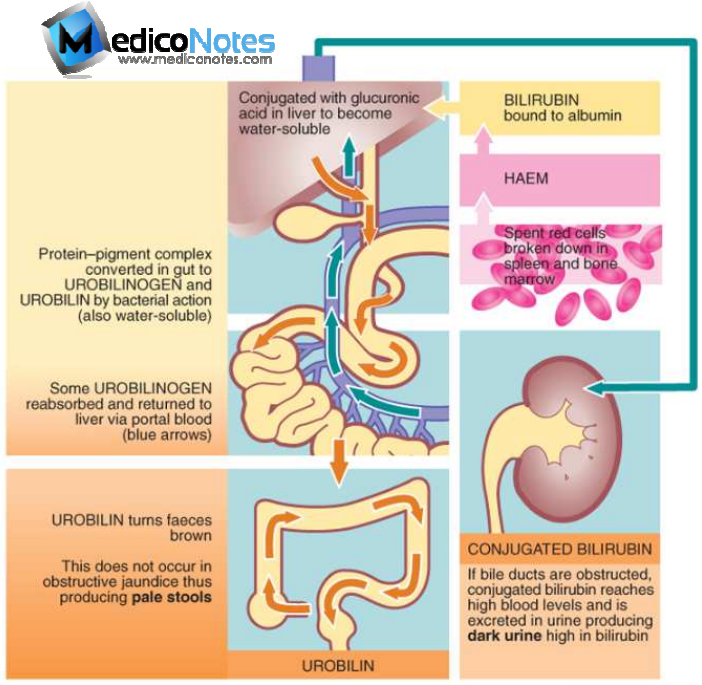
Approach to a jaundiced patient

THE NORMAL ENTEROHEPATIC CIRCULATION

- The **haem** component of spent red cells is normally broken down to bilirubin (mainly in the spleen and bone marrow), bound to albumin and transported to the liver. *This relatively stable protein-pigment complex is insoluble in water and is not excreted in the urine.*
- In the liver, the complex is split and the bilirubin conjugated with glucuronic acid which makes it water-soluble, before it is excreted into the bile canaliculi. *The normal concentration of both conjugated and unconjugated bilirubin in the blood is very low.*
- Bacterial action in the bowel converts conjugated bilirubin into colourless **urobilinogen** & pigmented **urobilin** which gives the brown colour to normal faeces.
- Some urobilinogen is reabsorbed, passing to the liver in the portal blood, and is then re-excreted in the bile. The entire process is called an **enterohepatic circulation**. A small amount of urobilinogen escapes into the systemic circulation and is excreted in the urine, *colouring it yellow*.

➔ **Bile acids** (**salts**) are synthesised in the liver from cholesterol-based precursors. These are excreted in bile to the duodenum and facilitate lipid digestion and absorption in the small intestine. About 95% of the bile acids are reabsorbed in the distal ileum and returned to the liver via the portal vein, only to be re-excreted in the bile →Thus both bilirubin and bile acids are involved in enterohepatic circulations.



PATHOPHYSIOLOGY OF OBSTRUCTIVE JAUNDICE

<u>If biliary outflow becomes obstructed :</u>

- Conjugated bilirubin is dammed back in liver from where it enters bloodstream and causes a gradual rise in plasma bilirubin.
- Once the plasma bilirubin level exceeds about 30 µmol/L, jaundice should be clinically detectable. Above 60 µmol/L, jaundice is obvious.

- **<u>Urine:</u>** Conjugated bilirubin, being water-soluble, is excreted in the urine, turning it **dark urine.**
- **<u>Feces:</u>** Diminished or absent excretion of bile into the bowel → less urobilin → causing **pale faeces**.
  Diminshed bile acids → **defective fat absorption**
  The two combine to give the stool a characteristic *'putty' colour.*
- <u>Skin:</u> Biliary obstruction also dams back bile acids, which raises their blood concentration leading to→ deposition in skin – causing **intense itching.**

➔ A consequence of poor dietary fat absorption is **malabsorption of vitamin K** → leading to decreased hepatic synthesis of clotting factors (prothrombin) .

- Impairment of blood clotting is not so great as to cause spontaneous haemorrhage or bruising but there is a significant risk of haemorrhage during surgery.
- Thus the patient's coagulation profile must be checked before any invasive procedure.
- The coagulopathy is corrected with parenteral vitamin K or, in the case of an urgent procedure, fresh frozen plasma.

Approach to a jaundiced patient

History-taking

➔ Change in colour of urine and stools, i.e. **dark urine & pale stools .**

- **<u>Gall stone disease</u>,** Enquiry about :
  - **E**pisodes of pain typical of gallstone disease,
  - **P**revious episodes of obstructive jaundice which resolved spontaneously,
  - **P**revious attacks of acute pancreatitis also suggest gallstone disease.
- **<u>Iatrogenic:</u> P**revious biliary tract surgery.
- **<u>Drug history:</u>** e.g : oral contraceptive pill-potential for intrahepatic cholestasis
- **<u>Risk factors for viral hepatitis:</u>** blood product transfusion, intravenous drug abuse, tattoos, shellfish ingestion, sexual exposure.
- **<u>Alcohol intake:</u>** if excessive, predisposes to pancreatitis & cirrhosis
- **<u>Symptoms suggestive of malignancy:</u>** anorexia, weight loss & non-specific upper GIT disturbance is common in carcinoma of the pancreas
- **<u>History of inflammatory bowel disease</u>**: predisposes to **sclerosing cholangitis** (rare).

