesterol synthesis
 - Disruption of **bile salt synthesis** (cirrhosis, fibrates), **secretion** (PBC, CF) and **reabsorption** (TI disease, malabsorption)



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- Pigment (bilirubin) stones: calcium bilirubinate (radioopaque)
 - Excess bilirubin seen with chronic hemolysis
- Diagnosis
 - Murphy Sign: 'cessation of inspiration upon contact with the examiners' fingers'
 - U/S, CT Imaging, HIDA (Hepatobiliary Iminodiacetic Acid)



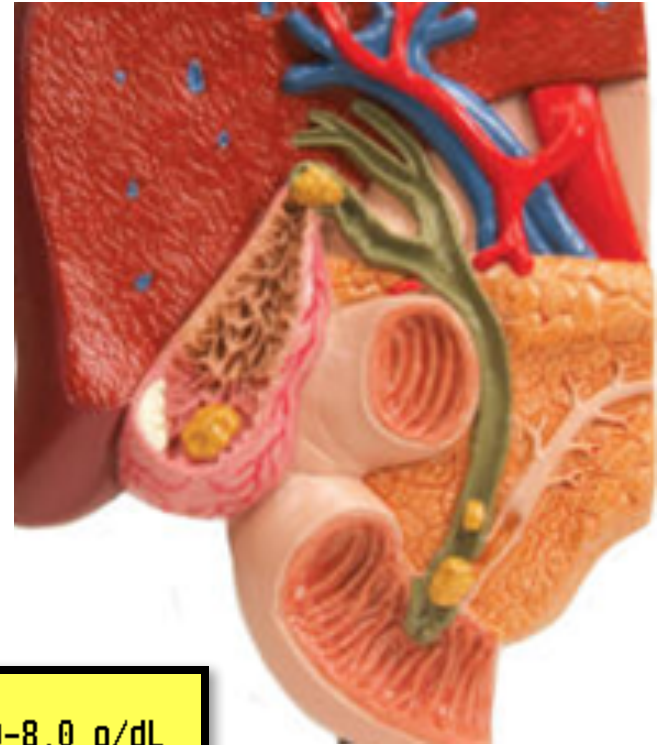
Functional study
(GB stress test)

Gallbladder, Cholelithiasis

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- Complications:
 - **Obstruction**: colic, cholecystitis (cystic duct), cholangitis, choledocholithiasis (CBD), pancreatitis (ampulla)
 - **Perforation**: gallstone ileus (air in biliary tree; pneumobilia)

