



Biliary obstruction and biliary stones

Objectives:

NOT GIVEN

Resources:

- Davidson's.
- 436 doctors slides.
- Surgical recall.
- 435' team work

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COLOR INDEX:

NOTES , IMPORTANT , EXTRA , DAVIDSON'S

EDITING FILE

FEEDBACK

Basic review:

Anatomy:

Biliary tree:

consists of fine intrahepatic biliary radicles that drain individual liver segments before forming the right and left hepatic ducts.

The left hepatic duct joins the right hepatic duct to form \Rightarrow common hepatic duct \Rightarrow common bile duct which ends at the ampulla of Vater (usually in the second part of the duodenum), It is usually joined by the pancreatic duct just before entering the duodenum.

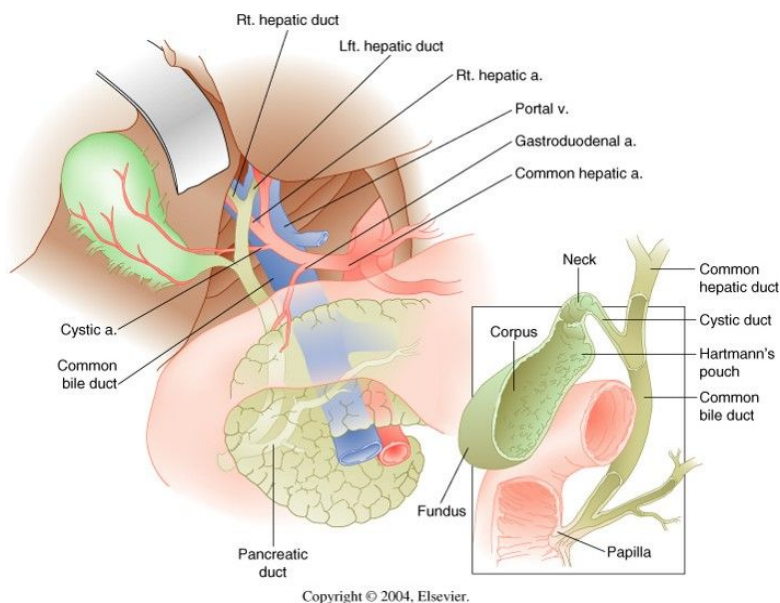
Gallbladder:

lies in a bed on the undersurface of the liver between its right and left halves with a fundus, body and neck. Hartmann's pouch is a dilatation of the gallbladder outlet adjacent to the origin of the cystic duct, in which gallstones frequently become impacted.

Blood supply:

Gallbladder and cystic duct are supplied by the cystic artery.

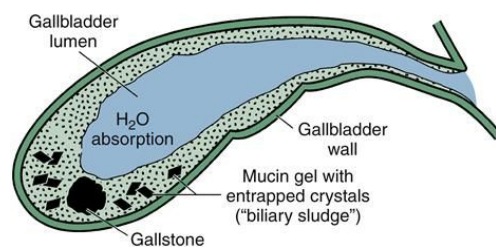
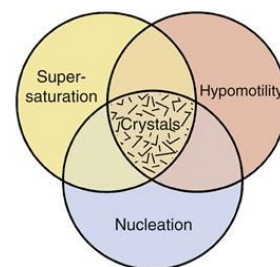
Celiac trunk \rightarrow common hepatic a. \rightarrow right hepatic a. \rightarrow cystic a.




So chronic emptying of bile (such with aging) leaves some salts in the gallbladder which may lead to stone formation.

The gallbladder capacity is 50ml, so how can it contain the 1 liter bile secreted from the liver? 1- The bile secretion is intermittent during the day & with the food. 2- The bile is reabsorbed after secretion from the liver to get concentrated in the gallbladder.

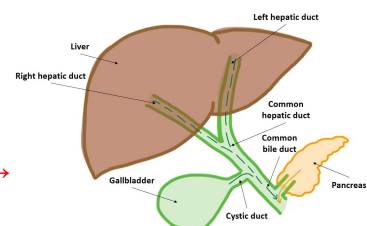
- Impaired motility can predispose to stones.
- Sludge is crystals without stones. It may be a first step in stones, or be independent of it.

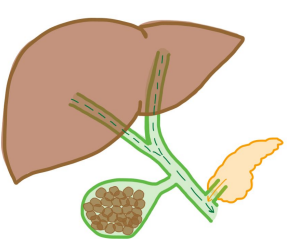
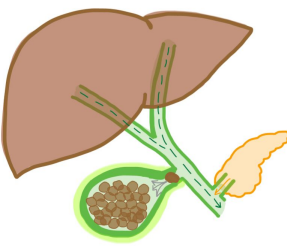
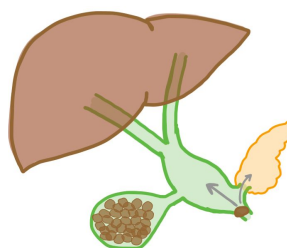
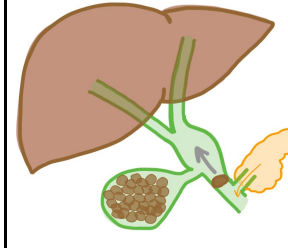


EXTRA

Tip: go through this table before studying the lecture and make sure you read after 