Examination

<u>General examination:</u>

- **Jaundice :** is first detectable in the sclera of the eye.
- **Scratch marks :** In some cases of obstructive jaundice, the patient develops generalised itching (pruritus) and scratch marks
- **Stigmata of liver disease:** such as : spider naevi and liver 'flap', are only found when jaundice is caused by primary liver disease
- Enlarged left supraclavicular node (Virchow's node) or periumbilical nodule (Sister Mary Joseph's nodule) suggests an : **abdominal malignancy.**
- Jugular venous distention, a sign of right-sided heart failure, suggests : **hepatic congestion .**

<u>Local Abdominal Examination:</u> Abdomen should be examined for :

1- **Ascites:** Ascites in the presence of jaundice suggests either : 1- cirrhosis or 2- malignancy with peritoneal spread.

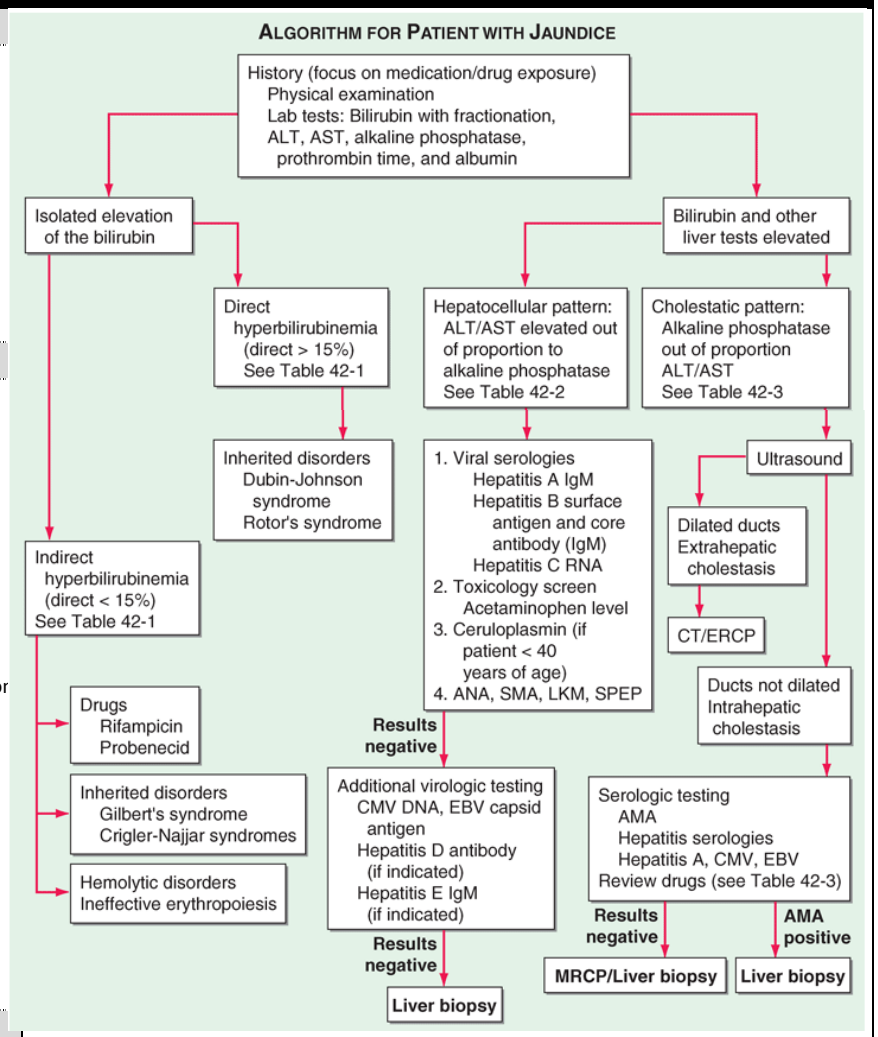
2- **Enlarged liver or spleen :**
   - An enlarged nodular liver may be caused by primary or secondary malignancy.
   - Splenomegaly & hepatomegaly is an important sign of chronic parenchymal liver disease (usually cirrhosis) & indicates portal hypertension

3- **Abnormal masses :** Obvious abdominal mass suggests malignancy.

4- **Palpable gall bladder** :
   - **Courvoisier's 'law'** : states that obstructive jaundice in the presence of a palpable gall bladder is not due to stone (and is therefore likely to be caused by tumour) :
     - In gall stone: - Gallstones cause chronic inflammation leading to: fibrosis of the gall bladder, which **prevents its distension**.
       - Intermittent stone obstruction leads to : thickening of the gall bladder wall, which **prevents its distension.**
     - In malignancy:
       - Progressive obstruction occurs over a short period and the gall bladder distends easily.