Location, Location, Location

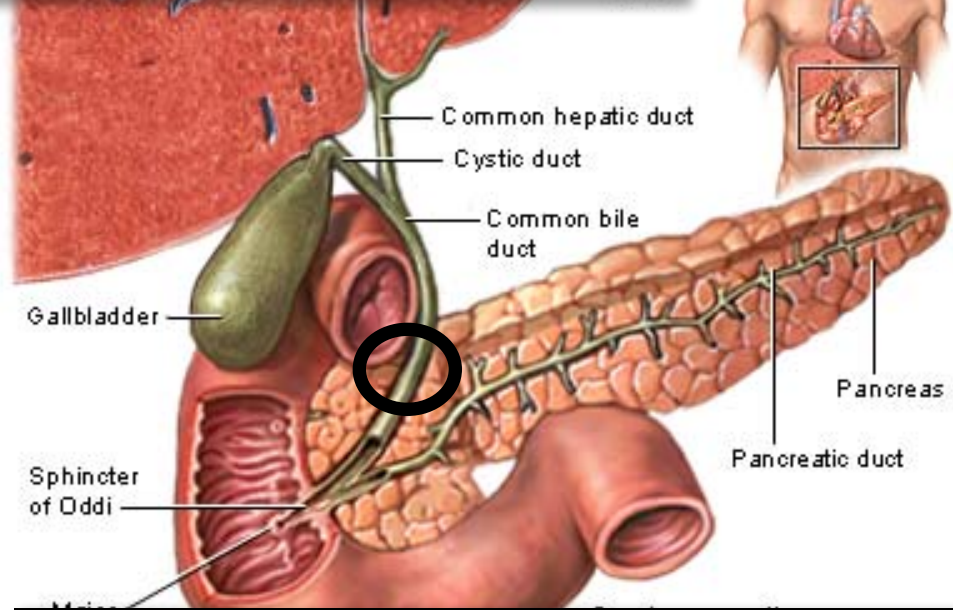
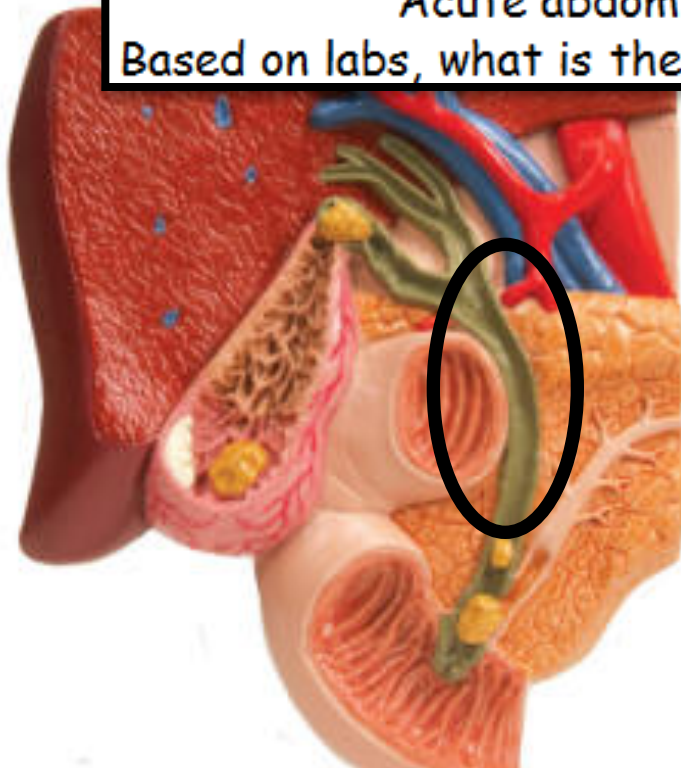
- A. cystic duct
- B. hepatic duct
- C. common bile duct
- D. major duodenal papilla



HEPATIC FUNCTION PANEL			
Total Protein	4.8	L	6.0-8.0 g/dL
Albumin	2.2	L	3.5-4.8 g/dL
Total Bilirubin	8.3	H	0.3-1.2 mg/dL
Direct Bilirubin	5.3	H	0.0-0.4 mg/dL
Alk Phosphatase	177	H	30-115 IU/L
AST	246	H	10-40 IU/L
ALT	209	H	10-40 IU/L

Acute abdominal pain and jaundice
 Based on labs, what is the most likely place of obstruction?

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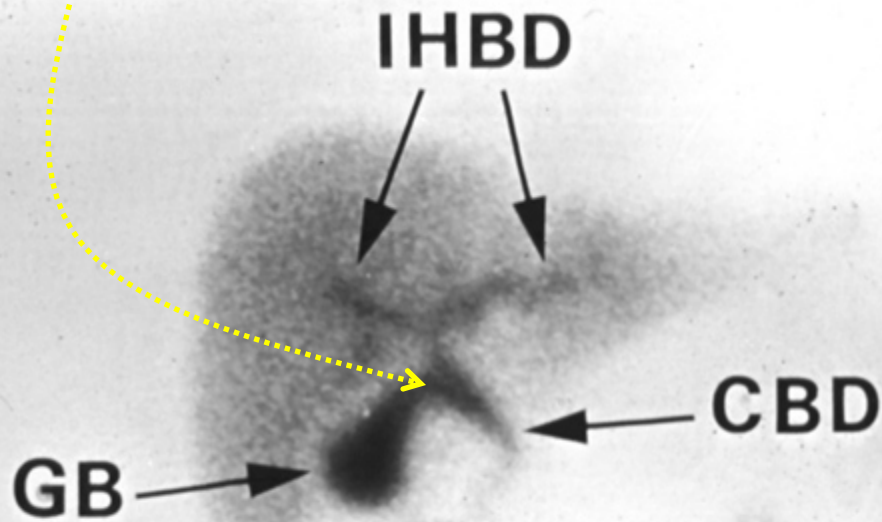
Choledocholithiasis

