



## Biliary Obstruction & Biliary Stones

### Done By:

Abdulelah AlMutairi  
Abdullah AlAmmari

### Reviewed by:

Reema AlRasheed  
Omar AlRahbeeni

### Objective:

Not given by the doctor

### Color Index:

-Doctor's Notes -Surgery Recall -Doctor's Slides -Important -Extra

# Anatomy of gall bladder and biliary System.

## Biliary System:

Which consists of the liver, gallbladder, and bile ducts.

## Bile Ducts:-

- Right and Left hepatic ducts
- Common Hepatic Duct
- Cystic (Gallbladder Duct)
- Common Bile Duct

Right and left hepatic ducts emerge from the liver and join, forming the common hepatic duct.

The cystic duct emerges from the gallbladder and joins the common hepatic duct, therefor forming the common bile duct.

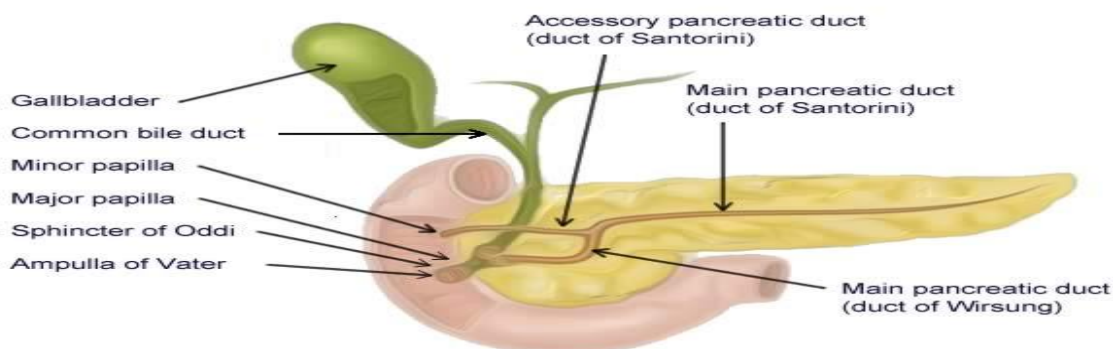
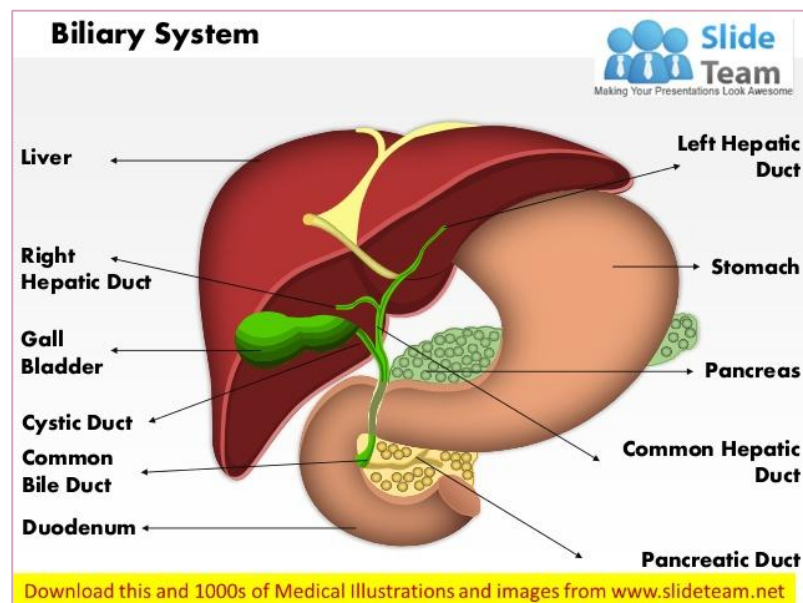
Later down its path, the common bile duct joins the main pancreatic duct at the head of the pancreas, opening into the second part of the duodenum via the ampulla of Vater (which is surrounded by the sphincter of Oddi).

## Gall Bladder

Divided into: Fundus, Body, Neck

## Blood Supply:

Cystic artery of the right hepatic artery  
Cystic Vein which drains into the portal vein.



