

A Concised Concept of Liver Function Test

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ABSTRACT

Liver is a vital organ in human body and also it is the largest gland in the body so a lot should be known about it. Liver function test (LFT) is the test for the examination of the liver. It not only tells about the functional status of the liver but also about the markers of liver cell damage and its dysfunction. But, the study material of liver function test is so vast that it has to be concised properly. So here is a concised concept of all the necessary parameters of LFT.

KEYWORDS: Liver Function Test, Serum Bilirubin, Alanine Transaminase, Aspartate Transaminase, Alkaline Phosphatase, Gamma- Glutamyl Transferase, Lactate Dehydrogenase.

INTRODUCTION

Liver is the largest gland in the body. It is located in the upper right-hand portion of the abdominal cavity, beneath the diaphragm, and on top of the stomach, right kidney, and intestines. Conical in shape and weighs around 1600 g in males and 1300 g in females. It occupies whole of the right hypochondrium, a good portion of epigastrium, and extends into the left hypochondrium and ends up to the left lateral line. Its major function is to secrete bile but it performs various other metabolic functions also.[1]

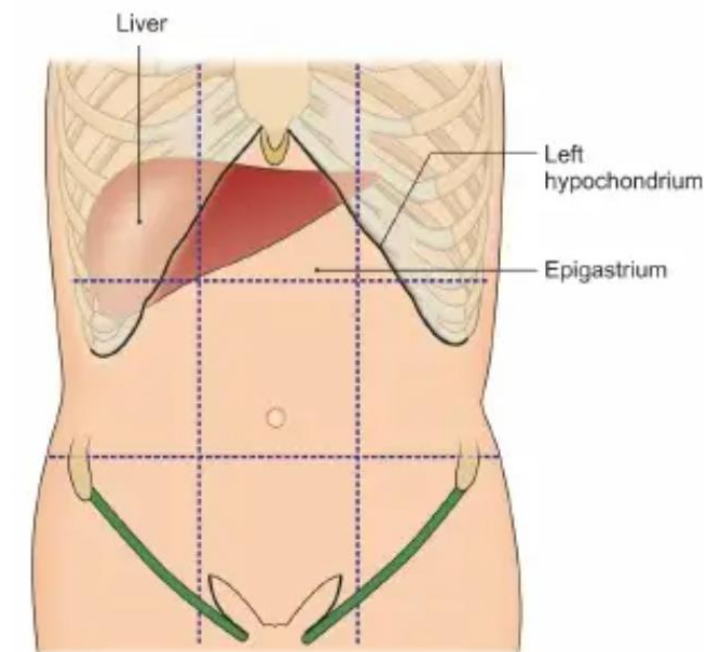


Figure 1: Anatomical Location Of Liver [1]

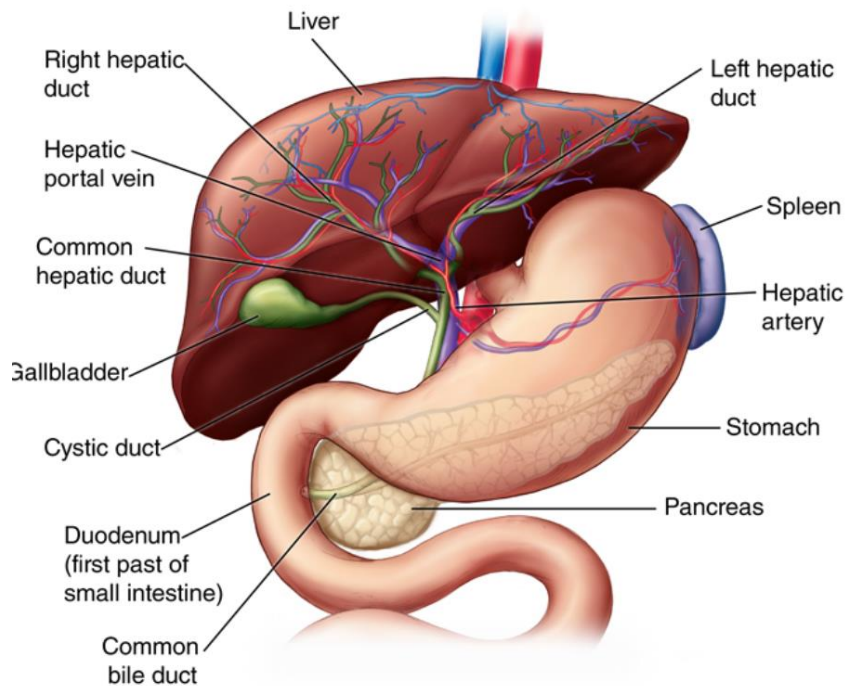


Figure 2: The Biliary System [1]