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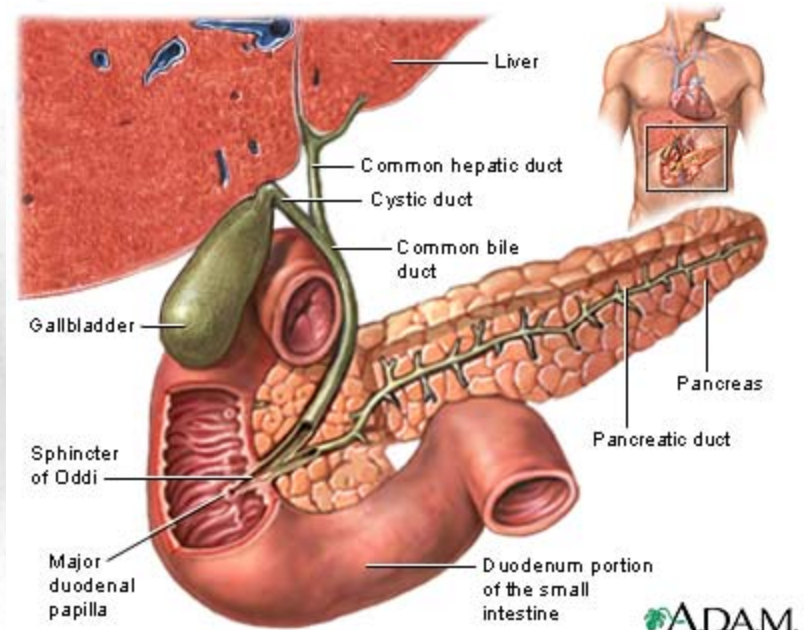
- A. cystic duct: normal transaminase
- B. hepatic duct: cholangiocarcinoma; Φ pain; not MOST likely
- C. common bile duct: obstruction with hepatic injury
- D. major duodenal papilla: gallstone pancreatitis

HIDA taken up by liver and excreted through biliary system.

Patent cystic duct

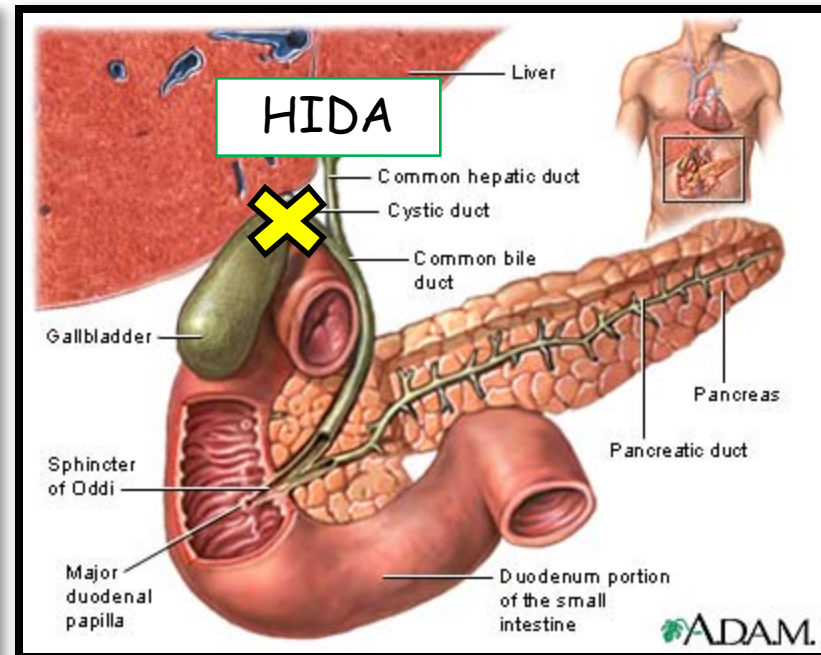
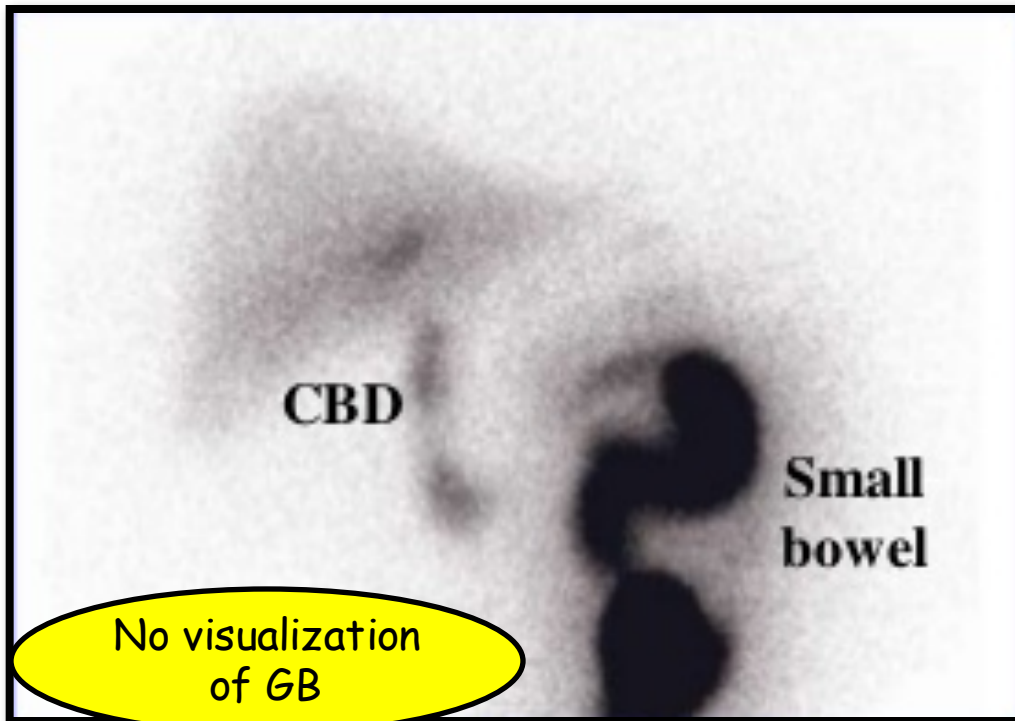