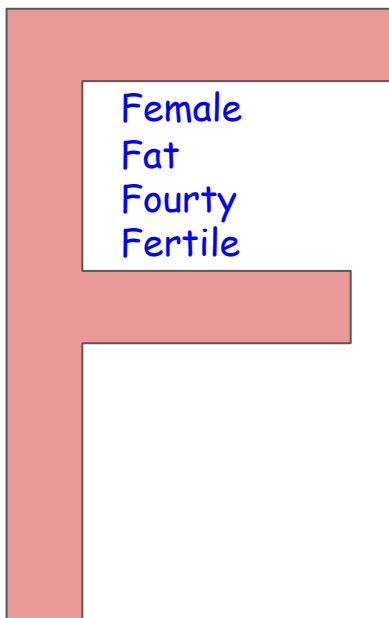
R.Hepatic + L.Hepatic  $\Rightarrow$  Common hepatic duct  
Common hepatic duct + Cystic duct  $\Rightarrow$  Common bile duct

# Epidemiology.

- The prevalence of gallstones is strongly influenced by two factors; age & gender.
- Gallstones may present at any age but **incidence markedly increases in those who are 40 y/o and above.**
- **Women are two to three times at higher risk of developing gallstones than men.**

## Risk Factors.

### The four F's



### Other Risk Factors:

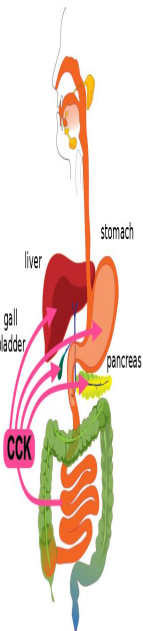
Fair skinned people  
Oral contraceptives  
Bile stasis  
Chronic hemolysis (pigment stones)  
Cirrhosis Infection  
Native American heritage  
Rapid weight loss/gastric bypass  
Obesity  
Inflammatory bowel disease (IBD)  
Terminal ileal resection  
Total parenteral nutrition (TPN)  
Vagotomy Advanced age  
Hyperlipidemia  
Somatostatin therapy

### Recall from GIT block physiology:

Liver produces 500-1000 ml (cc) → concentrated to 30 cc in gallbladder (by absorbing the water)..

When you eat fatty meal → cells in your duodenum → secrete Cholecystokinin (**CCK**) → as the name (kinin) indicates, this peptide hormone will travel through your bloodstream → going to your Liver, Gallbladder and Pancreas → (ينمغصون) contract to release the stored bile.

**IMAGINE!!** There is a stone in the neck of gallbladder that is obstructing the pathway □ more contraction to overcome the resistance □ more and more pain :(



# Classifications.



## Bile consists of:

- Lecithin
- Bile salts
- Phospholipids
- Other substances ..

Gallstones are conveniently classified into cholesterol, pigment stones, and of mixed composition.

### 1-Cholesterol gallstones:

*Account for 80% of all gallstones*

- Cholesterol is held in solution in bile by its association with bile salts and phospholipids in the form of micelles and vesicles.
- **Cholesterol will only crystallize into stones when the bile is supersaturated with cholesterol relative to the bile salt and phospholipid content.**
- In gallstone disease, the liver produces bile that contains a relative excess of cholesterol. Which promotes a lithogenic bile.

**Crystallization can be due to either of the following:-**

- **Relative deficiency of bile salts**
- **Relative excess of cholesterol**

**Pathogenic factors leading to production of lithogenic bile:**

- 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

### 2-Pigmented stones:

*Account for 15-20% of all gallstones. Composed of calcium bilirubinate.*

*\*Dark, multiple, and smaller in size.*

#### A-Black stones:

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.

#### B-Brown stones

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**

Black and brown pigment gallstones are morphologically, compositionally, and clinically distinct. Black stones form primarily in the gallbladder in sterile bile and are associated with advanced age, chronic hemolysis, alcoholism, cirrhosis, pancreatitis, and total parenteral nutrition. 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. Pubmed..

# History.

There are 3 clinical stages:

## A. Asymptomatic

- (60-80%) of cases are asymptomatic and are accidentally discovered by abdominal sonar.

## B. Symptomatic

- (40-20%) of cases develop symptoms

## C. With complications

- (20%) of symptomatic patients will develop complications.

### NOTE:

**Biliary colic** is the term used for the pain associated with the temporary gallbladder contraction against a stone.  
Or due to obstruction of the cystic or common bile duct, or stone migrating through those ducts.  
If not symptomatic, we call it cholelithiasis only..

