COMPARATIVE STUDY OF GAMMA-GLUTAMYL TRANSPEPTIDASE (GGT) AND BROMOSULPHALEIN (B.S.B) TESTS WITH OTHER STANDARD LIVER FUNCTION TESTS IN HEPATIC SCHISTOSOMIASIS.

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THESIS

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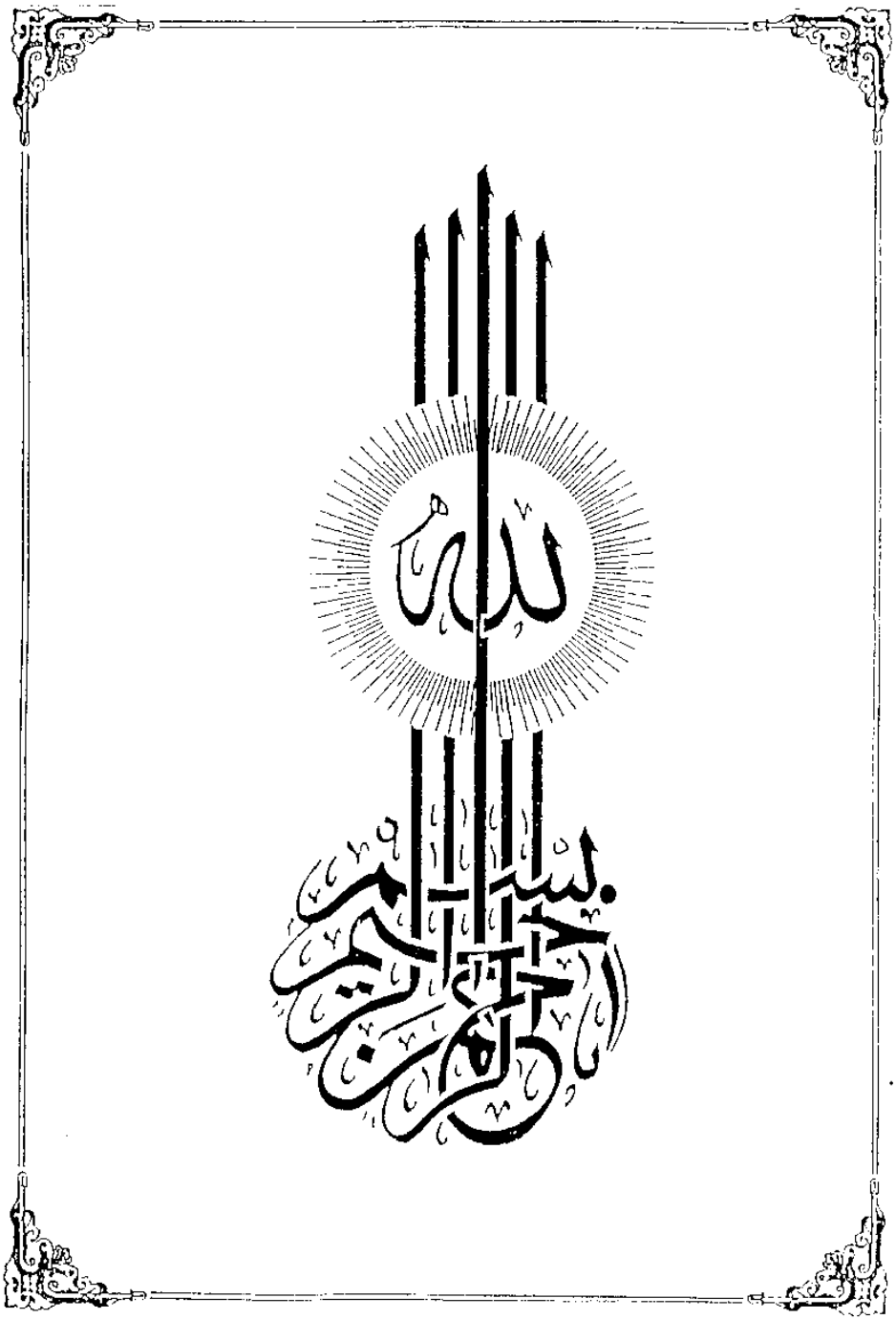

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INTRODUCTION AND AIM OF THE WORK

Hepatic schistosomiasis, our major national problem, needs further assessment to establish the best liver functions that can be used duing the different stages of the disease.

It is the aim of our study to evaluate in particular the Gamma Glutamyl Transpeptidase & Bromsulfalein tests in the different phases of hepatic schistomiasis.