15-20



HIDA taken up by liver and excreted through biliary system.

Functional study for cholecystitis esp when given with CCK

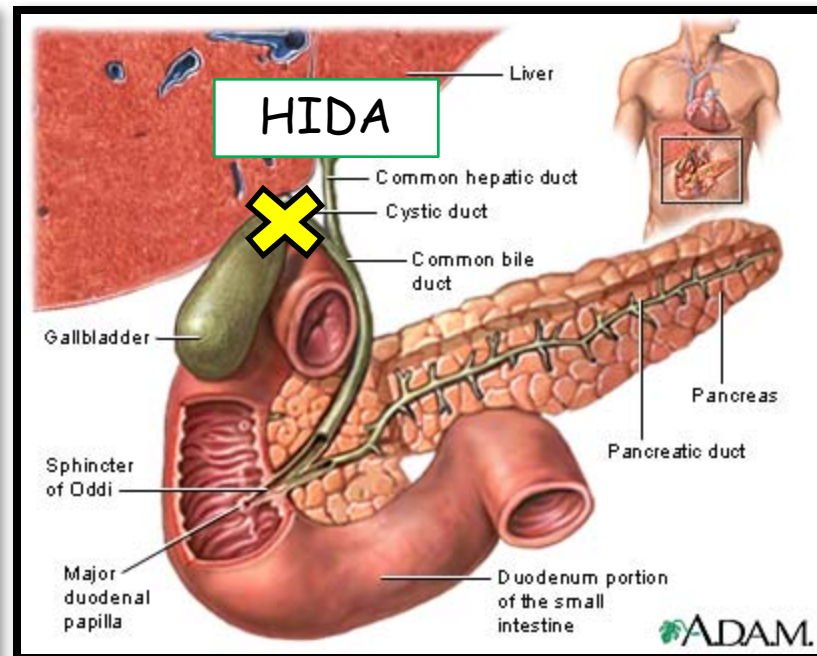
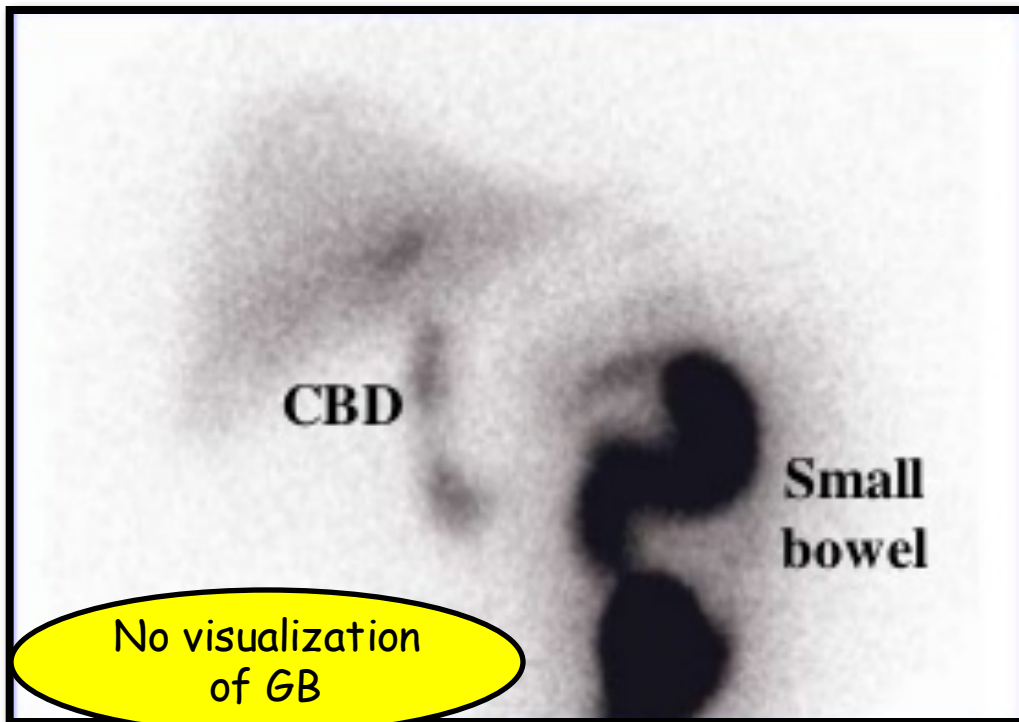


