Introduction

Chronic liver disease is a major health problem in Third World countries and is responsible for major burden of disease presenting to hospitals. Liver disease in pediatrics is one of the most significant causes of morbidity and mortality in this age group and includes a broad spectrum of disorders such as infections, developmental abnormalities, metabolic and neoplastic disorders that finally result in hepatic dysfunction and cirrhosis ***(Monajemzadeh et al., 2009).***

Among all the extrahepatic manifestations of liver diseases, the cutaneous manifestations are the most common. In addition, they are easily recognizable and may provide the first clues of liver disease allowing for early diagnosis and therapy. Dermatological manifestations occupy a central place and at times point to etiology of disease ***(Ghosn and Kibbi, 2008).***

Hepatobiliary disease can cause cutaneous manifestations in several ways; liver disease may cause skin changes, the skin and liver may be involved by the same pathologic process, skin disease may cause liver.

Many liver diseases associated with ocular manifestations, Wilson's disease or hepatolenticular degeneration is a disorder affecting the basal ganglia with pathological changes in liver and

in many instances associated with certain ocular manifestations. The most common and characteristic ophthalmic finding in the disease is the Kayser-Fleischer ring in the cornea. The other classic ophthalmological manifestation of Wilson's disease is the sunflower cataract, which was first described ***(Emerick et all 999).***

Hepatitis C virus infection has been associated with several eye disorders. Keratoconjunctivitis sicca (dry eyes) is part of Sjogren's syndrome. Mooren's ulcer is a rapidly progressive, painful ulceration of the cornea ***(Remoroza and Bonkovsky, 2003).***

Also, Alagille syndrome, a dominantly inherited disorders of variable expressivity characterized by paucity of the interlobular bile ducts manifested as cholestasis butterfly vertebrae, characteristic faces, renal diseases and characteristic ophthalmological features, that is posterior embryotoxon ***(Emerick et all 999).***

Thus the possibility of chronic liver diseases may not be excluded by clinical examination alone. So, objective eye assessment should be carried out, when possible in many circumstances ***(Haris, et al, 1999).***

Aim of the Essay

The aim of the work us to discuss different types of ocular manifestation in children with chronic liver disease.

Liver Anatomy

The liver is a vital organ of vertebrates and some other animals. In thehuman it is located in the upper right quadrant of the abdomen, below thediaphragm. The liver has a wide range of functions, including detoxification of various metabolites, protein synthesis, and the production of biochemicalsnecessary for digestion ***(Abdel-Misih et al., 2010).***

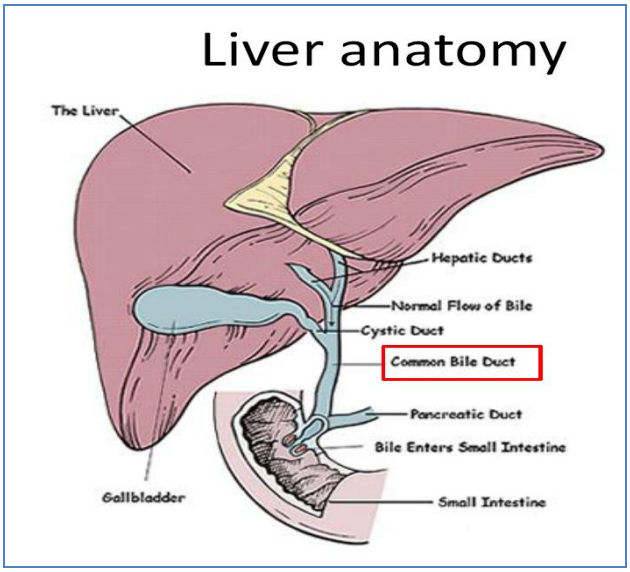

Fig. (1): Liver anatomy ***(Abdel-Misih et al., 2010).***

The liver is a gland and plays a major role in metabolism with numerous functions in the human body, including regulation of glycogen storage, decomposition of red blood cells, plasma protein synthesis, hormoneproduction, and detoxification. It is an accessory digestive gland and

produces bile, an alkaline compound which aids in digestion via theemulsification of lipids. The gallbladder, a small pouch that sits just under the liver, stores bile produced by the liver. The liver's highly specialized tissueconsisting of mostly hepatocytes regulates a wide variety of high-volume biochemical reactions, including the synthesis and breakdown of small and complex molecules, many of which are necessary for normal vital functions. Estimates regarding the organ's total number of functions vary, but textbooks generally cite it being around 500 ***(Berg et al., 2010).***