Normal →



		Cholelithiasis	Cholecystitis ¹	Choledocholithiasis	Cholangitis
Definition		presence of gallstones in the <u>gallbladder</u>	Inflammation of the <u>gallbladder</u>	Presence of a gallstone in the <u>common bile duct</u>	Inflammation of the <u>Common bile duct</u>
					
Site of obstruction		NO obstruction	Cystic duct	Common bile duct	Common bile duct
Clinical presentation		<ul style="list-style-type: none"> * Pain ~ RUQ ~ Colicky²/Intermittent ~ Radiates to right shoulder ~ worse with fatty food * +/- N/V 	<ul style="list-style-type: none"> * Pain ~ RUQ ~ Constant³ ~ Radiates right shoulder or back ~ worse with fatty food * +/- N/V * Fever 	<ul style="list-style-type: none"> * Pain (mild) ~ RUQ ~ Radiates to shoulder * Jaundice * +/- hepatitis * +/- pancreatitis * +/- N/V * +/- Fever 	Charcot's triad: RUQ pain + jaundice + fever (with rigors) Mnemonic: CHARcot's C olor = yellow(jaundice) H ot = fever (+rigors) A che right= RUQ pain
Murphy's sign		-	+ (acute type)	-	-
Obstructive jaundice		-	-	+	+
Diagnostic methods	Lab	NORMAL	↑ WBC	↑ WBC ↑ LFTs (ALP & GGT) ⁴ +/- ↑ amylase & lipase	↑ WBC ↑ LFTs (ALP & GGT)
	Imaging	US: <ul style="list-style-type: none"> • Gallstones 	US: (3 findings) <ol style="list-style-type: none"> 1. <u>Stones</u> 2. <u>Thickened wall</u> 3. Pericholecystic <u>fluid</u> 	US: <ul style="list-style-type: none"> • Obstruction • Dilated ducts Endoscopic US & MRCP	US: <ul style="list-style-type: none"> • Obstruction • Dilated ducts
Management		<ul style="list-style-type: none"> * Avoid fatty meal * <u>Elective</u> cholecystectomy + Ursodeoxycholic acid⁵ 	<ul style="list-style-type: none"> * NPO + IVF + IV Abx * <u>Urgent</u> Cholecystectomy⁶ 	<ul style="list-style-type: none"> * NPO + IVF + IV Abx * ERCP + <u>Elective</u> cholecystectomy 	<ul style="list-style-type: none"> * NPO + IVF + IV Abx * <u>Urgent</u> ERCP + <u>urgent</u> cholecystectomy

¹ Remember there is two types of cholecystitis: calculous cholecystitis (gallstones) & acalculous cholecystitis (without gallstones)

² المريض يقول لك الالم يجي ويروح ويتكرر بين كل فترة

³ Not colicky as its an inflammation so nothing will relieve it

⁴ Obstructive pattern + conjugated (direct) bilirubin

⁵ Effective agent for dissolving cholesterol gallstones



⁶ If cholecystectomy is of an option

Gallstones pathogenesis:

- Bile consists of 3 component in a balance.
 - **Lecithin (Phospholipids)**
 - **Bile acids**
 - **Cholesterol**
- The solubility of cholesterol in bile depends on the concentration of lecithin, bile salts and cholesterol.
- **Lecithin** and **cholesterol** are insoluble aqueous solutions but dissolve in bile salt-lecithin micelles.
- Conversely, increasing the biliary concentration of lecithin and bile salts should hinder cholesterol stone formation.
- Cholesterol will only crystallize into stones when the bile is supersaturated with cholesterol relative to the bile salt and phospholipid content and gradually stone growth occur.

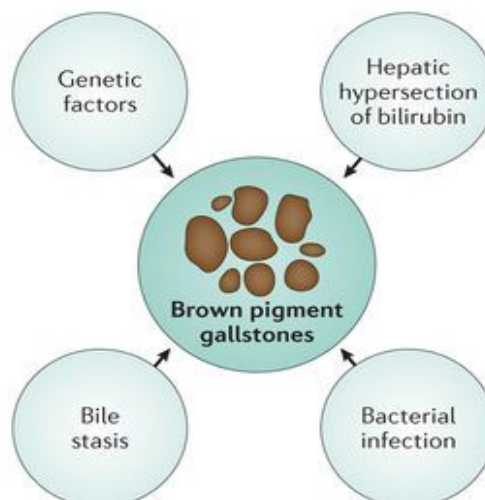
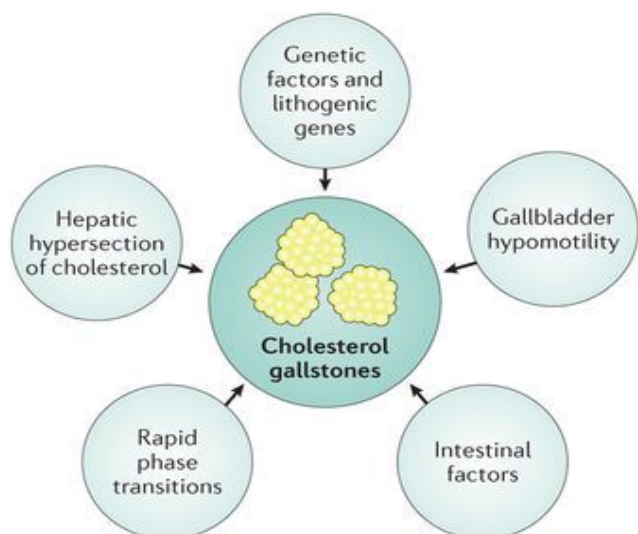
Normal bile (normally 1 Liter/day) contains glucaro-1,4-lactone, which inhibit the conversion of conjugated to unconjugated bilirubin, and thus stop the formation of calcium bilirubinate stones.

