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Available online at: www.jsirjournal.com**JOURNAL OF SCIENTIFIC & INNOVATIVE RESEARCH****Serum and Hepatocyte enzyme**

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Elevated serum aminotransferase and alkaline phosphatase activities are not indices of the degree of liver dysfunction but is only marker of liver injury. A better term to be used is a liver profile, which includes the tests routinely done to evaluate patients with suspected liver disease. The transaminases indicate the degree of cellular injury that occurred during the past few hours. High transaminase levels reflect the degree of hepatocyte injury. Estimation of bilirubin is one of the better liver function tests because the liver must take bilirubin away from the albumin to which it is bound in the circulation, conjugate it and excrete it into the bile - a truly complex series of reaction. AST (SGOT), and ALT (SGPT), is both sensitive markers of hepatocellular injury. ALT is limited primarily to liver, whereas AST is found in various tissues, including cardiac, skeletal muscle, kidneys, brain, pancreas, lungs, leukocytes, and erythrocytes. Serum ALT elevations are more specific reflection of hepatocellular injury.

When the liver cell is injured or dies, these proteins can leak through the liver cell membrane into the circulation and serum levels will rise. An AST/ALT ratio greater than two, with the AST not exceeding 300 units (normal up to 40) is suggestive of alcoholic liver disease. An AST/ALT ratio

greater than 3 with the AST greater than 500 units is restricted virtually to patients with circulatory disturbances (Geeta, 2000).¹

Alkaline phosphatase

ALP hydrolyses substrate P - nitrophenyl phosphate with the formation of

Pnitrophenol and liberation of phosphate ion (Kind & King, 1954).²

In all types of obstructive jaundice except congenital atresia in infants of extra hepatic biliary tree, ALP levels are normal whereas in intrahepatic biliary tree, ALP levels are elevated. ALP level is also elevated in nonjaundice patient with hepatobiliary disease and in patients with primary carcinoma of liver abscess. In macronodular cirrhosis and primary biliary cirrhosis ALP levels are elevated, whereas ALP level, is normal in micronodular cirrhosis and modest in obstructive biliary cirrhosis. In hepatic steatosis ALP level is slightly elevated, in parenchymal liver diseases ALP level is moderate. In alcoholics with fatty changes in liver, ALP levels are higher, whereas ALP levels are very high in biliary tract obstruction. The mechanism of elevated ALP levels may be due to defective hepatic excretion or by increased production of ALP by hepatic parenchymal or duct cells.

Serum alkaline phosphatase is produced by many tissues, especially bone, liver, intestine and placenta and is excreted in the bile. Most of the normal serum alkaline phosphatase (range 3-13 King Armstrong

units/dl or 25-85 IU/dl) is derived from bone. Elevation in activity of the enzyme can thus be found in diseases of bone, liver and in pregnancy. In the absence of bone disease and pregnancy, an elevated serum alkaline

phosphatase levels generally reflect hepatobiliary disease. The greatest elevation (3-10 times normal) occurs in biliary tract obstruction. Slight to moderate increase is seen in parenchymal liver diseases such as in hepatitis and cirrhosis and in metastatic liver disease.(Harsh Mohan, 2002).³

Amino transferases (Transaminase)

Two of the enzymes from large number of transaminases which are well studied are serum aspartate amino transferase (AST) or glutamate oxaloacetate transaminase (GOT) and Alanine amino transferase (ALT), or glutamate pyruvate transaminase (GPT).³

Assessment of liver cell necrosis is most frequently done by estimation of the following two serum enzymes:

Glutamate pyruvate transaminase (GPT)

ALT or SGPT is a cytosolic enzyme primarily present in the liver. Its normal serum level is 10-35 Karmel units/ml. ALT

reversibly catalyses amino group from alanine to α -ketoglutarate. ALT levels are very high in patients of viral hepatitis and hepatic necrosis, 10 to 200 fold higher in patients of post hepatic jaundice, intrahepatic cholestasis and below 10 fold in patients of metastatic carcinoma, cirrhosis and alcoholic hepatitis.³

Glutamate oxaloacetate transaminases (GOT)

AST or SGOT is a mitochondrial enzyme released from heart, liver, skeletal muscles and kidney. Its normal serum level is 10-40 Karmen units/ml. Reversibly catalyses transfer of amino group from aspartate to α -ketoglutarate. AST levels are 10 to 200 fold elevated in patients with acute hepatic necrosis, viral hepatitis, CCl₄ and drug induced poisoning. AST levels are also elevated by 10 fold in patients of post hepatic jaundice, intrahepatic cholestasis and less than 10 fold in alcoholic and hepatic steatosis.

Serum levels of SGOT and SGPT are increased on damage to the tissues producing them. Thus serum estimation of SGPT (ALT) which is fairly specific for liver tissue is of greater value in liver cell

injury, whereas SGOT (ALT) level may rise in acute necrosis or ischaemia of other organs such as the myocardium, besides liver cell injury. Transaminase estimations are useful in the early diagnosis of viral hepatitis. Very high levels are seen in extensive acute hepatic necrosis such as in severe viral hepatitis and acute cholestasis. Alcoholic liver disease and cirrhosis are associated with mild to moderate elevation of transaminases.³

Serum Bilirubin

Bilirubin in serum would only react with diazo reagent in the presence of alcohol, after the proteins are removed by precipitation. Experiments, however, have provided that complete coupling of indirect bilirubin will take place in the presence of serum proteins provided the alcohol concentration is of the order of 50%. The concentration can be achieved without protein precipitation if the serum is first diluted with water, and this procedure forms the basis of our technique for indirect bilirubin. This is not only elimination loss of bilirubin on the protein precipitate, but also provides a buffer substrate sufficient to stabilize the pH sensitive color of the azobilirubin.⁴ Addition of alcohol to the reaction mixture gives

positive tests for both conjugated and unconjugated bilirubin pigment. The unconjugated bilirubin level is then estimated by subtracting direct bilirubin value from this total value.³

The serum bilirubin level is one of the best tests of liver function. Bilirubin is the metabolic product of the break down of heme derived from senescent red blood cells. Each day about 7.5g of hemoglobin is catabolized with the corresponding production of 250 mg. bilirubin.¹ Normally, 0.25 mg/dl of conjugated bilirubin is present in the blood of an adult. Bilirubin level rises in diseases of hepatocytes, obstruction to biliary excretion into duodenum, in hemolysis and defects of hepatic uptake and conjugation of bilirubin treatment such as Gilbert's disease.³

Serum Protein

Liver cells synthesise albumin, fibrinogen, prothrombin, alpha-1-antitrypsin, hepatoglobin, ceruloplasmin, transferrin, alpha foetoproteins and acute phase reactant proteins. The blood levels of these plasma proteins are decreased in extensive liver damage. Routinely estimated total proteins are in the normal range of 5.5 to 8 gm/dl.

Hypoalbuminaemia may occur in liver diseases having significant destruction of hepatocytes. Hyperglobulinaemia may be present in chronic inflammatory disorders such as in cirrhosis and chronic hepatitis.³

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