### Notes:

- ❑ A history of RUQ pain with radiation to the back suggests biliary colic.
- ❑ If the pain associated empty stomach ⇒ rules out Gallstones (Most likely peptic ulcer or gastritis, it'll be in the left side)
- ❑ Most patients develop complication after symptoms, but sometimes complications arise without previous symptoms.
- ❑ Patients who have small stones are more prone to develop symptoms. (mobile)
- ❑ Morbidity and mortality are associated only with symptomatic patients.

# Symptoms of biliary colic.

## • Pain:

- Severe
- Colicky
- Located in the right upper quadrant
- Lasts from 1-5 hours

### Typical Symptoms:

- RUQ Pain
- Radiating to the back
- Colicky in nature (severe)
- Aggravated by fatty foods
- Associated with nausea and vomiting
- Recurrent pain

- ★ *Classically, the pain is in the right upper quadrant, however visceral pain and gallbladder wall distention may be only in the epigastric area. Once the peritoneum is irritated, pain localizes to RUQ.*
- ★ *A gallstone may impact the neck of the gallbladder or in the cystic duct giving biliary pain or cholecystitis.*
- ★ *Biliary pain usually occurs in the epigastrium and the right hypochondrium with radiation to the back.*



# Physical Examination.

- Vital signs and physical findings in asymptomatic cholelithiasis are completely normal.

## \*Symptomatic patients:

- Positive murphy sign
- Fever
- Tachycardia
- Hypotension
- Tachypnea

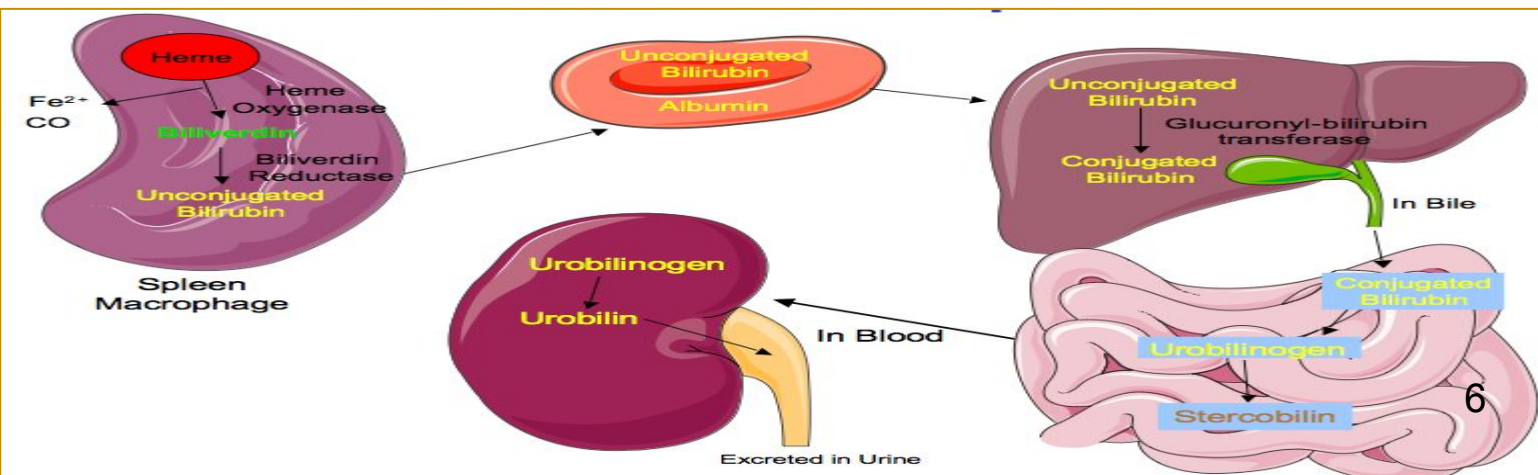
# Differential Diagnosis.