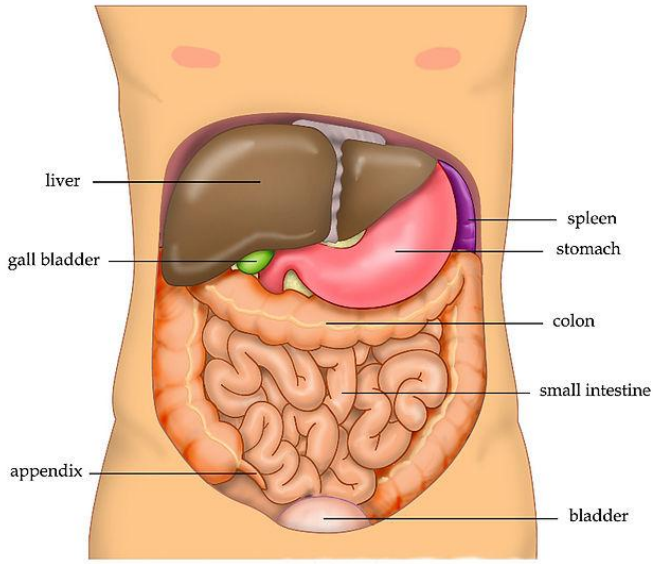

Fig. (2): Human liver shown in abdomen ***(Berg et al., 2010).***

Terminology related to the liver often starts in hepar- or hepat- from the Greekword for liver, hēpar (παρ, root hepat-, πατ-) ***(Chu et al., 2009).***

There is currently no way to compensate for the absence of liver function in the long term, although liver dialysis techniques can be used in the short term. Liver transplantation is the only option for complete liver failure ***(Clemente, 2011).***

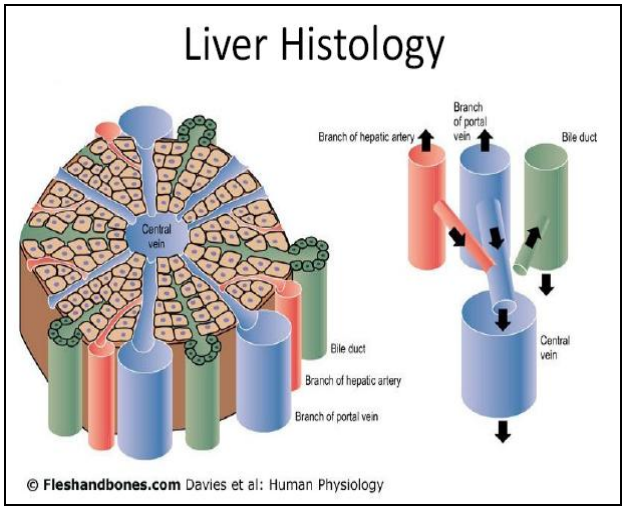

Fig. (3): Liver histology ***(Clemente, 2011).***

Liver has 2-blood supply resources; 70% from portal vein and 30% from hepatic artery.

Structure

The liver is a reddish brown wedge-shaped organ with four lobes of unequal size and shape. A human liver normally weighs 1.44–1.66 kg (3.2–3.7 lb). It is both the largest internal organ and the largest gland in the human body. Located in the right upper quadrant of the abdominal cavity,

it rests just below the diaphragm, to the right of the stomach and overlying the gallbladder ***(Cotran et al., 2005).***

The liver is connected to two large blood vessels, the hepatic artery and the portal vein. The hepatic artery carries oxygen-rich blood from the aorta, whereas the portal vein carries blood rich in digested nutrients from the entire gastrointestinal tract and also from thespleen and pancreas. These blood vessels subdivide into small capillaries known as liver sinusoids, which then lead to alobule ***(Dancygier, 2010).***

