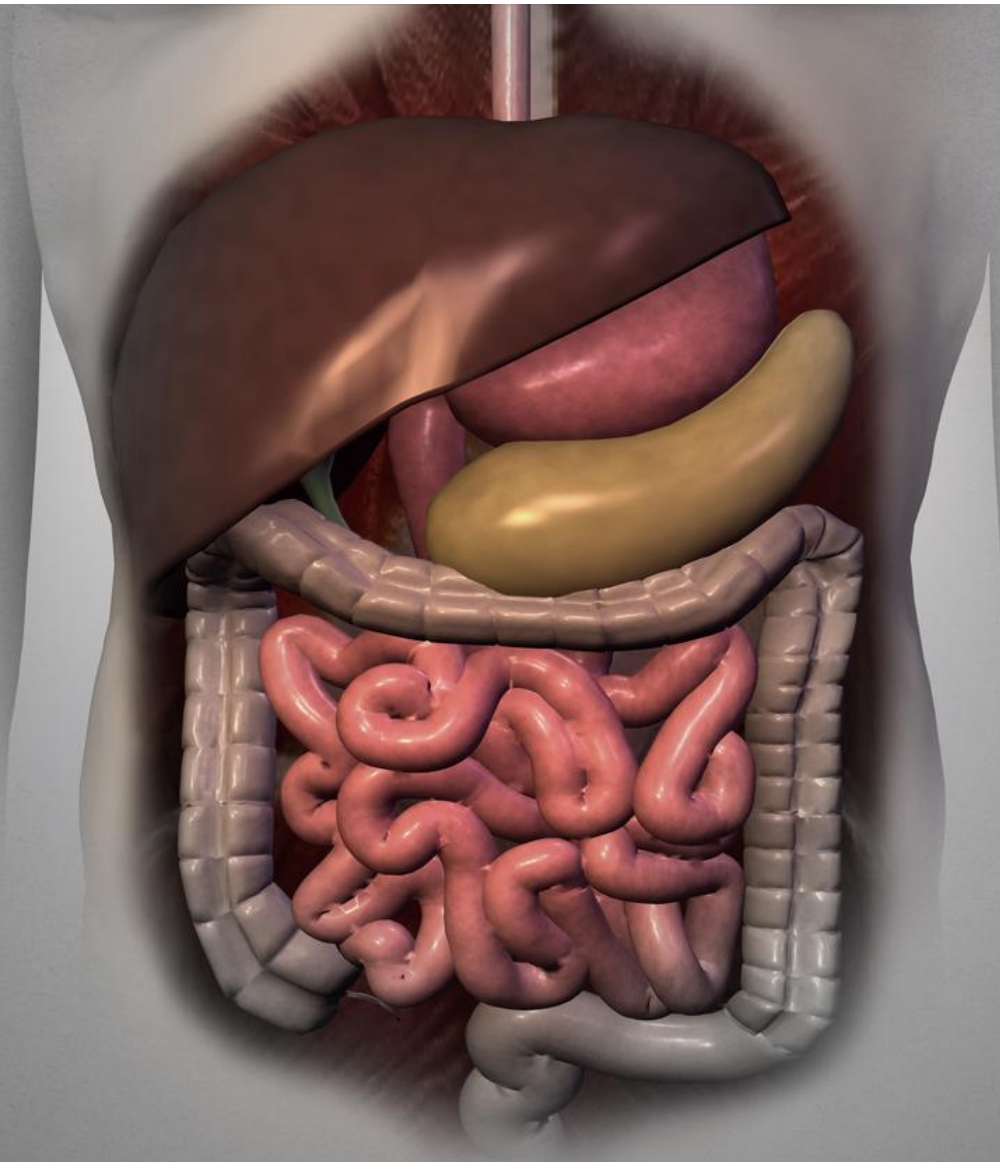

GIT Block

Physiology Team 431

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Pathogenesis and causes of Jaundice

Jaundice : **It is the yellow coloration of the skin, sclera, mucous membranes and deep tissues.**

Bilirubin has a yellow pigment
Normally in circulation not more than 0.5 mg/d

- **The usual cause is large quantities of bilirubin in the ECF, either free or conjugated bilirubin.**

*** The normal plasma concentration of total bilirubin is 0.3-1.2 mg/dl. (the doctor said it's important)**

- **when the concentration of total bilirubin in the plasma is greater than 2 - 2.5 mg/dl, The skin begins to appear jaundiced .(clinical)**
- **Bilirubin level from 0.5 to 2 mg/dl is called subclinical jaundice. (has jaundice but can't be seen)**

Classification of jaundice :

Before liver

1. **Prehepatic {hemolytic} jaundice: In hemolytic jaundice, the excretory function of the liver is not impaired. It is due to rapid increase in the destruction of the red blood cells (hemolysis), overwhelming the liver's ability to adequately remove the increased levels of bilirubin from the blood.**
   Excess RBC lysis is commonly the result of:
   i. **Autoimmune disease (that attacks the erythrocytes or bone marrow)**
   ii. **Hemolytic disease of the newborn (e.g. G6P dehydrogenase deficiency)**
   iii. **Rh- or ABO- incompatibility (are abnormal reactions that occur when a pregnant woman's blood type does not match the blood type of her baby. This may result in the destruction of the baby's red blood cells).**
   iv. **Structurally abnormal RBCs (Sickle cell disease)**
   v. **Breakdown of extravasated blood (blood extravasation : the leakage of blood from a vessel into tissues surrounding it).**

- **Therefore, the plasma concentrations of free bilirubin (hemobilirubin) rises to levels much above normal but it is not filtered through the kidney. (because it's free bilirubin(unconjugated))**

- The urine is free from bilirubin (acholuric jaundice).(unconjugated bilirubin is hydrophobic) .but there is urobilinogen in urine.