Types of stones:

Gallstones are conveniently classified into cholesterol, pigment stones, and of mixed composition.	
Cholesterol gallstones Most common Account for 80% of all gallstones	Pigmented stones Account for 15-20% of all gallstones, Composed of calcium bilirubinate. Dark, multiple, and smaller in size. <i>And this is the only type of biliary stones that can be seen on X-ray, but the US still the one to choose.</i>
<ul style="list-style-type: none"> • Cholesterol is held in solution in bile by its association with bile salts and phospholipids in the form of micelles and vesicles. (phospholipids (lecithin) + bile salt solubilize cholesterol) • In gallstone disease, the liver produces bile that contains a relative excess of cholesterol. Which promotes a lithogenic bile. <p><u>Crystallization</u> can be due to either of the following:</p> <ul style="list-style-type: none"> - Relative deficiency of bile salts - Relative excess of cholesterol <p><u>Pathogenic factors</u> leading to production of lithogenic bile:</p> <ul style="list-style-type: none"> - Defective bile salt synthesis (hepatic dysfunction) - Excessive cholesterol secretion (Increased HMG-CoA reductase activity) - Abnormal gallbladder function (impaired motility) - Excessive intestinal loss of bile salt 	<p>A-Black stones:⁷ Black pigment stones are mostly seen in patients with hemolytic conditions such as: sickle cell disease and spherocytosis, which there is a chronic excess in bilirubin production. They can be also found in Cirrhotic patients.</p> <p>B- Brown stones:⁸ These stones are composed of calcium salts of fatty acids as well as calcium bilirubinate. They are almost always found in the presence of bile stasis and/or biliary infection.</p> 

⁷ form primarily in the gallbladder in sterile bile and are associated with advanced age, chronic hemolysis, alcoholism, cirrhosis, pancreatitis, and total parenteral nutrition

⁸ Brown stones form not only within the gallbladder but also within the intrahepatic and extrahepatic ducts; they are uniformly infected with enteric bacteria and are **usually associated with ascending cholangitis**.



Gallbladder stones (Cholelithiasis)

Background:

- **Cholelithiasis** is the presence of gallstones in the gallbladder.
- Presentation and complications:
 - May remain **asymptomatic** for decades and incidentally get found in ultrasound exam for other problems, some patients has vague, upper abdominal discomfort and dyspepsia which cannot be explained by a specific disease. Routine cholecystectomy is not indicated.
 - May cause **biliary colic**⁹ type of pain.
 - May lead to **Cholangitis**¹⁰, **choledocholithiasis**¹¹ or **cholecystitis**¹².
- 70% of people with gallbladder are asymptomatic, no intervention needed.

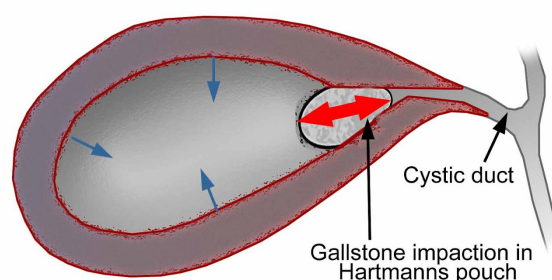
Sometimes the patient have pain, and their US shows biliary stones, but don't take it as it is!!
 Don't let the stones مسمار جحا إلی تعلقوا علیه كل المصابیب there are a high chance that the symptoms are from something else and the stones are just incidental finding, so do more investigations please before confirming your diagnosis.

- Other **symptoms are related to site of obstruction of stone**

Obstruction of:

- **Common bile duct** leading to pain & jaundice.
- **Pancreatic duct** leading to pancreatitis.
- Gallstones increased risk of carcinoma of the gallbladder.
- Biliary pain usually manifest in the epigastrium and right hypochondrium (RUQ).

Mechanism of Colic



⁹ Pain associated with temporary gallbladder contraction against a stone

¹⁰ Infection of the biliary tree.

¹¹ Gallstone in bile duct

¹² Inflammation of gallbladder from obstruction of CBD or cystic duct

Epidemiology, causes and risk factors:

affected by race, ethnicity, sex, medical conditions, fertility..

- Internationally: 20% of women, 14% of men.
- Patients over 60 prevalence was 12.9% for men, 22.4% for women. F > M
- Every year 1-3% of patients develop symptoms.
- **Morbidity and mortality is associated only with symptomatic stones.**

Risk factors ¹³	
Ethnicity	<ul style="list-style-type: none"> - High in Native americans Pima Indians (75% of elderly). AND Asians are more likely to have pigmented stones than others. - African origin with Sickle Cell Anemia. - Highest in fair skinned people of northern European descent and (in Hispanic populations 1-2% yearly.).
Sex	<ul style="list-style-type: none"> - More common in women. Etiology may vary being 2ndary to estrogen¹⁴(plz read footnote); causing increased cholesterol, and progesterone causing bile stasis. <ul style="list-style-type: none"> ● Pregnant women more likely to have symptoms. ● Women with multiple pregnancies at higher risk ● Oral contraceptives, estrogen replacement therapy (hormones increases the risk of stone formation). - 5F's: Forty (The process needs time <i>فيها مترسب الملح مع الوقت تشوف</i>), Fair¹⁵, Fat (The fat metabolism will results in more cholesterol formation), Female (due to hormones) & Fertile (<i>الوحدة تحمل وتولد واللي حولها يأكلو فيها ويسمونها وهي أساسا نحيفة</i>).
Age	<ul style="list-style-type: none"> - It is uncommon for children to have gallstones. <u>If they do</u>, it's more likely that they have congenital anomalies, biliary anomalies, or hemolytic pigment stones disease.. - Incidence of gallstones increases with age 1-3% per year.