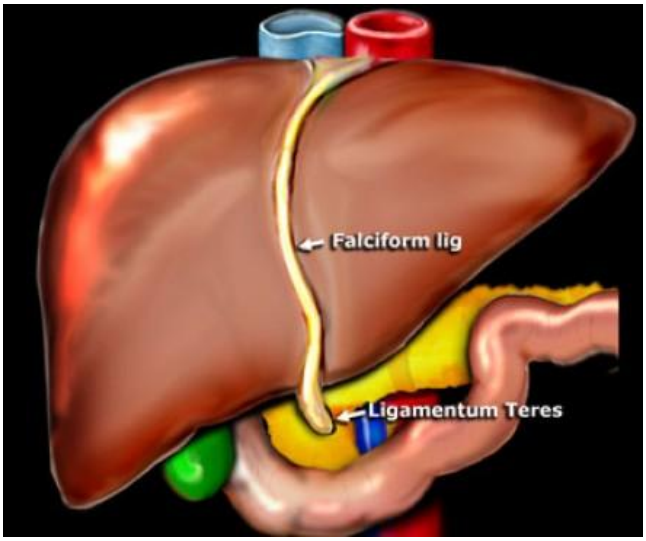

Fig. (4): Classical Anatomy ***(Dancygier, 2010).***

Lobules are the functional units of the liver. Each lobule is made up of millions of hepatic cells (hepatocytes) which are the basic metabolic cells. The lobules are held together by fine areolar tissue which extends into the

structure of the liver, by accompanying the vessels (veins and arteries) ducts and nerves through the hepatic portal, as a fibrous capsule calledGlisson's capsule. The whole surface of the liver is covered in a serous coat derived from peritoneum and this has an inner fibrous coat (Glisson's capsule) to which it is firmly adhered. The fibrous coat is of areolar tissue and follows the vessels and ducts to support them ***(Dorland's, 2012).***

Gross anatomy

Gross anatomy traditionally divided the liver into two portions– a right and a left lobe, as viewed from the front (diaphragmatic) surface; but the underside (thevisceral surface) shows it to be divided into four lobes and includes the caudateand quadrate lobes ***(Häussinger, 2011).***

The falciform ligament, visible on the front of the liver, divides the liver into a leftand a much larger right lobe. From the visceral surface, the two additional lobes are located between the right and left lobes, one in front of the other. A line can be imagined running from the left of the vena cava and all the way forward to divide the liver and gallbladder into two halves. This line is called Cantlie's line ***(Hirschfield and Gershwin, 2013).***

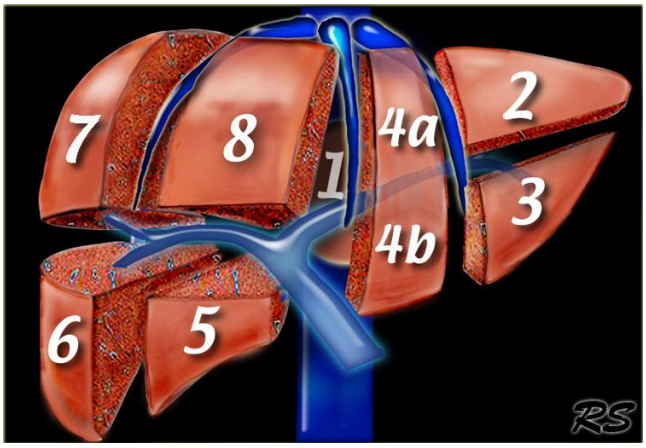

Fig. (5): Couinaud classification ***(Hirschfield and Gershwin, 2013).***

Other anatomical landmarks exist, such as the ligamentum venosum and the round ligament of the liver (ligamentum teres), which further divide the left side of the liver in two sections. An important anatomical landmark, theporta hepatis, also known as the transverse fissure of the liver, divides this left portion into four segments, which can be numbered starting at the caudate lobule as I in an anticlockwise manner. From this visceral view, seven segments can be seen, because the eighth segment is only visible in the parietal view ***(Kuntz et al., 2009).***