- Van der Bergh reaction is indirect.

  (Indirect-unconjugated)

- The stools appear darker than the normal color due to excessive stercobilin formation (stercobilin gives stool its brown color) (During the metabolism of the bile pigments)

Liver is working more (conjugating excessive unconjugated bilirubin)

2. Hepatic {hepatocellular} jaundice:

Hyper-bilirubinemia may be due to:

Impaired uptake of bilirubin into hepatic cells.

Disturbed intra cellular protein binding or conjugation.

Disturbed active secretion of bilirubin into bile canaliculi.

- The causes may be due to:
  - Damage of liver cells: e.g., viral hepatitis, drugs, chemical, alcohol, or toxins.
  - Genetic errors in bilirubin metabolism.
  - Genetic errors in specific proteins. (such as carrier proteins)
  - Autoimmune hepatitis.

- The diseased liver cells are unable to take all the unconjugated hemobilirubin formed, increasing its concentration in the blood.
- Also, there is intrahepatic biliary duct obstruction that leads to regurgitation of conjugated bilirubin to blood.
- Both types of bilirubin (conjugated & unconjugated) are present in blood in high concentration.
- Van den Bergh reaction is biphasic.
- Stools appear pale grayish in color due to deficiency of stercobilin.
- Urine appears dark brown due to filtration of excess conjugated bilirubin through the kidney.

♦ In this case, hyper-bilirubinemia is usually accompanied by other abnormalities in biochemical markers of liver function (why?

because the problem is in hepatic cells) Alanine amine transferase (ALT, SGPT) & Aspartate amine transferase (AST, SGOT). Will be elevated . (ALT & AST are liver function markers

3. Posthepatic {obstructive} jaundice :
Caused by an obstruction of the biliary tree.

1- Intrahepatic bile duct obstruction e.g.,:

- Drugs - Primary biliary cirrhosis - Cholangitis.

2- Extrahepatic bile duct obstruction e.g.,:

- Gall stones - Carcinoma of the head of pancreas (*imp.)

- Cholangiocarcinoma. (Outside cells)

- The rate of bilirubin formation is normal, bilirubin enters the liver cells and become conjugated in the usual way.
- The conjugated bilirubin formed simply cannot pass into small intestine and it returns back into blood.
- Van den Bergh reaction is direct. (because the hepatic cells is able to conjugate the bilirubin)
- In this type of jaundice, conjugated bilirubin is filtered through the kidney and appears in urine giving it dark brown color. (very dark = liquorish)
- Urine is free from urobilinogen (because it didn't go to the intestine to be conjugated)
- Stools are clay color due to absence of stercobilin.

Alkaline phosphatase & glutamate transferase are high in blood (indicators)

ALT & AST are increased but not to a significant extent

Summary

What is jaundice?
It is when bilirubin is formed more rapidly than it can be excreted leading to its accumulation in blood. Clinically, patients' skin, sclerae and mucous membranes appear *yellowish*.

What causes jaundice?

There are 3 different ways:
-**Prehepatic**: Problem occurs *before* the liver (excessive breakdown of RBCs resulting in the liver being presented with more bilirubin than it's capable of excreting)

- **Van der Bergh reaction is indirect.**

-**Hepatic**: problem is *in* the liver (The diseased liver cells are unable to take all the unconjugated hemobilirubin formed e.g. impaired conjugation)

- **Van der Bergh reaction is biphasic.**

-**Posthepatic**: problem occurs *after* the liver (e.g. obstruction; gallstones)

- **Van der Bergh reaction is direct.**

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Questions

1. Increased levels of serum bilirubin is known as:
A. Sprue.
B. jaundice
C. cholestasis

2. One of the causes of jaundice is:
a) Hypotension
b) Increase fatty food intake
c) Liver cirrhosis
d) Inflammatory bowel disease.

3. Which one of the following feature is commonly seen in cases of carcinoma of the head of pancreas?

A. obstructive jaundice

B. thrombosis of mesenteric artery

C. heamolytic anemia

4. Van der Bergh reaction in posthepatic jaundice is :

A. Biphasic

B. Direct

C. Indirect

5. Obstructive jaundice:

a) Results from excessive destruction of the RBCs.

b) Involves excretion of urine having a normal color.

c) Involves excretion of stools darker than normal.

d) Causes excess fat loss in the stools.

6- In hepatic jaundice:

a) Both haemobilirubin & cholebilirubin blood levels are decreased.
b) The liver functions are depressed & the plasma albumin level is decreased.
c) The urine colour is normal while that of the stools is darker than normal.
d) Fat digestion & absorption are not affected.

Answers :

B

C

A

B

D

B