Manifestations of liver and biliary disease

Jaundice, Hepatic Encephalopathy, Edema and Emaciation , Diarrhea and Constipation , Photosensitization, Hemorrhagic diathesis , Abdominal pain , Alteration in the size of the liver, Displacement of the liver ,and Rapture of the liver.

1-Jaundice:

Jaundice or icterus is characterized by the yellow discoloration of unpigmented skin, mucosal and conjunctival membranes, As well as membranes over the sclera and is caused by elevated blood bilirubin concentrations. Jaundice is classified into three categories depending on its etiology: **prehepatic or hemolytic, hepatic or hepatocellular, and posthepatic or cholestatic**.

PREHEPATIC or HEMOLYTIC JAUNDICE

Hemolytic jaundice is caused by massive intravascular or extravascular hemolysis resulting in the release of red blood cell hemoglobin. The breakdown of the increased amounts of hemoglobin results in elevated concentrations of unconjugated (or indirect) bilirubin, which needs to be converted into conjugated (or direct) bilirubin by the liver before being excreted through the biliary system.

Hemolytic jaundice is common in animals and may be associated with bacterial toxins, invasion of erythrocytes by protozoa or viruses, inorganic and organic poisons, and immunologic reactions.

1- Diseases in which bacterial toxins cause intravascular hemolysis are bacillary hemoglobinuria of cattle and leptospirosis,.
2- The common protozoan and viral diseases in which hemolysis occur include babesiosis, anaplasmosis, and equine infectious anemia.
3- Chronic copper poisoning, selenium poisoning in sheep, phenothiazine poisoning in horses, pasturing on rape and other cruciferous plants, and bites by snakes are other common causes.
4- Postparturient hemoglobinuria has an uncertain etiology but has been attributed to a deficiency of phosphorus in the diet and the feeding of cruciferous plants.
5- Isoimmunization hemolytic anemia of the newborn is caused by animmunologic reaction between the sensitized cells of the newborn and antibodies in the colostrum of the dam.
6- calves that drink large quantities of cold water (water intoxication) has been associated with a sudden drop in plasma osmolarity . Lower plasma osmolarity would result in a shift of

water into red blood cells and could result in a burst of erythrocytes in severe cases.

- ❖ Prehepatic or hemolytic jaundice is characterized by a moderate degree of yellowing of the mucosae.
- ❖ Although both intravascular and extravascular hemolysis can cause hemolytic jaundice, and hemoglobinemia.
- ❖ hemoglobinuria are only observed with intravascular hemolysis.
- ❖ An extravascular destruction of erythrocytes (anaplasmosis), does not result in the release of free hemoglobin into plasma or urine.

HEPATIC OR HEPATOCELLULAR JAUNDICE

Hepatocellular jaundice is the result of impaired capacity of the liver to conjugate indirect to direct bilirubin, which is required for excretion of bilirubin with bile.

The cause may be any of those diffuse diseases of the liver that cause degeneration of hepatic cells **e.g.**

- virus hepatitis.
- Toxic hepatitis (phosphorus, arsenic).
- -Infectious hepatitis (salmonell., leptosp., listeriosis and inf. Eq. anaemia).
- -Parasitic hepatitis (Massive liver fluke. Migration of ascaris larvae).
- Nutritional hepatitis (Deficiency of cysteine and thiamine & Methionin deficiency
- Congestive hepatitis.
- Swelling and edema in the liver caused by inflammation can result in a mechanical obstruction of the biliary flow within the liver.
- Mechanical stasis of the biliary flow can also be caused by fibrous tissue constriction and obliteration of the small biliary canaliculi after hepatitis.

C) Post hepatic causes: (Obstructive)

In causes of obstruction of bile duct by

- calculi,
- Fasciola
- tumors
- abscess pressing on the bile duct and causing its obstructing.

Obstruction is usually complete and results in the disappearance of bile pigments from the feces. Serum concentrations of conjugated bilirubin rise, causing a marked elevation of total bilirubin in the serum.

CLINICAL FINDINGS

The staining of jaundice is caused by staining of tissues, especially elastic tissue, which makes it best detected clinically in the sclera.

CLINICAL PATHOLOGY

- The levels of bilirubin in blood affect the intensity of the jaundice.
- The levels of bilirubin in obstructive form are 10 times higher than those commonly seen in hemolytic anemia.
- Differentiation between of jaundice with **impaired bile flow and jaundice without impaired bile flow** by the examination of the urine for the presence of bilirubin and urobilinogen and the determination of the relative amounts of direct(conjugated) and indirect (unconjugated) bilirubin present in the serum.