5- **Rectal Examination :** Pale stool is characteristic of obstructive jaundice.

➔ The urine should be inspected : - dark yellow or orange from the presence of conjugated bilirubin, and
- froths when shaken due to the detergent effect of bile acids.



Approach to investigation of jaundice , step by step as follows:

Laboratory :

1- <u>Urine tests :</u> Presence of substantial quantities of bilirubin in the urine which is established by: 1- clinic al or 2- bedside dipstick urine tests

2- <u>Blood tests</u> : →

A) Enzyme tests : To differentiate between : a **hepatocellular process** <u>&</u> **cholestatic process**

- <u>Patients with a hepatocellular process</u> : have a disproportionate rise in the aminotransferases compared to the ALP.
- <u>Patients with a cholestatic process</u>: have a disproportionate rise in the ALP compared to the aminotransferases.
- *The bilirubin can be prominently elevated in both hepatocellular & cholestatic conditions →, therefore, is not necessarily in differentiating.*

B) Assessment of liver function : All jaundiced patients should have additional blood tests, to assess liver function :

1- **Albumin level: -** Low albumin level suggests a chronic process such as cirrhosis or cancer.
   - Normal albumin level is suggestive of a more acute process such as viral hepatitis or choledocholithiasis

2- **Prothrombin time:**
   - An elevated prothrombin time indicates either 1- Vitamin K deficiency ,due to prolonged jaundice & malabsorption of vitamin K <u>or</u> 2- Significant hepatocellular dysfunction.

The failure of the prothrombin time to correct with parenteral administration of vitamin K indicates severe hepatocellular injury.

➔ **<u>By liver function tests , Obstructive jaundice is characterised by :</u>**
1- Elevated level of plasma bilirubin, predominantly in the conjugated form.
2- There is marked elevation of plasma ALP , which is derived from bile canaliculi.
3- The transaminases, derived from hepatocytes, are usually only mildly elevated

- When pattern of the liver tests suggests a **cholestatic disorder**, the next step is to determine whether it's :
  - Intra- hepatic cholestasis or
  - Extra-hepatic cholestasis.
- Distinguishing intrahepatic from extrahepatic cholestasis may be difficult. History, physical examination, and laboratory tests are often not helpful.
- The next appropriate test is an **ultrasound**.

Imaging :

A) <u>Hepatobiliary ultrasonography</u>, shows :

1- U/S can detect dilation of the intra- and extrahepatic biliary tree :
   Absence of biliary dilatation suggests: **intrahepatic cholestasis** / while Presence of biliary dilatation indicates: **extrahepatic cholestasis.**
2- Liver secondaries
3- Gall bladder abnormalities including stones.

➔ Although ultrasonography may indicate extrahepatic cholestasis, **it rarely identifies the site or cause of obstruction**.
➔ The distal common bile duct is a particularly difficult area to visualize by ultrasound because of overlying bowel gas.

Appropriate next tests include: CT, & ERCP.

B) <u>CT scanning</u> : CT scanning & MRCP are better than ultrasonography for :

1- Assessing the head of the pancreas and
2- Assessment distal common bile duct for a- choledocholithiasis , particularly when the ducts are not dilated b- small carcinoma .

C) <u>Endoscopy-diagnostic & therapeutic</u>

- **If ultrasound demonstrates dilated ducts→<u>ERCP</u>** is frequently next investigation (gold standard for identifying & ttt choledocholithiasis).
- **IF** ERCP failed → Percutaneous Transhepatic Cholangiopancreatography (PTC).

D) <u>Liver biopsy :</u>

- **If bile ducts are not dilated** (intrahepatic cholestasis)→ **1- Serologic testing** <u>in combination with</u> 2- **Percutaneous liver biopsy**

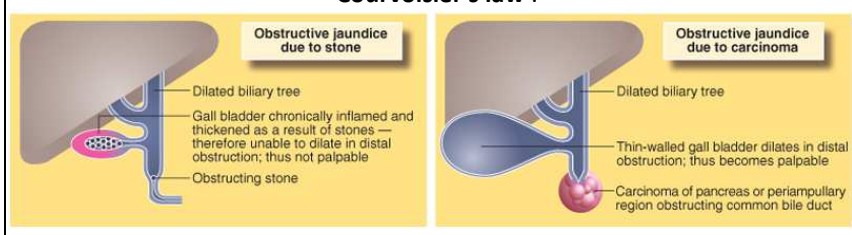
E) <u>Laparoscopy</u>, indications :

1- In patients unsuitable for percutaneous biopsy, or
2- Those who require visualisation of other organs,

- Laparoscopy may be used to visualise the liver directly and to obtain biopsy specimens from suspicious areas.

Occasionally, a firm diagnosis cannot be made before operation → abdominal exploration and frozen section histology + opportunity for treatment at the same time.

Courvoisier's law :



Conditions causing obstructive jaundice :