Surfaces

On the diaphragmatic surface, apart from a large triangular bare areawhere it connects to the diaphragm, the liver is covered by a thin double-layered membrane, the peritoneum, that reduces friction against other organs. This

surface covers the convex shape of the two lobes where it accommodates the shape of the diaphragm. The peritoneum folds back on itself to form the falciform ligament and the right and left triangular ligaments ***(Lade and Monga, 2011).***

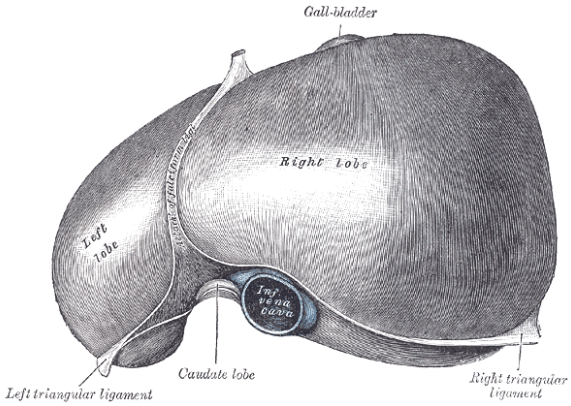

Fig. (6**):** The upper surface of the liver showing two lobes ***(Lade and Monga, 2011).***

These peritoneal ligaments are not related to the anatomic ligaments in joints, and the right and left triangular ligaments have no known functional importance, though they serve as surface landmarks. The falciform ligament functions to attach the liver to the posterior portion of the anterior body wall ***(Renz and Kinkhabwala, 2014).***

The visceral surface or inferior surface, is uneven and concave. It is covered in peritoneum apart from where it attaches the gallbladder and the porta hepatis ***(Kuntz et al., 2009).***

There are several impressions on the surface of the liver which accommodate the various adjacent structures and organs. Underneath the right lobe and to the right of the gallbladder fossa, are two impressions, one behind the other and separated by a ridge. The one in front is a shallow colic impression, formed by thehepatic flexure and the one behind is a deeper renal impressionaccommodating part of the right kidney and part of the suprarenal gland ***(Lade and Monga, 2011).***

The suprarenal impression is a small triangular depressed area on the liver. It is located close to the right of the fossa between the bare area and the caudate lobe and immediately above the renal impression. The greater part of the suprarenal impression is devoid of peritoneum and it lodges the right suprarenal gland ***(Dancygier, 2010).***

Medial to the renal impression is a third and slightly marked impression, lying between it and the neck of the gall-bladder. This is caused by the descending portion of the duodenum, and is known as the duodenal impression ***(Berg et al., 2010).***

The inferior surface of the left lobe of the liver presents behind and to the left the gastric impression. This is moulded over the upper front surface of the stomach, and to

the right of this is a rounded eminence, the tuber omentale, which fits into the concavity of the lesser curvature of the stomach and lies in front of the anterior layer of the lesser omentum ***(Dancygier, 2010).***

Functional anatomy

The central area where the common bile duct, hepatic portal vein, and the hepatic artery proper enter is the hilum known as the porta hepatis (gateway to the liver) or the transverse fissure of the liver. The duct, vein, and artery divide into left and right branches, and the areas of the liver supplied by these branches constitute the functional left and right lobes.The functional lobes are separated by the imaginary plane, Cantlie's line, joining the gallbladder fossa to the inferior vena cava. The plane separates the liver into the true right and left lobes. The middle hepatic vein also demarcates the true right and left lobes. The right lobe is further divided into an anterior and posterior segment by the right hepatic vein. The left lobe is divided into the medial and lateral segments by the left hepatic vein ***(Häussinger, 2011).***

