THE REVIEW ARTICLE ON LIVER FUNCTION TEST IN HUMAN BODY

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Abstract

Laboratory Liver function tests (LFT) may be defined as the tests which are useful in the evaluation and treatment of patients with hepatic dysfunction. Theliver is of vital importance in intermediary metabolism, in the detoxification andin the elimination of toxic substances. The biochemical tests are useful in detecting the presence of liver disease. The test are also cheap, non- invasive and widely available and are of value in directing the use of other diagnostic tests such as liver biopsy and imaging. Some of the biochemical markers such as serum Bilirubin, SGPT or Alanine amino transferase (ALT) , SGOT or aspartate amino transferase (AST) , Alkaline phosphatase (ALP), Gamma Glutamyl Transferase (GGT), 5′ nucleotidase, Ceruloplasmin etc. are considered in this article. An isolated or conjugated alteration of biochemical markers of liver damage in patients can challenge the clinicians during the diagnosis of disease related to liver directly or with some other organs.

Laboratory Liver Function Test

These tests may be used-

1. In the differential diagnosis of the different types of jaundice.
2. To assess the severity of liver damage in known liver disease.
3. To screen the suspected cases during outbreak of infective hepatitis.
4. To screen the persons exposed to potential hepatotoxic material in industry.
5. To screen the persons exposed to hepatotoxic drugs to treat some other disease.

BILIRUBIN

Bilirubin is a bile pigment and is the excretory end product of heme degradation. It is conjugated in the liver to form bilirubin diglucuronide, and excreted in bile. The normal concentration of serum bilirubin is in the range of 0.2-1.0 mg/dl. Of this the conjugated bilirubin (diglucuronide 75%, monoglucuronide 25%) is 0.2-0.4 mg/dl while the unconjugated bilirubin is 0.2-0.6 mg/dl.

Transaminases or aminotransferases

The activities of two enzymes serum glutamate pyruvate transaminase (SGPT or ALT) and serum glutamate oxaloacetate transaminase (SGOT or AST) —are widely used to assess theliver function.

ALT is a cytoplasmic enzyme while AST is found in both cytoplasm and mitochondria. The activity of these enzymes is low in normal serum (ALT 5-40 IU/l, AST 5-45 IU/l). Serum ALTand AST are increased in liver damage. So, Alanine transaminase is more sensitive and reliable for the assessment of LFT.

The normal AST/ALT ratio is around 0.8. This ratio is increased (>2) in myocardial infarction, alcoholic hepatitis, and cirrhosis.

AST/ALT ratio is decreased (i.e. ALT higher) in acute hepatocellular damage and cholestasis.

Alkaline phosphatase

Alkaline phosphatase (ALP) is mainly derived from bone and liver (the cells lining the bile canaliculi).

A rise in serum ALP (normal 3-13 KA units/dl), usually associated with elevated serum bilirubin is an indicator of biliary obstruction (obstructive/posthepatic jaundice). ALP is also elevated in cirrhosis of liver and hepatic tumors. Liver is not the sole source of alkaline phosphatase. The liver and bone isoenzymes of ALP can be separated by electrophoresis.

Gamma-Glutamyl transpeptidase

This is a microsomal enzyme widely distributed in body tissues, including liver. Measurement of Gama glutamyl transpeptidase (GGT) activity provides a sensitive index to asses liver abnormality. The activity of this enzyme almost parallels that of transaminases in hepatic damage. Serum GGT is highly elevated (normal 5-40 IU/l) in biliary obstruction and alcoholism. Many drugs (e.g. phenytoin) induce (liver synthesis) and increase thisenzyme in circulation.

5-Nucleotidase

The serum activity of 5-nucleotidase (normal 2-15 U/l) is elevated in hepatobiliary disease and this parallels ALP. The advantage with 5-nucleotidase is that it is not altered in bone diseae (as is the case with ALP).