1. Abdominal Aortic Aneurysm
2. Appendicitis
3. Cholangitis, cholelithiasis
4. Diverticulitis
5. Gastroenteritis, hepatitis
6. IBD, MI, SBO
7. Pancreatitis, renal colic, pneumonia



- Jaundice ⇒ high bilirubin, either due to increase synthesis or decrease excretion.
- You can differentiate between obstructive jaundice because of stone and obstructive jaundice because of cancer by history. For example: cancer patient will have weight loss and the jaundice will be gradually and painless jaundice, while in stone patient will be painful jaundice.
- Gilbert syndrome is enzymatic defect in the liver that make it unable to produce bile.
- High indirect ⇒ prehepatic (hemolysis)
- High direct bilirubin ⇒ Post hepatic (obstruction)
- Hepatic cause both could be elevated

## *Direct(Conjugated) vs Indirect (Unconjugated)*



# Workup.

CBC, LFTS, Electrolyte, Kidney function (urea and creatinine), Coagulation profile ⇒ all could be normal,

less than 4 days of vomiting ⇒ most likely no kidney function or electrolyte disturbances

Give saline+Paracetamol initially to relieve the patient symptoms, so you can investigate براحتك

- Labs with asymptomatic cholelithiasis and biliary colic should all be normal.
- WBC, elevated LFTS may be helpful in diagnosis of acute cholecystitis, but normal values do not rule it out.
- Study by Singer et al examined utility of labs with chole diagnosed with HIDA, and showed no difference in WBC, AST, ALT Bilirubin, and Alkaline Phosphatase, in patients diagnosed and those without elevated WBC is expected but not reliable.
- In retrospective study, only 60% of patients with cholecystitis had a WBC greater than 11,000. A WBC greater than 15,000 may indicate perforation or gangrene.
- ALT, AST, AP more suggestive of CBD stones

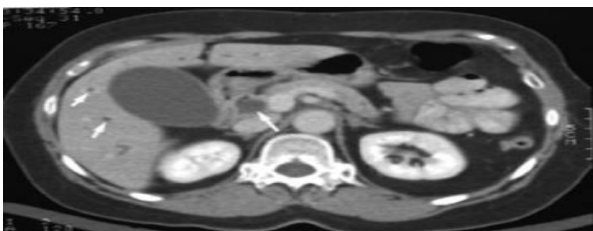
{High liver enzyme(ALT+AST) ⇒ diseased hepatocytes ⇒ Hepatitis is a differential}

- Amylase elevation may be GS pancreatitis.
- No obstructive jaundice without these 2;
  - Alkaline phosphatase + Gamma-glutamyl transpeptidase (cholecytic markers) will be significantly high in obstruction
  - In obstructive jaundice there will be high bilirubin mainly direct.

# Imaging Studies.

MCQ: What is the best, easiest and most sensitive & available ⇒ US

- US and Hida are the best. Plain x-rays, CT scans ERCP are adjuncts.
- X-rays: 15% stones are radiopaque, porcelain GB may be seen. Air in biliary tree, emphysematous GB wall.
- CT: for complications, ductal dilatation, surrounding organs. Misses 20% of GS. Get if diagnosis uncertain.



CT scan



Plain films

# Imaging Studies, Cont.

## Ultrasound:

- Ultrasound is 95% sensitive for stones, 80% specific for cholecystitis. It is 98% sensitive and specific for simple stones.
- **Wall thickening (2-4mm) ⇒ Inflammation (swollen), could be false positives!**
- **(when there is thickening of gallbladder, you have to admit عطلول).**
- Distension ⇒ Stone is obstructing the biliary system
- Pericholecystic fluid, sonographic Murphy's.
- Dilated common bile duct (7-8mm).
- Last portion of common bile duct is not visible normally ⇒ if it's dilated, you can see it..
- In US you might see: stone in the gall bladder, thickness of the bladder wall, dilatation of biliary system.
- Liver cirrhosis patients might have jaundice with No dilatation of the biliary system.(hepatic cause)..



Figure 1



Figure 2

If there is stones ⇒ but there is no symptoms 70% ⇒ dx: cholelithiasis  
 Stones + Pain ⇒ biliary colic ⇒ won't need surgery but if they want ⇒ elective surgery.  
 colicky pain (usually >6 h) or days+Nausea+ vomiting + febrile +(swollen wall in US + high WBCs) ⇒ acute cholecystitis ⇒ need admission and surgery  
 Severity: Cholelithiasis < biliary colic < acute cholecystitis < acute cholangitis (cholecystitis+infectin)