**Acute cholecystitis:
Cystic duct obstruction**

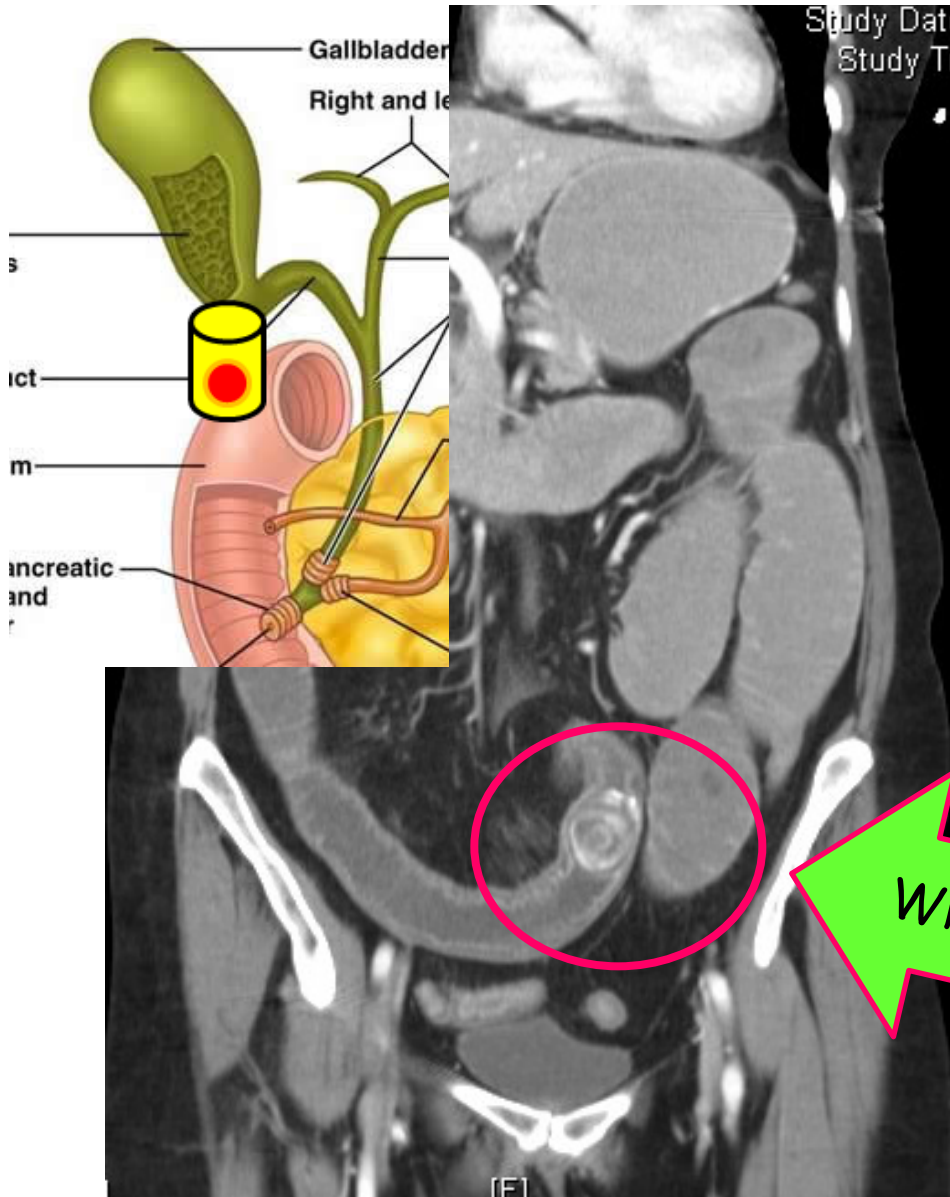
Functional study for cholecystitis esp when given with CCK
It's like a stress for the gall bladder