Causes	Differential diagnosis
<ul style="list-style-type: none"> - High fat diet, Obesity - Rapid weight loss, TPN, Ileal disease. - Increases with age, alcoholism. - Diabetics have more complications - Hemolytics - Multiparity - Childbearing - First degree relatives 	<ul style="list-style-type: none"> - AAA (Abdominal Aortic Aneurysm) - Appendicitis, Cholangitis, cholelithiasis - Diverticulitis, Gastroenteritis, hepatitis - IBD, MI, SBO - Pancreatitis, renal colic, pneumonia

¹³ Nowadays there is new risk factors including: Hormonal replacement therapy, oral contraceptives and lifestyle changes

¹⁴ Estrogen increase HMG coA which will lead to: 1.more cholesterol synthesis and secretion to GB 2.increase the lipoprotein receptors on hepatocytes = more lipid uptake.

¹⁵ common in Caucasians population.

History:

- 3 clinical stages: **asymptomatic** (60-80%), **symptomatic**, and with **complications** (cholecystitis, cholangitis, CBD stones).

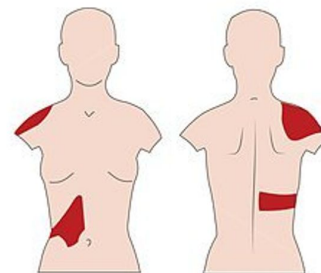
- Typical symptoms of **biliary colic**:

(why did we say biliary colic and not gallstones? Because typically gallstones are asymptomatic)

- **RUQ colicky pain, Radiating** to the **back** and **shoulder**¹⁶ and **never** radiated to the left side.
- Aggravated by **fatty food**

If pain is associated w/ empty stomach ⇒ think more of duodenal ulcer. **The pain can't be there when you are fasting!**

- Associated with **nausea** and **vomiting**
- Usually **recurrent pain**
- **No fever or leukocytosis** (Because the stones are present there but without inflaming the gallbladder yet), **Normal LFT**



Mechanism of pain in case of gallstones:

Cholecystokinin (CCK) will be secreted **after eating a fatty food** (CCK affect is in the muscular layer of gallbladder causing it to **contract**, in order to push bile into the duodenum -where the fatty food digestion happens-) and when the gallbladder contract **it won't release bile** (stones obstruct release of bile) stomach will secrete more and more CCK to get the bile so more and more contraction in the gallbladder causes pain.

- Sometimes the pain can be relieved by vomiting, (how? When you vomit → less CCK secreted → less contraction → less pain)
- A **detailed history** of the pattern and characteristics of symptoms along with the use of **ULTRASOUND** will help in the diagnosis.
- Most patients develop symptoms before complications.
- Indigestion, bloating and fatty food intolerance occur in similar frequencies in patients without gallstones, and are not cured with cholecystectomy.
- atypical symptoms of gallstones could be in the epigastric area, could be also without nausea and vomiting, but if the pain is in the LUQ this is less likely to be gallstones
- Small stones are more symptomatic. How? It can move and obstruct ampulla of vater that will lead to (obstructive jaundice/pancreatitis)

Physical examination:

- Vital signs and physical findings in **cholelithiasis** are **completely normal**.
- Fever, tachycardia and tachypnea¹⁷, hypotension, alert you to more serious infections, including cholangitis, cholecystitis.
- Negative Murphy's sign¹⁸.

¹⁶ Due to diaphragmatic irritation

¹⁷ tachycardia and tachypnea due to pain.

¹⁸ it is performed by asking the patient to breathe out and then gently placing the hand below the costal margin on the right side at the midclavicular line (the approximate location of the gallbladder). The patient is then instructed to inspire (breathe in). If the patient stops breathing in (as the gallbladder is tender and, in moving downward, comes in contact with the examiner's fingers) and winces with a 'catch' in breath, the test is considered positive.

Investigation:

Labs:

- Labs with **asymptomatic cholelithiasis** and **biliary colic** will be **normal**.
- **High WBCs**, and **elevated LFTs** may be helpful in diagnosis of **acute cholecystitis**, but normal values do not rule it out.