The kidney does not excrete indirect bilirubin, which has not passed through hepatic cells,, so that in hemolytic jaundice, the indirect bilirubin content of the serum is markedly increased and although the urine contains an increased amount of urobilinogen, no bilirubin is present.

In those cases in which jaundice is caused by impairment of bile flow there is a marked increase in the serum level of conjugated (direct) bilirubin, and the bilirubin content of the urine is greatly increased. The amount of urobilinogen varies depending on whether any bilirubin reaches the intestine to be metabolized to urobilinogen and reabsorbed. In complete extrahepatic biliary obstruction urobilinogen is not present in the urine.

2- **Hepatic Encephalopathy** : Hepatic encephalopathy is defined as the occurrence of neurologic signs caused by neurotoxic substances in the blood that are normally detoxified by the liver.

Typical signs include the following:

• Dullness

• Head pressing

• Compulsive walking

• Ataxia

• Muscle tremors and weakness

• Central blindness

• Hyperexcitability

• Convulsions

Many factors, including hypoglycemia and failure of normal hepatic detoxification mechanisms, leading to the accumulation of excess amino acids and ammonia, If the hepatic damage occurs more slowly, the hypoglycemia is less marked and less precipitous. With persistent **hypoglycemia,** structural changes may occur in the brain (hypoglycemic encephalopathy).

High blood levels of ammonia occur in pyrrolizidine poisoning in sheep, leading to development of spongy degeneration in the brain and the clinical signs of hepatic encephalopathy. In horses the most common cause of hyperammonemia and encephalopathy is a depression of hepatic function caused by acute or chronic liver disease. In cattle severe hepatic lipidosis (with hepatic lipid concentration of 30% and higher) has been associated with hepatic encephalopathy and liver coma.

3: **Edema and Emaciation:** Failure of the liver to anabolize amino acids and protein during hepatic insufficiency is manifested by tissue wasting and a fall in plasma protein. This may be sufficiently severe to cause edema because of the lowered oncotic pressure of the plasma. Hepatic edema is not usually very marked and is manifested most often in the inter mandibular space (bottle jaw).

4- **Diarrhea and Constipation:** In hepatitis, hepatic fibrosis, and obstruction or stasis of the biliary system, the partial or complete absence of bile salts from the alimentary tract deprives it of the laxative and mildly disinfectant qualities of these salts. This, together with the reflex effects of acute hepatitis, causing anorexia, vomiting in some species, and constipation with attacks of diarrhea. The feces are pale in color and, if there is present amount of fat in the diet, there is steatorrhea.

5-PHOTOSENSITIZATION

Photosensitization is caused by the accumulation of photosensitizing substances in the skin, resulting in the local irritation of unprotected, unpigmented skin after exposure to sunlight. Phylloerythrin, a breakdown product of chlorophyll in the alimentary tract, is excreted in the bile. In hepatic or biliary insufficiency excretion of these substances is retarded and photosensitization occurs.

6- **Hemorrhagic diathesis** results in severe diffuse diseases of the liver this could be attributed to deficiency in the prothrombin formation resulting in prolongation of clotting time of the blood. Deficiencies of fibrinogen and thromboplastin also occur. Prothrombin and other factors in the Prothrombin complex depend upon the presence of vitamin K for their formation and an absence of bile salts from the intestine retards the absorption of this fat-soluble vitamin.

7- Abdominal pains: Two mechanisms cause the pain in diseases of the liver:

a- Distension of the organ with increased tension of the capsule(acute swelling of the liver occurs as a result of engorgement with blood in congestive heart failure and in acute inflammation).
b- Lesions of the capsule (Inflammatory and neoplastic lesions of the capsule or of the liver parenchyma just beneath the capsule cause local irritation to its pain end organs.

The pain is usually subacute, causing abnormal posture، particularly arching the back, and disinclination to move.

8-Alteration in size of the liver: Great variation in the size of the liver is often seen at necropsy, but clinical detection is not easy unless the liver is grossly enlarged. This is most likely to occur in advanced congestion of the liver caused by congestive heart failure, in some plant poisonings in horses, and when multiple abscesses or neoplastic metastases occur. In acute hepatitis the swelling is not sufficiently large to be detected Clinically.

9-Displacement of the liver: The liver may be displaced from its normal position and protrude into the thoracic cavity through a diaphragmatic hernia, causing respiratory distress and abnormal findings on percussion of the chest.

10-Rupture of the liver occur usually as a result of trauma.

Teats are "burned" and painful

Burned" muzzle, discharges from inflamed eyelids.

The sclera or "white of the eye" is yellow or icteric, an indication that liver damage may be present.

Multiple abscesses in the calf liver as a result of an umbilical infection

Echinococcosis E.granulosus in the liver cysts in the liver (Right)
parasitic lesion &mineralization sheep liver (left)