Acute Cholecystitis	Features	Biliary colic
Somatic pain	Nature of pain	Visceral pain
RHC	Location of pain	Epigastrium
> 3 hours	Duration of pain	< 3 hours
+ve	Murphy's sign	-ve
Present	Fever	Absent
Present	Leucocytosis	Absent

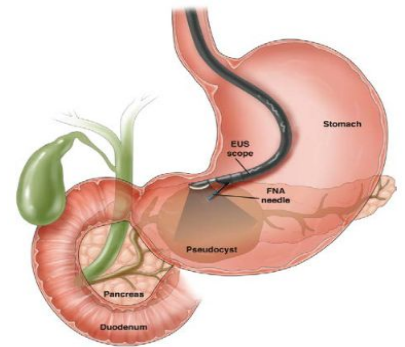


# Imaging Studies, Cont.

## Endoscopic ultrasound (EUS):

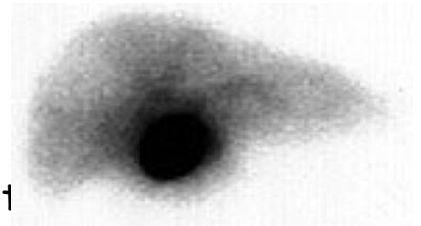
It is a minimally invasive procedure to assess digestive (gastrointestinal) and lung diseases. It uses high-frequency sound waves to produce detailed images of the lining and walls of your digestive tract and chest, nearby organs such as the pancreas and liver, and lymph nodes.

It is more sensitive.



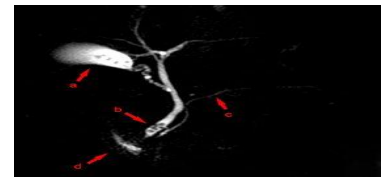
## HIDA scan: (Cholescintigraphy or Hepatobiliary Imino-Diacetic Acid scan).

- Hida scan documents cystic duct patency.
- 94% sensitive, 85% specific
- GB should be visualized in 30 min.
- If GB visualized later it may point to chronic cholecystitis
- CBD obstruction appears as non visualization of small intestine.
- False positives, high bilirubin.



## MRCP: (Magnetic resonance cholangiopancreatography):

it is a special type of magnetic resonance imaging (MRI) exam that produces detailed images of the hepatobiliary and pancreatic systems, including the liver, gallbladder, bile ducts, pancreas and pancreatic duct.



## ERCP: (Endoscopic Retrograde CholangioPancreatogram):

- ERCP is therapeutic only, not diagnostic (remove the stones).
- ERCP is not diagnostic because it is invasive (the patient mostly will develop complications) and we do it if there is high bilirubin and dilated of biliary system
- Provides radiographic and endoscopic visualization of biliary tree.
  - Do when CBD dilated and elevated LFTs.
  - Complications include bleeding, perforation, pancreatitis, cholangitis.
- ERCP is contraindicated in case of cholangitis.