Ultrasound can visualize a stone but **HIDA** tells you if that stone is obstructive.

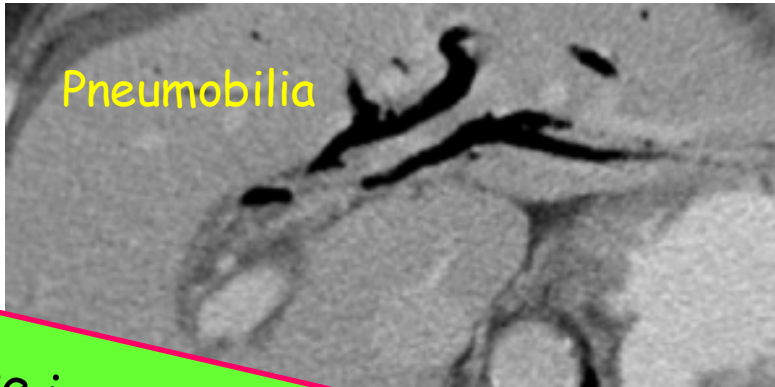
Other sonographic features suggestive of cholecystitis:
Murphy sign, wall thickening and pericholecystic fluid collection.



Acute cholecystitis:
Cystic duct obstruction



Gallstone Ileus:
Pneumobilia
Small bowel ileus
Ectopic stone (ileum)