Needless to say, such study will help in the management of our Bilharzia patients and for better assessment of pre and post operative conditions of the patients.

We hope that the work will serve such problems.

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Anatomy of The Liver (1)

The liver is the largest organ in the body, weights 1200 - 1500 gm and comprises one-fifth of the total body weight. In infancy, the liver is relatively larger, comprising one-eighteenth of the birth weight. This is mainly due to a large left lobe, which accounts for bulging abdomen in infants.

The liver lies chiefly in the right hypochondrium sheltered by the ribs. It is shaped like a pyramid whose apex reaches the xiphisternum. The upper border lies approximately at the level of nipples. There are two anatomical lobes, the right being about six times the size of the left in adults, but only three times as large in infancy. The right lobe comprises the quadrate lobe, on its inferior surface, and the caudate lobe on the posterior surface. The right and left lobes are separated anteriorily by a fold of peritonium called the falciform ligament, inferiorly by the fissure for the legamentum venosum.

Blood Supply (2)

The liver has a double blood supply. The portal vein brings venous blood from the intestine and the spleen and the hepatic artery, coming from the coeliac axis,

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supplies the liver with arterial blood. These vessels enter the liver through a fissure, the porta hepatis, which lies on the inferior surface of the right lobe. T he portal vein divided into two branches which further divide into small portal venules. These lie in the portal tracts or spaces together with branches of the hepatic artery and bile ducts. Their blood pours into the sinusoid. Two separate but adjacant blood streams run in the portal vein. The right one, brings blood from the small intestine and proximal half of the colon, divides into the right portal branch to most of the right hepatic lobe; while the left stream, bringing blood from stomach, spleen and distal half of the colon (and, therefore is of low nutritive value) goes through the left portal branch to the functional left lobe of the liver (anatomical left lobe and left part of anatomical right lobe). The portal vein supplies most of the blood going to the liver, and also the major part of the necessary oxygen. The average portal pressure is 7 mmHg.

The hepatic artery divides also into two branches that accompany those of the portal vein; the ultimate small tributaries and into the sinusoids. It is responsible for 10-30 %. of hepatic blood which is of high O_2 content. Its pressure is 120/80 mmHg. The sinusoids

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are blood spaces lying inbetween sheets of liver cells which have no basement membrane. Therefore allowing for free interchange between the cells and blood. In them blood from portal and hepatic vessels are poured. Sinusoids end into the central vein; in their walls are kupffer cells which form part of the reticulo-endothelial system. T he central veins run in a plan' horizontal to that of the portal tracts. They carry blood from the sinusoids to the interlobular veins, which in turn unite to form sublobular veins, ending in two hepatic veins which enter the inferior vena cava very near to its points of entery in the right auricle.

Lymphatic vessels :

Terminate in small groups of glands around the porta hepatis. Efferent vessels drian into gland around the coeliac axis. Some superficial hepatic lymphatics pass through the diaphragm in the falciform ligament and finally reach the mediastinal glands. Another group accompanies the inferior vena cava into the thorax and ends in a few small glands around the intrathoracic portion of the inferior vena cava.

The ligamentum venosum :

A slender remnant of the ductus venosus of the foetus, arises from the left branch of the portal vein and fuses with the inferior vena cava at the enterance

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of the left hepatic vein. The ligamentum teres, aremenant of the umblical vein of the foetus, runs in the free edge of the falciform ligament from the umblicus to the inferior border of the liver and joins the left branch of the portal vein. Small veins accompanying it connect the portal vein with veins around the umblicus. These become prominant when the portal venous system is obstructed inside the liver.

Bile Ducts :-

Bile formed in the liver cells passes into the fine canaliculi or capillaries, which are spaces inbetween the hepatic cells. Towards the periphery of the lobule bile capillaries become wider and lined by cubical endothelium; thus forming bile ductules or cholangioles, which in turn, end into the interlobular bile ducts. These unite to form two hepatic bile ducts which emerge from the hepatic fissure and unite to form the common hepatic duct.

The gall bladder :

It lies in a fossa extending from the inferior border of the liver to the right end of the portahepatis. the liver is completely covered with peritaneum except. in three places. It comes into direct contact with the diaphragm through the bare area which lies to the right of the fossa for the inferior vena cava. The other

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areas without peritoneal covering are the fossae for the inferior vena cava and gall bladder.

The liver is kept in position by peritoneal ligament and by the intra - abdominal pressure transmitted by the tone of the muscles of the abdominal wall.