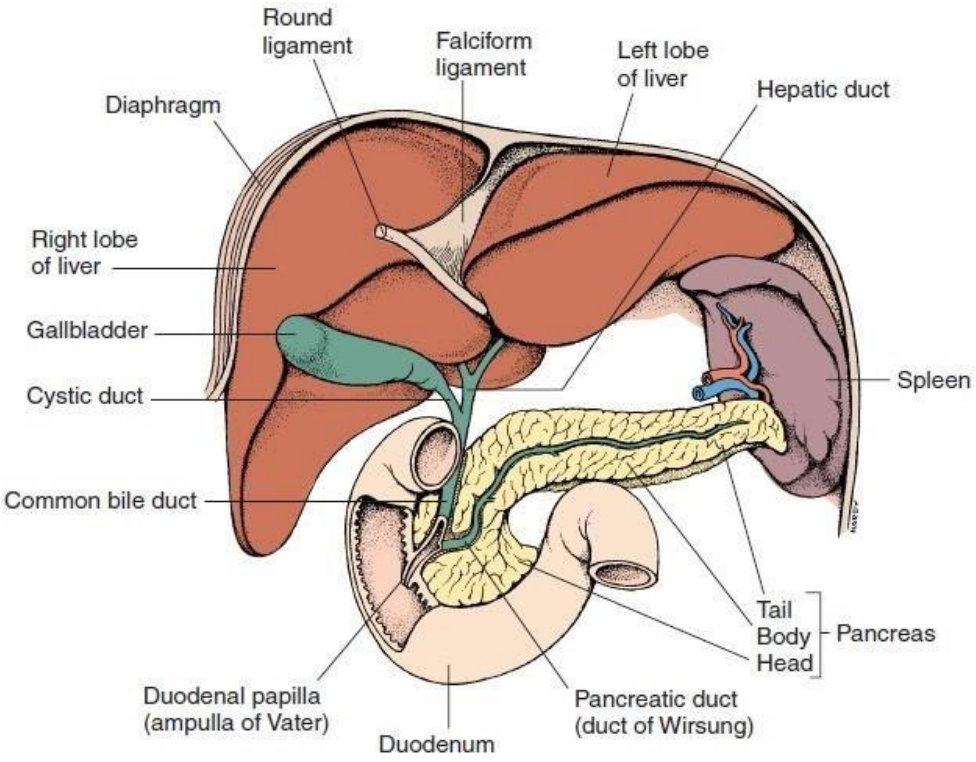
Ceruloplasmin

Ceruloplasmin is synthesized in the liver and is an acute phase protein. It binds with the copper and serves as a major carrier for copper in the blood . Normal plasma level of ceruloplasmin is 200 to 600mg/L .

The level is elevated in infections, rheumatoid arthritis, pregnancy, non Wilson liver disease and obstructive jaundice. Low levels may also be seen in neonates, menke's disease, kwashiorkor, marasmus, protein losing enteropathy, copper deficiency andaceruloplasminemia.

Introduction

The liver is the largest organ in the human body. It weighs 1.2 to 1.5 Kg in adult. It is heavier in males than females. In males it generally weighs 1.4-1.8 Kg and in females 1.2-
1.5 Kg. It is located in the right upper quadrant of the abdomen and is attached beanth the diaphragm by its ligaments. It is divided into four lobes, left, right, quadrate and caudate. These are supplied by the left and right branches of the portal vein and the hepatic artery. The bilary drainage is into the right and left hepatic ducts. A thin connective tissue capsule covers the entire liver surface.



The majority of cells in the liver are hepatocytes (about 2/3 of liver mass). The remaining cell types are Kupffer cells, stellate (fat storing) cells, endothelial cells of blood vessels, cells of bile ducts and supporting structures. Hepatocytes demonstrate pinocyotic and endocytic activity with active and passive uptake of nutrients. Kupffer cells represent the largest group of fixed macrophages in the body. Hepatocytes perform various functions in maintaining homeostasis and health. These functions include coagulation

factors, synthesis of albumin, hormonal and growth factors, production of bile, deamination, excreation, lipogenesis, detoxification etc.

FUNCTIONS OF LIVER

1. **Production of Bile**. The liver secretes bile (hepatic pH 8.6). The bile is stored in gall bladder (pH 7.6). About 500- 1000 ml of bile is secreted by liver in a day. Bile salts (sodium bicarbonate, sodium glycocholate, sodium taurocholate) help In digestion of fats in small intestine by bringing about their emulsification (conversion of large fat droplets into small ones).

2. **Deamination**. It is the process by which the amino group is removed from the amino acids resulting in production of ammonia which is converted into urea.

3. Excretion.

(i) Liver synthesizes urea with the help of ammonia and carbon dioxide. Urea is passed out through excretory system.

(ii) The bile contains bile pigments (bilirubin- yellow and biliverdin- green) that are also excretory products.

(iii) The liver cells also eliminate certain other waste products like cholesterol, metal ions and waste products of harmoglobin. These waste products and bile pigments reach the duodenum through bile and pass out with faeces.

4. **Glycogenesis**. It is the conversion of the excess of glucose into glycogen by liver cells with the help of insulin secreted by the pancreas.

5. **Glycogenolysis**. It is the conversion of glycogen into glucose by the liver cells with the help of glucagon secreated by pancreas.

6. **Lipogenesis**. It is conversion of excess of glucose and amino acids into fats. **7.Gluconeogensis**. It is the formation of glucose or glycogen from non- carbohydrate source such as amino acids, fatty acids, glycerol, etc. It occurs in the kidney and stripedmuscles.

8. Detoxification. Liver converts toxic substances into harmless substances, e.g. harmful prussic acids, formed during metabolism in all body cells is neutralized and rendered harmless by liver cells.

9. Haemopoiesis. The process of formation of blood corpuscles is called haemopoiesis. The liver produces red corpuscles in the embryo.

10. Synthesis of Blood Proteins. The liver produces blood proteins such as prothrombin andfibrinogen that help in the clotting of blood.

11. Secretion of heparin. Liver secretes heparin (anticoagulant).

12. Lymph Formation. Liver is an important seat of lymph formation.

13. Synthesis of Vitamin A. Liver synthesis vitamin A from b- carotene. The latter in an orange –

yellow substance of carrot.

14. Secretion of Enzymes. Liver secretes certain enzymes which play important roles in themetabolism of proteins, fats and carbohydrates in the body.

15. Destruction of RBC. The old worn out red blood corpuscles are broken down in the livercells. Their haemoglobin is changed into bile pigments.

16. Phagocytosis. The Kupffer's cells of the liver engulf the disease causing microorganisms,dead cells and foreign matter.

17. Osmoregulation. Liver produces angiotensinogen (a protein) which helps kidneys inmaintaining body fluid osmoregulation.

18. Production of Heat. Due to high metabolic activities of the liver, enough heat isgenerated, which is essential for maintaining the optimum body temperature.

19. Storage. Liver stores glycogen, Fats, Vitamins like A, D, E, K and B_{12} ,Bile in gall bladder,Blood, water, Iron, copper and potassium.

Conclusion.

The liver function tests (LFT) are the biochemical investigations to assess the capacity of theliver to carry out any of the functions it performs. LFT will help to detect the abnormalities and the extent of liver damage.

The choice of biochemical tests to measure liver functions mostly depends on the purpose of the investigation. The clinical history of the subject is often a guiding factor in this regard. A single test in isolation may have a little diagnostic value.

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