Liver function test (LFT) is a whole test panel for the examination of liver. It not only tells about the functional status of the liver, but it also involves markers of liver cell damage and its dysfunction. Thus, this test helps to assume many of the disease conditions of the hepato biliary system. [2]

The most common liver tests included in LFT are as follows:

- Liver enzymes test: This includes alkaline phosphatase (ALP), alanine transaminase (ALT), aspartate aminotransferase (AST) and gamma-glutamyl transferase (GGT). These are elevated when there's liver cell injury.
- Total protein test: It measures the levels of protein, present in your blood. A decreased protein level may indicate that the liver is not functioning optimally, as protein is produced by our liver.
- Bilirubin test: Bilirubin is a waste product that is present in bile.
- Lactate dehydrogenase (LDH): LDH is an enzyme found in liver and also in many other body tissues.
- Prothrombin Time (PT) test: This test measures the clotting time. This is included in LFT because, the clotting process involves several proteins, which are produced by our liver. [3]
- Normal reference ranges for LFTs tend to vary slightly from laboratory to laboratory. The normal reference ranges may vary between males and females and may be higher for those with a higher body mass index. It should also be kept in mind that a patient's blood test values of the LFT, should be interpreted based upon the normal reference value of that laboratory, in which the test is done. However, in general the normal reference values of LFT are as follows:
 - Alanine transaminase: 4 to 36 IU/L
 - Aspartate transaminase: 5 to 30 IU/L
 - Alkaline phosphatase: 30 to 120 IU/L
 - Gamma- glutamyl transferase: 6-50 IU/L
 - Bilirubin: 2 to 17 $\mu\text{mol/L}$
 - Direct bilirubin: 0 to 6 $\mu\text{mol/L}$

- Prothrombin time: 10.9 to 12.5 seconds
- Albumin: 35-50 g/L
- Total protein: 60 to 80 g/L
- Lactate dehydrogenase: 50 to 150 IU/L. [4]

The prevalence of mildly abnormal LFT results with one or more abnormal components of the LFT is high (10% to 21.7%).

Also, hepatic fibrosis markers are often used to evaluate hepatic fibrosis in chronic hepatic diseases. This is done as a part of the LFT, and this includes many markers like hyaluronic acid, type IV collagen, 7S domain of type IV collagen, Wisteria floribunda, etc. [2]

SERUM BILIRUBIN

Bilirubin is a by-product of broken RBC metabolism. It is of two types conjugated and unconjugated bilirubin. Increased levels of serum conjugated bilirubin is seen in viral hepatitis, hepatocellular damage, toxic or ischemic liver injury. Hyperbilirubinemia in acute viral hepatitis is directly proportional to the degree of histological injury of hepatocytes and the longer course of the disease.

The recent study has shown that a high serum total bilirubin level may protect neurologic damage due to stroke.

ALANINE TRANSAMINASE

Alanine transaminase (ALT) is found in a higher concentration in liver and also to some extent in kidney, heart and muscle tissue. ALT is purely cytoplasmic and it catalyses the transamination reaction.[5] Any type of liver cell injury can increase the concerned levels of ALT. Medically, an elevated value of ALT up to 300 U/L are considered nonspecific. A marked elevation in the level of ALT (greater than 500 U/L) indicate diseases that primarily affect liver hepatocytes such as viral hepatitis, toxin-induced liver damage and ischemic liver injury (shock liver). Despite knowing the association between highly increased level of ALT and hepatocellular diseases, there is no correlation of the two which can show the exact extent of hepatocellular damage. [6] Viral hepatitis like A, B, C, D, E, hepatic fat accumulation in childhood obesity and nonalcoholic fatty liver disease may be responsible for a marked increase in ALT levels.

ASPARTATE TRANSAMINASE

Aspartate transaminase (AST) exist in two different isoenzyme forms i.e., mitochondrial and cytoplasmic form. AST is found in highest concentration in heart tissue and comparatively to a lower extent in other tissues like skeletal muscle, liver and kidney tissue. An elevated level of mitochondrial AST is seen in extensive tissue necrosis during MI (myocardial infarction) and also in chronic liver diseases like liver tissue degeneration and in liver necrosis. Also, AST elevations are often high in patients with cirrhosis.