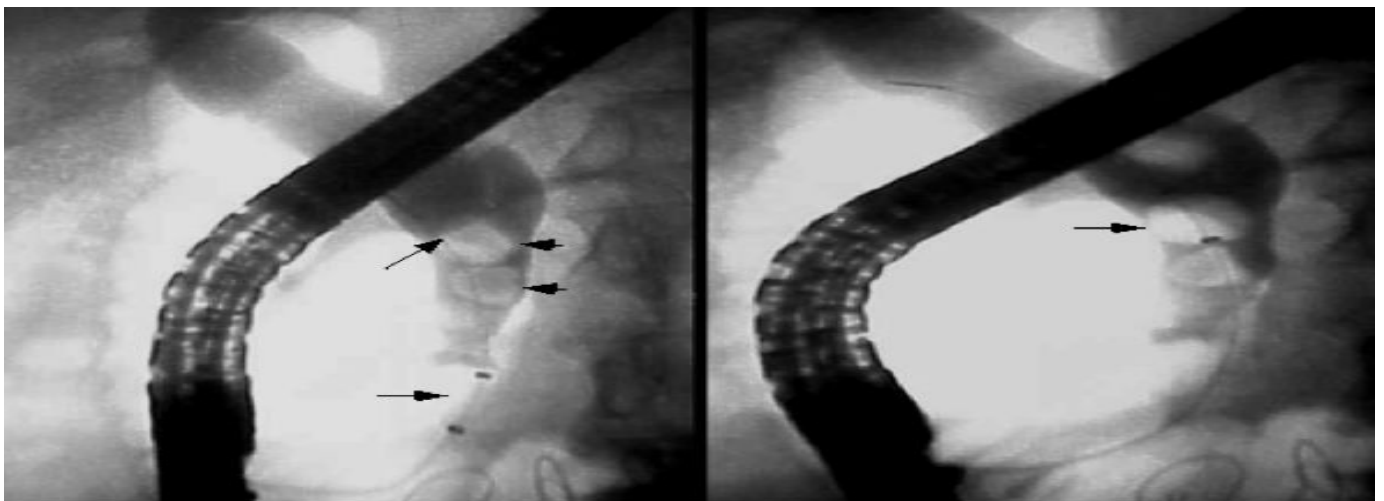


# Notes before going to treatment.

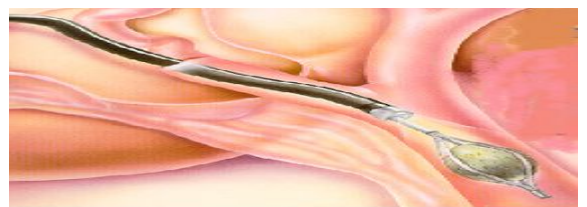
- Suspect GB colic in patients with RUQ pain of less than 4-6h duration radiating to back.
- Consider acute cholecystitis in those with longer duration of pain, with or without fever.
- Elderly and diabetics do not tolerate delay in diagnosis and can proceed to sepsis.
- After assessment of ABC's, perform standard IV, pulse oximetry, EKG, and monitoring. Send labs while IV placed, include cultures if febrile.
- Primary goal of ED care is diagnosis of acute cholecystitis with labs, US, and or Hida. Once diagnosed, hospitalization usually necessary. Some treated as outpatient.
- In patients who are unstable or in severe pain, consider a bedside US to exclude AAA and to assist in diagnosis of acute cholecystitis.
- Replace volume with IVF, NPO, +/- NGT.
- Administer pain control early. A courtesy call to surgery may give them time to examine without narcotics.
- Historically cholecystitis 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.
- Get GI involved early if suspect CBD obstruction.

## Treatment.

### Balloon extraction of common bile duct stones:



**Balloon extraction of common bile duct stones** Balloon extraction of common bile duct stones. Left panel shows a balloon catheter being threaded over a guidewire within the common bile duct (thin arrows). At least two gallstones are visible in the distal common bile duct (arrow heads), which is dilated. In the right panel, the balloon has been inflated above a gallstone (arrow), which permits the balloon to drag the gallstone out of the duct. Courtesy of Isaac Rajjman, MD.



# Treatment, Cont.

## Medications:

- Anticholinergics such as Bentyl (dicyclomine hydrochloride) to decrease GB and biliary tree tone. (20mg IM q4-6).
- Demerol 25-75mg IV/IM q3
- Antiemetics (phenergan, compazine).
- Antibiotics (Zosyn 3.375g IV q6) need to cover Ecoli (39%), Klebsiella(54%), Enterobacter(34%), enterococci, group D strep.

-the drugs that we always give in acute attack are: IV Fluids, Antibiotic and pain killer.

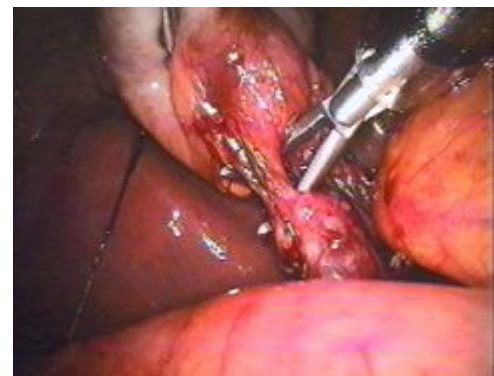
### Further Inpatient Care:

- Cholecystectomy can be performed after the first 24-48h or after the inflammation has subsided (approximately 6 weeks to subside).
- Unstable patients may need more urgent interventions with ERCP, percutaneous drainage, or cholecystectomy.
- Lap chole very effective with few complications (4%). 5% convert to open. In acute setting up to 50% open.