Surface Anatomy

The upper border of the right lobe is on a level with the 5th rib at a point 2 cm medial to the right mid-clavicular line (1 cm below the right nipple). The upper border of the left lobe corresponds to the upper border of the 6th rib at a paint in the left mid-clavicular line (2 cm below the left nipple). Here only the diaphragm separates the liver from the apex of the heart. The lower border passes obliquely upwards from the 9th right to the 8th left costal cartilage. In the right nipple line it lies between a point just to 2 cm below the costal margin. It crosses the mid-line about mid-way between the base of the xiphoid and the umbilicus and the left lobe extend only 5 cm to the left of the sternum.

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Anatomical abnormalities

(1) Accessory Lobe (3) :

The liver may be occassionly divided into distinct 8 separate lobe by strands of connective tissue. The lobes are small up to sixteen in number have been separated. They are usually on the under surface of the liver so that they are not detected clinically, but noted accidentally at operation or post mortum. Rarely, they are intrathoracic. An accessory lobe may have its own mesentry containing hepatic artery, portal vein, bile duct and hepatic artery.

(2) Reidel's Lobe (4) :

Is fairly common and is a downwards tongue like projection of the right lobe of the liver. It is a simple anatomical variation and is not a true accessory lobe, this condition is much more frequent in women. It is detected as a mobile tumour on the right side of the abdomen, which descends with the diaphragm during respiration. It may cause confusion with other tumours in this area especially a visceroptotic kidney.

(3) Cough furrows of the liver :

Are parallel grooves on the convexity of the right lob. They are one to six in number and run anteroposteriorly, being deeper posteriorly. They are more common

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in females and discovered at autopsy and are usually associated with chronic cough.

(4) Atrophy of the left lobe (5) :

Severe atrophy confined to the functional left lobe of the liver is not uncommon post-mortum finding the usual cause is interference with the left branch of the portal vein.

Histology of the Liver Cells

The liver cells comprise 60 per cent of the liver. They are polyhedral and are approximately 25 - 35 μ in diameter. The nucleus is single or less often multiple and divide by mitosis.

Potential spaces between the hepatic cells and the walls of the sinusoid are called the spaces of Disse. These are only seen in necropsy sections . They contain tissue fluid which flows outwards into lymphatics in the portal tract.

Electra microscopy (6) (7):

The liver cell margin is straight except for a few anchoring pegs (desmosomes). From it equally sized and spaced microvilli project into the lumen of the bile canaliculi. Along the sinusoidal border, irrigularily sized

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and spaced microvilli project into the perisinusoidal tissue spaces. This microvillus structure indicates active secretion or absorption, mainly of fluid.

The nucleus has a double contour with pores allowing interchange with the surrounding hyalaplasm.

The mitochondria also have a double membrane, the inner being invaginated to form grooves or cristae. An enermous number of energy providing processes take place within them as phosphorylation and glycogen synthesis. They contain many enzymes as cytochrome oxidases.

The rough endoplasmic reticulum consist of ribonucleoprotein and appears as basaphilic granules. They synthesize specific hepatic proteins particularily albumin and proteins used in blood coagulation.

The smooth reticulum contains the microsomes. It is the site of bilirubin conjugation and the detoxication of many drugs as well as steroid synthesis.

The lysomes are pericanlicular dense bodies adjacent to the bile canaliculi. They contain many hydrolytic enzymes which, if released, could destroy the cells. They are probably intracellular scavengers which destroy organelles with shortened life spans.

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The golgi apparatus consists of a system of particles and vesicles again lying near the canaliculus. It may be regarded as a packaging site for excretion into the bile.

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Pathophysiological Aspects of the Liver

(1) Carbohydrate metabolism (8)(9) :

Carbohydrates are absorbed from the intestine in the form of monosaccharides and disaccharides the completion of digestion of disaccharides into monosaccharides is performed by the disaccharidase enzymes present in the intestinal mucosal cells. Monosaccharides then pass into the portal circulation and reach the liver, which plays an important role in their metabolism. The first step is conversion of other monosaccharides (galactose and fructose) into glucose. The glucose is stored as glycogen in the liver, a normal liver contains about 70-100 grams of glycogen.

Glycogen is the most suitable form to store carbohydrate because being insoluble it exerts no osmotic. Pressure, thus does not disturb the intracellular fluid content and it has a higher energy level than a corresponding weight of glucose. In addition, the glycogen molecule is readily broken down under the influence of enzymes into glucose and lower intermediates to liberate energy. The average glycogen content of the liver is 5 percent of its weight. The liver glycogen is derived from :

1- The hexose monosaccharides; glucose, fructose and

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