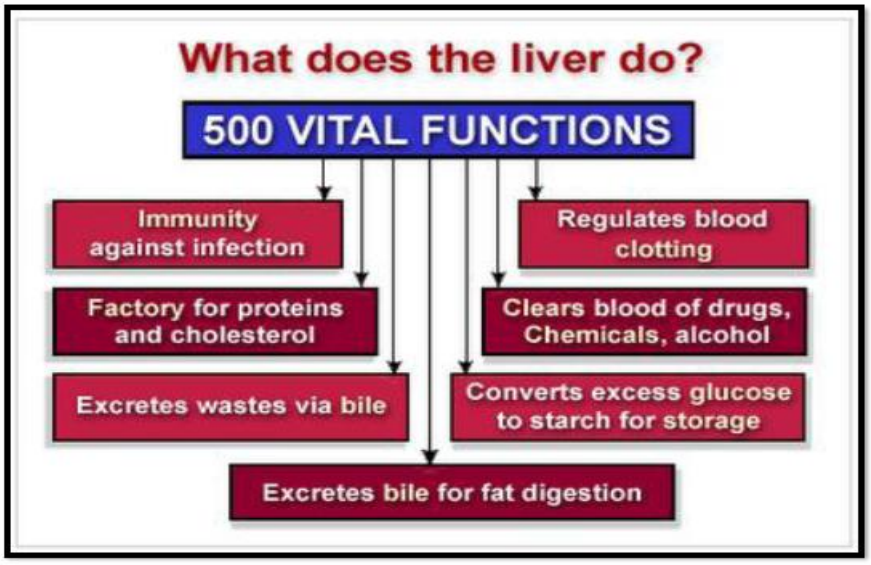

Fig. (7): Liver function ***(Häussinger, 2011).***

Development

Organogenesis, the development of the organs takes place from the third to the eighth week in human embryogenesis. The origins of the liver lie in both the ventral portion of the foregut endoderm (endoderm being one of the 3 embryonic germ layers) and the constituents of the adjacent septum transversum mesenchyme. In the human embryo, the hepatic diverticulum is the tube of endoderm that extends out from the foregut into the surrounding mesenchyme. The mesenchyme of septum transversum induces this endoderm to proliferate, to branch, and to form the glandular epithelium of the liver. A portion of the hepatic diverticulum (that region closest to the digestive tube) continues to function as the drainage duct of the liver, and a branch from this duct produces the gallbladder. Besides signals

from the septum transversum mesenchyme, fibroblast growth factor from the developing heart also contributes to hepatic competence, along with retinoic acid emanating from the lateral plate mesoderm. The hepatic endodermal cells undergo a morphological transition from columnar to pseudostratified resulting in thickening into the early liver bud. Their expansion forms a population of the bipotential hepatoblasts. Hepatic stellate cells are derived from mesenchyme ***(Renz et al., 2014).***

Fetal blood supply

In the growing fetus, a major source of blood to the liver is the umbilical vein which supplies nutrients to the growing fetus. The umbilical vein enters the abdomen at the umbilicus, and passes upward along the free margin of the falciform ligamentof the liver to the inferior surface of the liver. There it joins with the left branch of the portal vein. The ductus venosus carries blood from the left portal vein to the left hepatic vein and then to the inferior vena cava, allowing placental blood to bypass the liver ***(Cotran et al., 2005).***

In the fetus, the liver develops throughout normal gestation, and does not perform the normal filtration of the infant liver. The liver does not perform digestive processes because the fetus does not consume meals directly, but receives nourishment from the mother via the placenta. The fetal liver releases some blood stem cells that migrate to the fetal thymus, so initially the

lymphocytes, called T-cells, are created from fetal liver stem cells. Once the fetus is delivered, the formation of blood stem cells in infants shifts to the red bone marrow.

After birth, the umbilical vein and ductus venosus are completely obliterated in two to five days; the former becomes theligamentum teres and the latter becomes the ligamentum venosum. In the disease state of cirrhosis and portal hypertension, the umbilical vein can open up again ***(Cotran et al., 2005).***

Biliary flow

The biliary tree is derived from the branches of the bile ducts. The biliary tree, or biliary tract, is the path by which bile is secreted by the liver then transported to the first part of the small intestine, the duodenum. The bile produced in the liver is collected in bile canaliculi, small grooves between the faces of adjacent hepatocytes. The canaliculi radiate to the edge of the liver lobule, where they merge to form bile ducts. Within the liver, these ducts are termed intrahepatic bile ducts, and once they exit the liver they are considered extrahepatic. The intrahepatic ducts eventually drain into the right and left hepatic ducts, which exit the liver at the transverse fissure, and merge to form the common hepatic duct. The cystic duct from thegallbladder joins with the common hepatic duct to form the common bile duct ***(Pocock, 2006).***