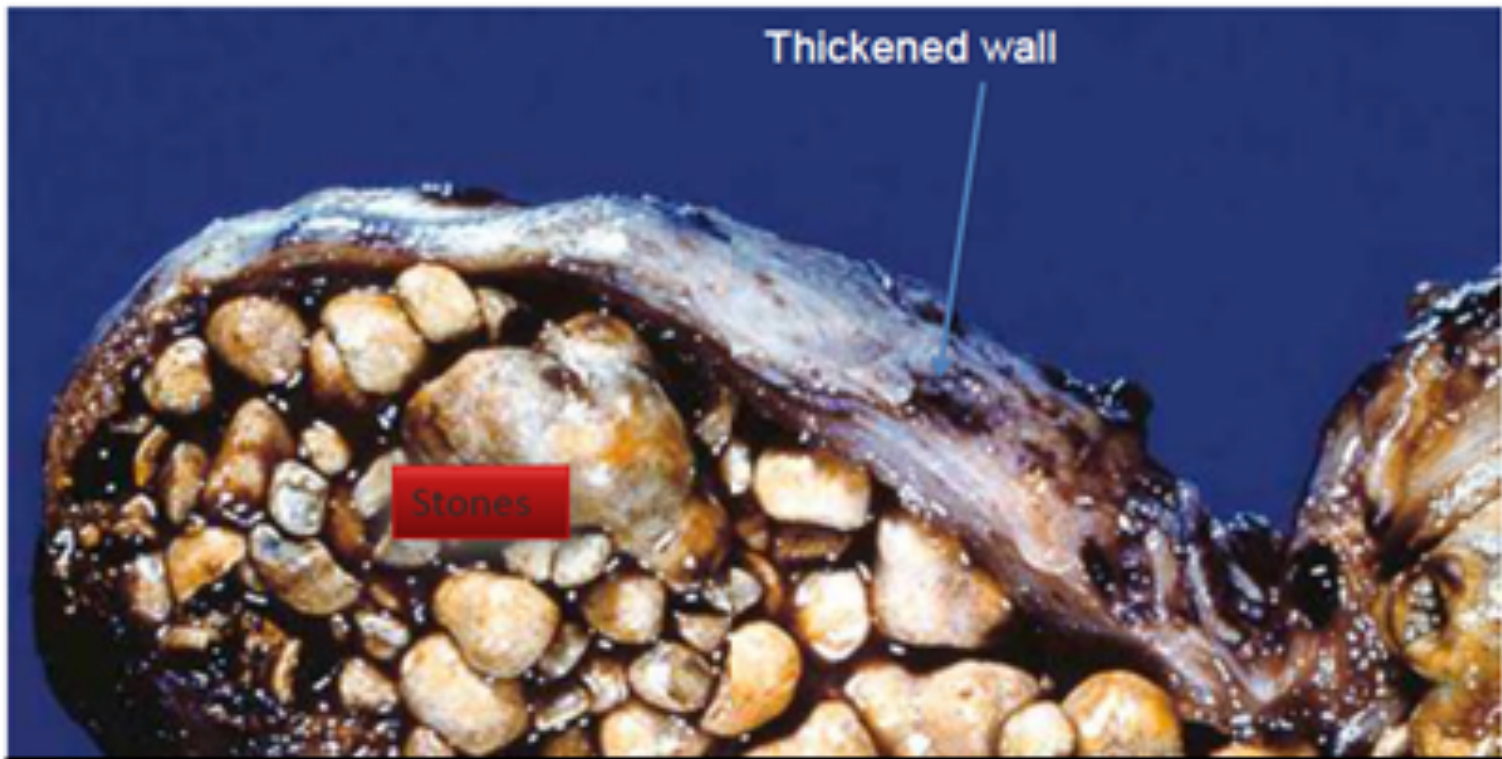
Where is it lodged?



Pigmented Stones:
Calcium Bilirubinate
(Calcium salts, bilirubin polymers)

