Liver Function Tests

Definition

The liver is the largest glandular organ in the body. It is a digestive tube that weighs about one and a half kilograms, is reddish brown and is divided into four unequal lobes. The right side of the abdominal cavity is located under the diaphragm. The blood is transported through the hepatic artery carrying blood and oxygen from the aorta. The portal vein is transported to the blood carrying digested food from the small intestine.

Function of the Liver

Major Metabolic Functions of the Liver

- **Synthetic Function**
  - Plasma proteins (albumin, globulins), cholesterol, triglycerides and lipoproteins
- **Detoxification and excretion**
  - Ammonia to urea (urea cycle), bilirubin, cholesterol, drug metabolites
- **Storage Function**
  - Vitamins A, D, E, K and B_{12}
- **Production of bile salts**
  - Helps in digestion

The liver is the largest plant of the body's metabolism. Liver cells represent about 60% of the liver tissue, which is carried out by any group of other cells in the body.It transforms most of the nutrients eaten by humans into a form that the body can use such as:-

1-Convert and store sugar until it is needed and then regulate its blood level.

2-Break down the fat and convert it into a cholesterol.

3-Formulate the proteins absorbed for blood clotting.

4-Dispose of ammonia by converting it to urea through the urea cycle.

5-Yellow collagen which breaks down the human eating of fat.

Liver function test (LFT)

Liver function tests are a set of blood tests that measure some of the enzymes and proteins in the blood. Liver function tests are used to help detect and evaluate liver diseases. Some of these analyses the measurement of liver function effectively such as the analysis of albumin and analysis of bilirubin, where the measurement of the extent of the quality of the liver in the production of protein albumin and ability to get rid of bilirubin. There are analysis does not reflect the effectively for liver function

is the measurement of the level of some of enzymes that the liver when the incidence of certain diseases.

Typically the LFT comprises of :

1- Alanine transaminase (ALT) .

2-Aspartate transaminase (AST) .

3-Alkaline phosphatase (ALP) .

4-Albumin and total protein .

5-Bilirubin .

Alkaline phosphatase (ALP) :

Alkline Phosphate (ALP) This enzyme is present in most tissues of the body. It has a large concentration of liver and bone, gastrointestinal tract, placenta.Its height may be normal in the stages of bone growth.In general, the increase in blood rate is an indication of the injury of one of the organs or tissues rich in it, especially the liver, where the enzyme rises in the inflammation of the liver and its cancers and blockage of the bile ducts.

Normal value (varies by age):

Adults , Children *(5 _ 25) K. A.U / dl(3 _13) K.A.U / dl*

Analysis of the other can do to assess the liver function :

* **Gamma-glutamyltransferase (GGT) .**

*** L-lactate dehydrogenase (LDH) .**

*** Prothrombin time (PT) .**

Prothrombin time (PT)

Prothrombin is a protein are produced in the liver, a base material that is the production of factors coagulation helping the coagulation, of them. Prothrombin itself is not effective, but with the addition other factors in the plasma or that can be added in artificial in tube test, turns prothrombin to (thrombin). thrombin is the enzyme converts (fibrinogen) .fibrin which is in fact article clotting blood.

This test examines practically all tracks blood clotting, usually used to test the effect of anti-coagulation, which is given by the mouth .

There is a dysfunction in the liver that has led several diseases :

*Hepatocellular disease , Cholestasis (obstruction of bile flow)

*Cirrhosis , *Hepatitis , Jaundice , Liver cancer

Bilirubin

- A byproduct of red blood cell breakdown
- It is the yellowish pigment observed in jaundice
- High bilirubin levels are observed in:
  - Gallstones, acute and chronic hepatitis

Jaundice

Is the coloration of the skin and eyes in yellow as a result of the accumulation of bilirubin in the body and the inability of the liver to get rid of them out of the body; in the natural situation bilirubin is a substance associated with red blood cells, and when the blood corpuscle rid of the kidney and bilirubin found in them, New young red blood, but for a problem in the liver, it can not get rid of these pyramidal pellets, accumulate bilirubin in the body.