AST/ALT RATIO

The AST to ALT ratio has a high clinical utility than assessing their individual levels. The ratio increases in progressive liver function impairment. [5]

An elevated ratio greater than 1 shows advanced liver fibrosis and chronic hepatitis C infection and a level of AST/ALT ratio greater than 2 is seen in alcoholic hepatitis. [6,7,8]

ALKALINE PHOSPHATASE

Alkaline phosphatase (ALP) levels has a clinical significance in diagnosing cholestatic liver disease as, ALP elevations are observed in patients suffering from cholestasis. Usually, an elevation of 4-fold or more in the upper limit of normal ALP level is seen in nearly 75% of patients with cholestasis, (whether intrahepatic or extrahepatic). [9] The degree of elevation does not help in distinguishing the 2 types of cholestasis. Also, an elevation in ALP levels is seen in cases of biliary obstruction due to cancer (cholangiocarcinoma, pancreatic head adenocarcinoma, or ampullary adenocarcinoma), choledocholithiasis, biliary stricture, sclerosing cholangitis, or primary biliary cholangitis (PBC), drug-induced liver injury, infiltrative liver diseases (amyloidosis, tuberculosis, and liver metastasis). Patients with AIDS may also exhibit notably high levels of ALP. [10]

GAMMA- GLUTAMYL TRANSFERASE

Gamma- glutamyl transferase (GGT) is an enzyme also found throughout the body, but mostly in liver tissue. When there is a damage in liver tissue, GGT may leak into the bloodstream. An increased level of GGT shows liver disease or a damage to bile ducts. [11]

LACTATE DEHYDROGENASE

When oxygen is absent or there is a limited supply, Lactate dehydrogenase (LDH) do the anaerobic metabolism of glucose. An increased serum LDH level is seen in certain liver diseases, kidney diseases, muscle injury, trauma, heart attack, pancreatitis, cancer, and anemia. Normally, a higher level of serum LDH is seen in infants and young children as compared to older children and adults. Also, serum usually has a higher level of LDH in comparison with plasma because LDH is released during the process of blood clotting. The LDH is also increased during a strenuous physical activity. A falsely low level of LDH is seen in conditions with high concentration of vitamin C. On the other hand, a falsely high level of LDH is seen in the presence of anesthetics, aspirin, alcohols, and certain narcotics, and procainamide too. [12]

REFERENCES:

1. Chaurasia BD, Garg K. Human anatomy: Regional and Applied Dissection and clinical. Vol. 2. New Delhi, India: CBS Publishers & Distributors; 2010.
2. Science direct: Liver function test [Internet]. c2024[cited 2024 Jan 8]. Available from:<https://www.sciencedirect.com/topics/medicine-and-dentistry/liver-function-test>
3. Cleveland clinic: Liver function tests [Internet]. c2024[cited 2024 jan 9]. Available from: <https://my.clevelandclinic.org/health/diagnostics/17662-liver-function-tests>
4. Lala V, Zubair M, Minter DA. Liver Function Tests. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK482489/>
5. Gowda, S., Desai, P. B., Hull, V. V., et al. A review on laboratory liver function tests. [Internet]. 2009 [cited 2024 Jan 9]. Available from:<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2984286/>
6. Kallei L, Hahn A, Roder VZ. Correlation between histological findings and serum transaminase values in chronic diseases of the liver. Acta Medica Scandinavica. 1964; 175:49–56.
7. Coates P. Liver function tests. [Internet]. 2011 [cited 2024 jan 9]. Available on: <https://www.racgp.org.au/getattachment/36d1c5e0-9c1d-43fc-a8a0-b323e3ed8f8e/Liver-function-tests.aspx>

8. Wallis J, Ross C. Geeky medics: Interpretation of liver function tests (LFTs). [Internet]. 2018. [cited 2024 Jan 9]. Available from: <https://geekymedics.com/interpretation-of-liver-function-tests-lfts/>
9. Sharma U, Pal D, Prasad R. Alkaline phosphatase: an overview. Indian J Clin Biochem. 2014 Jul;29(3):269-78.
10. Lowe D, Sanvictores T, Zubair M, et al. Alkaline Phosphatase. StatPearls [Internet]. 2023 [cited 2024 Jan 9]. Available from: [https://www.ncbi.nlm.nih.gov/books/NBK459201/#:~:text=Alkaline%20phosphatases%20\(ALPs\)%20are%20a,essential%20cofactors%20of%20this%20enzyme.](https://www.ncbi.nlm.nih.gov/books/NBK459201/#:~:text=Alkaline%20phosphatases%20(ALPs)%20are%20a,essential%20cofactors%20of%20this%20enzyme.)
11. Medline plus. Gamma-glutamyl Transferase (GGT) Test [Internet]. 2021 [cited 2024 Jan 18]. Available from: <https://medlineplus.gov/lab-tests/gamma-glutamyl-transferase-ggt-test/>
12. Farhana A, Lappin SL. Biochemistry, Lactate Dehydrogenase. StatPearls [Internet]. 2023 [cited 2024 Jan 22]. Available from; [https://www.ncbi.nlm.nih.gov/books/NBK557536/#:~:text=Lactate%20dehydrogenase%20\(LDH\)%20is%20an,to%20NADH%20and%20vice%20versa.](https://www.ncbi.nlm.nih.gov/books/NBK557536/#:~:text=Lactate%20dehydrogenase%20(LDH)%20is%20an,to%20NADH%20and%20vice%20versa.)