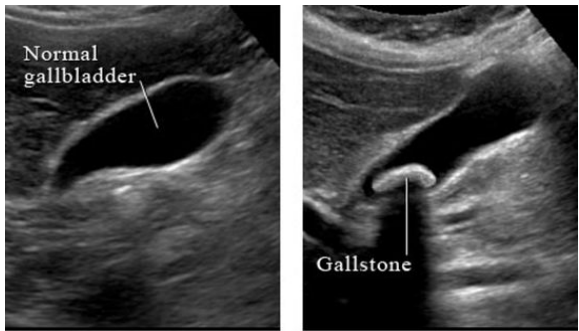
Test labs to order:

- **CBC** (to rule out infection and cholecystitis), It will be high in case of infection and cholecystitis.
- **LFTs: AST+ALT** (to know if there is any disease or viral infection in the hepatocyte itself), **Alkaline phosphatase, GGT, total bilirubin + direct bilirubin**¹⁹ to know:
 - a. if the patient has jaundice ²⁰ or not
 - b. what type of jaundice he has: obstructive or cholestatic
- **Amylase** (to rule out pancreatitis), U&E (urea and electrolyte), renal function test, and coagulation profile²¹

Imaging studies for all biliary cases:

US is the most sensitive and available method to detect biliary stones and HIDA²². Plain x-rays, CT scans ERCP are adjuncts²³.

What to do for a patient coming with pain: cannula "painkillers (1g paracetamol) and IV fluid (1L saline)" after 1 hour the patient is no longer tachypnic nor tachycardic → meaning the pain is relieved. If you examine his/her abdomen will be soft and lax. All the lab tests will be normal, so how to confirm your diagnosis? By ultrasound.

X-rays	CT	Ultrasound
<p>15% stones are radiopaque, porcelain GB may be seen. Air in biliary tree, emphysematous GB wall.</p> 	<p>for complications, ductal dilatation, surrounding organs. Misses 20% of GS. done only if diagnosis was uncertain. Denotes the wall thickening and the fluids around the GB also can show the distention</p> 	<ul style="list-style-type: none"> - 95% sensitive for stones, 80% specific for cholecystitis. It is 98% sensitive and specific for simple stones. - Wall thickening (>3 mm) <u>positive in (Cholecystitis)</u> - Pericholecystic fluid, sonographic Murphy's sign <u>positive in (Cholecystitis)</u>. - Dilated CBD (7-8mm) (<u>Positive in Choledocholithiasis and cholangitis</u>). - The acoustic shadow due to absence of reflected sound waves behind gallstone <p>Last portion of common bile duct is normally invisible, thus if seen == it is dilated !!</p> 

¹⁹ The direct bilirubin test provides an estimate of the amount of conjugated bilirubin present. Total bilirubin level (unconjugated plus conjugated bilirubin).

²⁰ Inspecting the sclera and skin color changes is not enough to find jaundice as it depends on the fairness of the patient skin tone and also dark skinned people has yellow sclera normally

²¹ For any future procedure

²² Cholescintigraphy or **Hepatobiliary IminoDiacetic Acid**

²³ ERCP is diagnostic and therapeutic, but used mostly to treat due to its side effects (therapeutic)

What do you need to know from **ultrasound** 3 things to look for:

1. presence of **stones**
2. is there any radiological signs of cholecystitis? "**wall thickening**"²⁴ of the gallbladder or **pericholecystic fluid**" (if present it indicate inflammation "cholecystitis" not gallstones)
3. **Dilation** of the biliary system

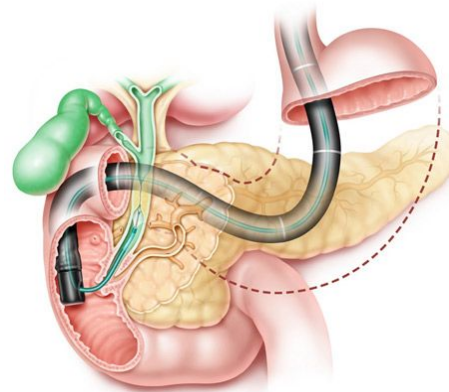
So in biliary colic (Cholelithiasis) :

1. presence of stones
2. no wall thickening
3. no dilation

Imaging studies (cont..)

ERCP²⁵

- We enter through the ampulla of Vater into the common bile duct.
- ERCP is **therapeutic not diagnostic**²⁶.
- **Never do if patient is having active pancreatitis, cholangitis, or when patient is hypotensive.**
- Provides radiographic and endoscopic visualization of biliary tree.
- Obstruction is visualized as a filling defect of contrast.
- Done only when CBD is dilated (if you can't prove dilation with US, **don't use it as diagnostic**) and elevated LFTs.
- **Complications include bleeding, perforation, pancreatitis the most common, cholangitis (all complications are fatal)**



IMPORTANT MCQs

patient 30 y/o (with all symptoms of biliary colic).

- What is the best option to confirm biliary colic or (presence of stones in the gallbladder)? **Ultrasound**
- What is the most sensitive for gallbladder stones (biliary colic)? **Ultrasound**
- The cheapest or the most available? **Ultrasound**
- أي سؤال يجيبكم بأي صيغة كانت جوابه **US** إلا إذا كان السؤال عن **biliary system**
- What is the most sensitive modality for "**BILIARY TREE SYSTEM**" stones "not the gallbladder"?
- **EUS (endoscopic ultrasound)** You can use regular US to check if the system was dilated, and we don't use the it to confirm the presence of stones because the stones might be invisible (because duodenum is on top of biliary tree, and it contains air which is not a good medium for the regular US waves to show the stones.
- **If not available use MRCP** (which is MRI picture which shows the biliary tract and the pancreas as a reconstructed image and removes other unneeded structures) is used, if stone present we do ERCP to remove it. if still there are multiple other stones we couldn't remove we do stenting. Then after sometime we do ERCP again !! it's a must.