Type of Jaundice :-

1-Hemolytic Jaundice

Cause by hemolytic of R.B.C

2- Hepatic Jaundice

Cause by infected of liver such as hepatitis

3- Obstructive Jaundice

Cause by obstructive of bile duct

Kidney functions

1- Eliminations of toxic substances and metabolites:

2- Regulation of acid-base balance and electrolyte balance:

3- Secretion of hormones

Kidneys function tests

Many conditions can affect the ability of the kidneys to carry out their vital functions . Some lead to a rapid (acute) failure in kidney function; others lead to a gradual (chronic) failure in function. Both result in a build-up of toxic waste substances in the blood.

Blood test of kidney function

The usual blood test which checks that the kidneys are working properly measures the level of:-

1) **Urea**

is a metabolic product derived from the catabolism of proteins.

Protein → A.A. → Ammonia → Urea

Is a waste product formed from the breakdown of proteins.*

*Urea is usually passed out in the urine.

N.V : 14-44 mg/100ml [3.5 -7 mmol/L]

*Hyper uremia (chronic nephritis, obstruction of urinary tract)

*Hypo uremia (liver diseases & Starvation)

2) **Creatinine**

* 98% of the body creatine is present in the muscles where it functions as store of high energy in the form of creatine phosphate**.**

* Is a waste product made by the muscles**.** end product of creatine

* Creatinine is usually a more accurate marker (specific test) of kidney function than urea. Creatinine is not reabsorbed by the renal tubules.

* Creatinine should be 0.8–1.2 mg/100 ml for males

And 0.6–0.9 mg/100 ml for females

*Clinical sig. kidney fuilar, Obstruction of urinary tract.

Creatinine Clearance Test:

- This test evaluates how efficiently the kidneys clear creatinine from the blood.
- Creatinine a waste product of muscle energy metabolism.
- the body does not recycle it, all creatinine filtered by the kidneys in a given amount of time is excreted in the urine, making creatinine clearance a very specific measurement of kidney function.

3)Uric acid

- End products of purine metabolism .
- N.V for male = (3-7)mg/dl
  For female = (2-6)mg/dl
- Clinical Sig. (Gout , Leukemia)

4)Dissolved Salts

- There are measured Na , Cl and bicarbonate .
- They are sometimes referred to as (electrolytes)abnormal blood levels of any of these may be due to kidney problem .

Urine analysis

Urine is formed in the kidneys, is a product of ultrafiltration of plasma by the renal glomeruli.

Collection of urine

- Early morning sample-qualitative
- Random sample- routine
- 24hrs sample- quantitative
- Midstream sample-UTI
- Post prandial sample-D.M

*For quantitative estimation of proteins

*For estimation of vanillyl mandelic acid, 5-hydroxyindole acetic acid, metanephrines

*For detection of AFB in urine

*For detection of microalbuminuria

Urine examination

- Macroscopic examination
- Chemical examination
- Microscopic examination

Macroscopic examination

Volume ,Color , Odor ,Reaction or urinary pH, Specific gravity

Chemical examination

Proteins ,Sugars , Ketone bodies , Bilirubin , Bile salts , Urobilinogen ,Blood

Microscopic examination

Microscopic urinalysis is done simply pouring the urine sample into a test tube and centrifuging it (spinning it down in a machine) for a few minutes. The top liquid part (the supernatant) is discarded. The solid part left in the bottom of the test tube (the urine sediment) is mixed with the remaining drop of urine in the test tube and one drop is analyzed under a microscope .

Crystals in urine

Crystals in acidic urine

- Uric acid
- Calcium oxalate
- Cystine
- Leucine

Crystals in alkaline urine

- Ammonium magnesium phosphates(triple phosphate crystals)
- Calcium carbonate