Pigment (bilirubin) stones

– Excess bilirubin seen with chronic hemolysis; **RADIOOPAQUE**



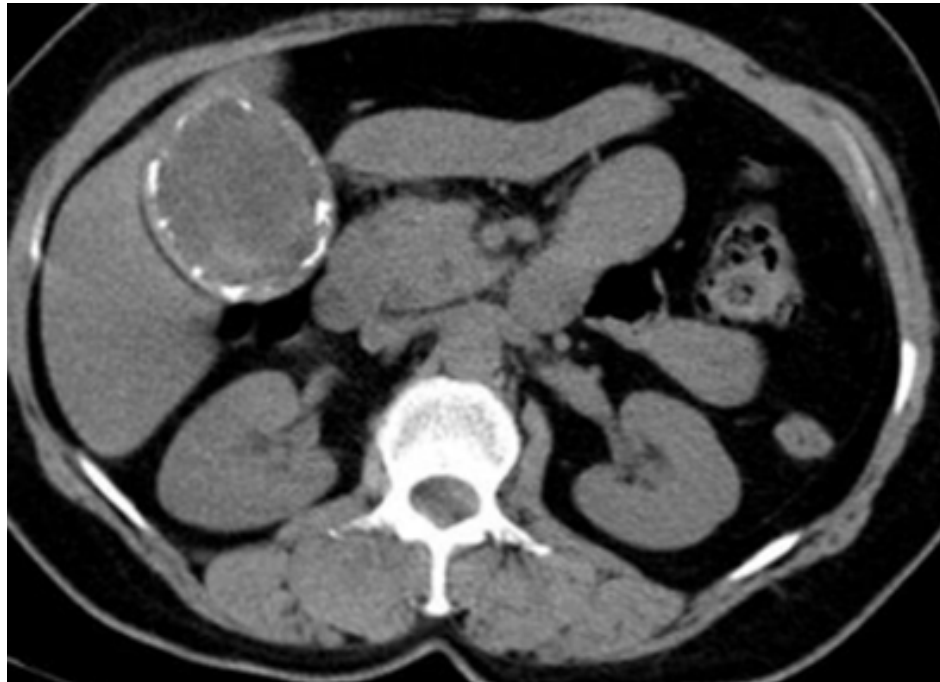
Thickened wall

Stones

**Porcelain Gallbladder:
2-3% adenoCa; poor prognosis; CCY advised**

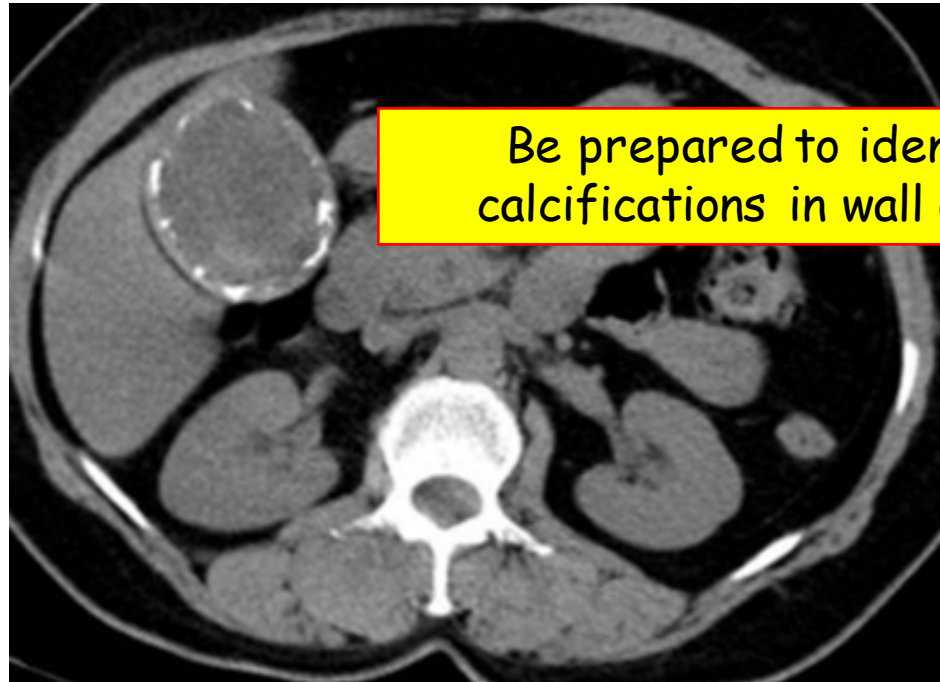
Adenocarcinoma NOT Cholangiocarcinoma

Patient has CT scan to evaluate RUQ pain. Image shown. If CCY not performed, the patient is at increased risk of which of the following?:



- A. Cholangiocarcinoma
- B. Squamous cell carcinoma
- C. Adenocarcinoma
- D. Hepatocellular carcinoma

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Be prepared to identify calcifications in wall of GB

- A. Cholangiocarcinoma
- B. Squamous cell carcinoma
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A patient presents to the ER with right upper quadrant colicky pain and fever. They are most concerned that the patient has acute cholecystitis. An AXR shows opacities in the right subcostal area. The patient most likely suffers from which of the following disorders?

1. Cystic fibrosis
2. Alcoholism
3. Elliptocytosis
4. Biliary cirrhosis
5. Terminal ileitis

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1. Cystic fibrosis, Alcoholism:
 - cholesterol stone; pancreatic calcification (epigastrium)
2. **Elliptocytosis: radioopacity = calcification**
 - **Calcium bilirubinate (pigment) stone**
3. Biliary cirrhosis: radiolucent
4. Terminal ileitis: radiolucent

Conjugated Hyperbilirubinemia

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