Management:

- Historically cholithiasis was operated on emergently which increased mortality.
- Surgical consult is appropriate, and depending on the institution, either medicine or surgery may admit the patients for care. (elective surgery) And manage the condition until the time of the surgery be advising the patient to avoid fatty food.
- Get GI doctor involved early if suspect CBD obstruction.

Although the absence of symptoms, some people may want to perform cholecystectomy as a prophylactic for any future stone formation or inflammation!

The percentage of people who gets complications because of untreated symptoms (like pancreatitis or obstructive jaundice) and the people who gets complication because they weren't aware about there symptome is actually the same! So a prophylactic procedure will be useless and maybe harmful.

²⁴ Normal thickening of the gallbladder is 3mm

²⁵ Endoscopic Retrograde CholangioPancreatography.

²⁶ ERCP is diagnostic and therapeutic, but in case of gallstones its used to remove CBD stones

Surgical approaches: **IMPORTANT**

Non-febrile

Patient comes to ER with

- Typical biliary colic symptoms and history of recurrent episodes of biliary colic. (متعددة دائماً)
- Order labs (CBC, LFTs, E&U, coagulation profile) >> **All NORMAL**
- US: confirm presence of stones in gallbladder.
- US (3)Qs
 1. Presence of stones? Yes
 2. Thickened wall/ peri-cholecystic fluid ? **NO**
 3. Dilated biliary tree? No



In ER:

- Given pain killers and rehydrated (IV saline) (symptoms will subside completely)

How to treat him?

- The patient may be tachycardic and tachypneic, and it is because of pain, once you give the patient painkillers he will be back to normal.
- You advise him to do cholecystectomy (**electively**), waiting won't increase risk as 80% are asymptomatic.

Febrile (cholecystitis)

Patient comes to ER with:

- Same symptoms, BUT **febrile** (maybe perforation)
- Order labs : (CBC, LFTS, E&U, coagulation profile)>> **CBC: ↑ WBC (inflammation)**
- Suspecting cholecystitis
- US (3)Qs
 1. Presence of stones? Yes
 2. Thickened wall/ pericholecystic fluid ? Yes
 3. Dilated biliary tree? No

In ER:

- Given pain killers and rehydrated (IV saline) (symptoms won't subside completely there will still be tenderness).
- **Admit patient (acute cholecystitis).**

At this stage you think of your "surgical window"²⁷

<p>E.g. 2 days (within surgical window)</p> <ul style="list-style-type: none"> - Gallbladder wall thickness is 5mm , it is not extremely inflamed >>> surgery can be done with minimum bleeding 5ml or non. - ↑ WBC (15) - Schedule elective surgery - 	<p>E.g. 4 days (beyond surgical window)</p> <ul style="list-style-type: none"> - gallbladder wall thickness is 10mm, GB is too inflamed to operate²⁸. there will be a lot of bleeding 100-200 ml. - Conservative management (NPO, IV fluid, Antibiotic,Painkiller) until stable, how to know? - By checking daily for improvement of 5 clinical features and 1 laboratory feature - Clinical: Tenderness, Tachycardia, Tachypnea, fever, Tolerating food orally - Lab: ↑↑ WBC (20) - Now send patient home with antibiotic for 6-8 weeks, so all the inflammation heals then - Schedule an semi-elective surgery.- 	<p>If no improvement of previous case of pt came after 6 days (way beyond surgical window)</p> <ul style="list-style-type: none"> - Gallbladder wall is 15mm. - More tachycardia - More tachypnea - ↑↑↑WBC (22) - Higher fever. - Rebound tenderness → peritonitis - Emergency surgery²⁹- مجبر احاك لابطل if we waited patient may die
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²⁷it's time frame from the beginning of the inflammation till presentation where it's the safest to do the surgery varrieng upon your experience and the institute you work in

²⁸ you won't differentiate cystic duct from cystic artery, everything is friable and erythematous

²⁹ Surgery most likely will convert to open , maybe won't be even able to remove gall bladder and only remove necrotic tissue

Further Inpatient Care :

Open cholecystectomy	Laparoscopic cholecystectomy
can be performed after the first 24-48h or after the inflammation has subsided. Unstable patients may need more urgent interventions with ERCP, percutaneous drainage, or cholecystectomy.	very effective with few complications (4%). 5% convert to open. In acute setting up to 50% open.

Cholecystitis

It's an inflammation of the gallbladder secondary to calculi

Characteristics	<ul style="list-style-type: none"> • Continuous pain. • Fever. • High WBC count due to inflammation. • Murphy's sign on examination. • Distended gallbladder and thickening of the wall on Ultrasound due to inflammation.
Complications of acute cholecystitis Dr skipped it	<ul style="list-style-type: none"> • Hydrops: Obstruction of cystic duct followed by absorption of pigments and secretion of mucus to gallbladder (White bile) - There may be round tender mass in RUQ- Urgent cholecystectomy is indicated • Empyema of gallbladder: Pus-filled GB due to bacterial proliferation in obstructed GB. Usually more toxic with high fever Emergent operation is needed. • Perforated gallbladder: pericholecystic abscess is present (up to 10% of acute cholecystitis) <ul style="list-style-type: none"> ○ Percutaneous drainage in acute phase • Biliary peritonitis due to free perforation (Require emergent laparotomy) • Chronic perforation of adjacent viscus (cholecystoenteric fistula) <ul style="list-style-type: none"> ○ Air seen in the biliary tree ○ The stone can cause small bowel obstruction if large enough (gallstone ileus) ○ Laparotomy is needed for extraction of the stone, cholecystectomy and closure of the fistula
Management	<pre> graph TD A[The patient should be admitted to the hospital] --> B[Stabilized.] B --> C[Given IV antibiotics and analgesics.] C --> D[if the patient did not respond to the treatment] C --> E[If the patient responded to the treatment] D --> F[Urgent surgery is required, because gangrenous cholecystitis may develop] E --> G[elective cholecystectomy is done after 6 weeks so that the inflammatory process cools down.] </pre>

when stones pass they'll either cause:

- acute pancreatitis if it lodges in ampulla of vater.
- cholangitis if accompanied by infection.
- Obstructive jaundice if it lodges in CBD



Cholangitis

Infection of the biliary tree .

Characteristics	<p>Charcot's triad :</p> <ul style="list-style-type: none"> - RUQ pain. - Jaundice. - Fever. <p>Reynolds pentad³⁰: Charcot's triad + septic shock and altered mental status</p>
Management	<ul style="list-style-type: none"> - No ERCP, if the patient was patient is hypotensive on inotropes , if sedated to do ERCP BP will drop . - Percutaneous transhepatic cholangiography (PTC)³¹; by placing a percutaneous stent to drain inflammation and infection (pus) - Patient doesn't need inotropes anymore → ERCP → Cholecystectomy (within the same admission)

Obstructive Jaundice

- When obstructive jaundice occurs it means that one of the stones moved down to the common bile duct and caused an obstruction which will obstruct the flow of bile from the liver to the small bowel.
- It can also be a mass (pancreatic head) that's causing the obstruction.

Symptoms & Signs	<ul style="list-style-type: none"> • Jaundice: <ul style="list-style-type: none"> - Look for it in the sclera³² (specially dark skinned people and during the sunlight), skin and mucosa - The bilirubin level in the blood is at least double the normal (Upper normal level is 17 mmol) • Pale stool (could be delayed up to 3 days) • Dark urine (first sign) • Itching (due to accumulation of bile salts under the skin)
Differential Diagnosis	<ul style="list-style-type: none"> • Cancer (obstruction develops gradually), Painless³³ obstructive jaundice with significant weight loss. <ul style="list-style-type: none"> ○ Head of pancreas cancer ○ ampulla of Vater cancer ○ Distal CBD cancer
Investigations	<p>↑Total bilirubin, 80% is direct</p> <p>↑ alkaline phosphatase</p> <p>↑ GGT Gamma glutamyl transferase</p> <ul style="list-style-type: none"> - These 2 enzymes are the most sensitive indicators, even if the US didn't show dilatation of CBD! <p>(obstructive pattern of obstructive jaundice)</p> <p>US 3 Q?</p> <ol style="list-style-type: none"> 1. Presence of stones? Yes 2. Thickened wall/ peri-cholecystic fluid ? No

³⁰ serious infection of the biliary system

³¹ Like any other pus collection needs drainage.

³² Inspecting the sclera and skin color changes is not enough to find jaundice as it depends on the fairness of the patient skin tone and also dark skinned people has yellow sclera normally

³³ Unlike stones which cause **PAINFUL** obstructive jaundice + young patient and acute onset in stones, old and progressive (e.g. noticed by family members) in cancer



3. Dilated biliary tree? Yes, secondary to the obstruction (the bile accumulates at a higher level and expand the duct).

Then ERCP³⁴ to remove the stone as part of management.

Other Complications:

- Sepsis, Cholangitis
- Pancreatitis (80% of pancreatitis is due to stones)
- Perforation (10%)
- GS ileus (mortality 20% as diagnosis difficult).
- Hepatitis
- Choledocholithiasis

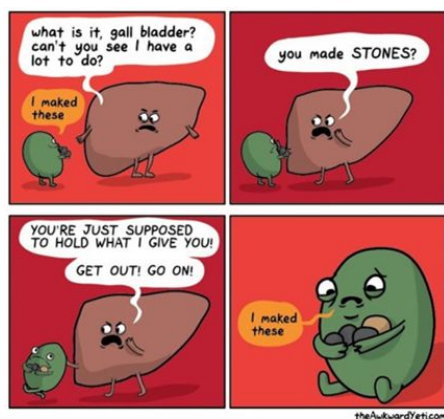
Prognosis:

- Uncomplicated cholecystitis has a low mortality.
- Emphysematous GB mortality is 15%
- Perforation of GB occurs in 3-15% with up to 60% mortality.
- Gangrenous GB 25% mortality.

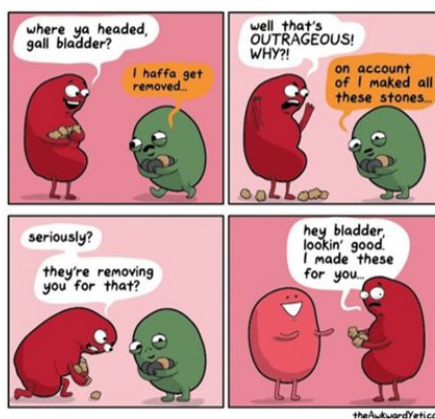
³⁴ If patient just had the CBD obstructed yesterday he may not have biliary tree dilatation just yet, so you don't have proof to perform such an invasive procedure with fatal complications like ERCP. instead you do Endoscopic ultrasound (EUS) (If EUS is not available do MRCP). EUS is done using an endoscope with an US probe, place the probe on ampulla of vater to visualize obstruction then replace probe by ERCP with the same endoscope.