### Further Outpatient Care:

- Afebrile, normal VS
- Minimal pain and tenderness.
- No markedly abnormal labs, normal CBD, no pericholecystic fluid.
- No underlying medical problems.
- Next day follow-up visit.
- Discharge on oral antibiotics, pain meds.

## Laparoscopic Cholecystectomy





## Surgical indications (Cholecystectomy) > (3 Conditions)

<p>1-stones &gt; Typical symptoms.</p>	<p>2-when he has inflammation (us &gt; thickening of wall of gallbladder), he mostly becomes febrile (medications mostly is not effective).</p>	<p>3-the patient is worse and worse and worse (medication not effective never) &gt; the patient develops <u>peritonitis</u>.</p>
<p><u>Elective Surgery</u>, and when he develops attack (Tachycardia and tachypnea but afebrile), give him pain killer and rehydration in the time of attack and then do elective surgery.</p>	<p><u>Surgical window</u>: يعني ممكن نسوي عملية او لا، راح نعطي المريض فترة تقريبا 24 ساعة ونشوف اذا فيه نتيجة من الادوية نقول الحمد لله وما نسوي عملية في الوقت الحالي وتصير في وقت آخر أما لو ما في نتيجة من الأدوية فراح نضطر نسوي العملية.</p>	<p>You must do <u>surgery now</u>, مجبرا أخاك لا بطل</p>

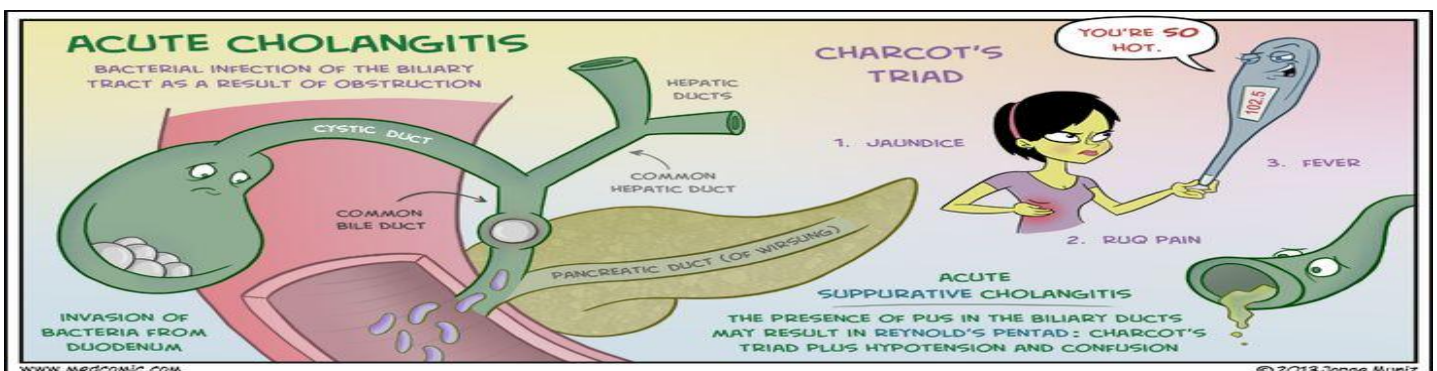
\*In case of **cholangitis**: the thing that you must to do in treatment is Drainage by using PTC (Percutaneous transhepatic cholangiography), (ERCP is contraindicated, we will use it after drainage to remove the stones but you can't use it before drainage of the pus).

After removing the stones > you have to do cholecystectomy in the same time.

بنفس الوقت لأن المرضى هذول معرضين بنسبة 40% انه ترجع لهم الحصوات فليش نرجعهم البيت

## Complications.

- Cholangitis, sepsis
- Pancreatitis
- Perforation (10%)
- GS ileus (mortality 20% as diagnosis difficult).
- Hepatitis
- Choledocholithiasis
- 80% of acute pancreatitis because of biliary colic.





# Prognosis.

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

## Surgical Recall;

How are symptomatic or complicated cases of cholelithiasis treated?

By cholecystectomy.

What are the indication for cholecystectomy in the asymptomatic patient?

Sickle-cell disease, calcified gallbladder, patient is a child.

What is the major feared complication of ERCP?

Pancreatitis.

What is the difference between cholecystitis and biliary colic?

Biliary colic has temporary pain; acute cholecystitis has pain that does not resolve, usually with elevated WBC's, fever, and sign of acute inflammation on U/S.