Summary from doctors slide:

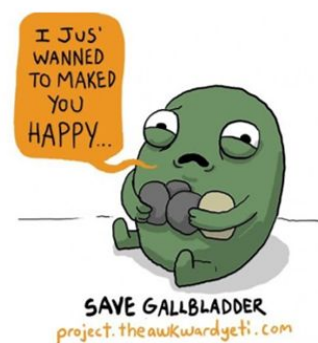
Complication	History	Examination	Blood tests
Biliary Colic	- Intermittent RUQ/epigastric pain (minutes/hours) into back or right shoulder - N&V	-Tender RUQ -No peritonism -Murphy's - -Apyrexial, HR and BP (N)	-WCC (N) CRP (N) - LFT (N)
Acute Cholecystitis	-Constant RUQ pain into back or right shoulder -N&V -Feverish	-Tender RUQ -Periotnism RUQ (guarding/rebound) -Murphy's + -Pyrexia, HR (↑)	-WCC and CRP (↑) -LFT (N or mildly (↑))
Empyema	-Constant RUQ pain into back or right shoulder -N&V -Feverish	-Tender RUQ -Peritonism RUQ -Murphy's + -Pyrexia, HR (↑), BP (↔ or ↓) -More septic than acute cholecystitis	-WCC and CRP (↑) -LFT (N or mildly (↑))
Obstructive Jaundice	-Yellow discolouration -Pale stool, dark urine -painless or associated with mild RUQ pain	-Jaundiced -Non-tender or minimally tender RUQ -No peritonism -Murphy's - -Apyrexial, HR and BP (N)	-WCC and CRP (N) -LFT: obstructive pattern bili (↑), ALP (↑), GGT (↑), ALT/AST (↔) -INR (↔ or ↑)
Ascending Cholangitis	Becks triad -RUQ pain (constant) -Jaundice -Rigors	-Jaundiced -Tender RUQ -Peritonism RUQ -Spiking high pyrexia (38-39) -HR (↑), BP (↔ or ↓) -Can develop septic shock	-WCC and CRP (↑) -LFT: obstructive pattern bili (↑), ALP (↑), GGT (↑), ALT/AST (↔) -INR (↔ or ↑)
Acute Pancreatitis	-Severe upper abdominal pain (constant) into back -Profuse vomiting	-Tender upper abdomen -Upper abdominal or generalised peritonism -Usually apyrexial, HR (↑), BP (↔ or ↓)	-WCC and CRP (↑) -LFT: (N) if passed stone or obstructive pattern ifstone still in CBD - Amylase (↑) -INR/APTT (N) or (↑) if DIC
Gallstone Ileus	- 4 cardinal features of SBO	-distended tympanic abdomen -hyperactive/tinkling bowel sounds	



1



2



3



Summary

- 80% of Cholelithiasis are asymptomatic.
- Symptoms of cholelithiasis include:
 - RUQ colicky pain radiating to the back and shoulders/Aggravated by fatty food and usually recurrent.
 - Most sensitive test for gallbladder stones in Ultrasound.
 - Most sensitive test for biliary tree system stones is Endoscopic ultrasound.
- Surgical approaches for cholecystectomy depend on the clinical condition of the patient/Presence of symptoms/Imaging studies/lab results.
- Gallstones are considered the most common cause of pancreatitis.
- Complications of gallstones include:
 - 1-Cholecystitis:
Continues RUQ pain/fever/high wbc/+Murphy sign/thickening of the gallbladder wall on US
 - 2-Obstructive jaundice:
Yellowish discoloration of the sclera /pale stool/dark urine
Investigations of obstructive jaundice:
 - Increase alkaline phosphatase
 - Increase Gamma glutamyl transferase
 - 3-Cholangitis:
Charcot's triad (RUQ pain/Fever/Jaundice)



Questions

1) 73-year old previously healthy man presents to the emergency room with several days of jaundice followed by 12 hours of RUQ pain and fever. He is mildly hypotensive. CT scan of the abdomen revealed dilation of the biliary tree. What is the most likely diagnosis?

- A. Cholecystitis
- B. Choledocholithiasis
- C. Cholangitis
- D. Cholelithiasis

2) The management of the previous case includes which of the following?

- A. Laparoscopic cholecystectomy
- B. Open cholecystectomy and T tube replacement.
- C. Open cholecystectomy and choledochojejunostomy.
- D. Fluid resuscitation, antibiotics, and ERCP.

3) Which of the following is the most sensitive radiological modality to detect biliary stones ?

- A. CT
- B. X-Ray
- C. US
- D. MRI

4) Risk factors for gallstones include all of the following except

- A. Obesity.
- B. Contraceptive pills.
- C. Sickle cell anemia.
- D. High protein diet.

5) What is the best modality to prove presence of stones in CBD?

- A. ERCP
- B. US
- C. MRCP
- D. CT

6) Positive Murphy sign is seen in which of the following?

- A. Cholecystitis
- B. Choledocholithiasis
- C. Cholangitis
- D. Cholelithiasis

Answers:

1:C 2:D 3:C 4:D 5:C 6:A