A STUDY OF THE INTRAOCULAR PRESSURE CHANGES IN CHRONIC LIVER DISEASES WITH ASCITES

THESIS
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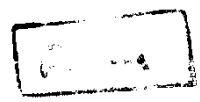

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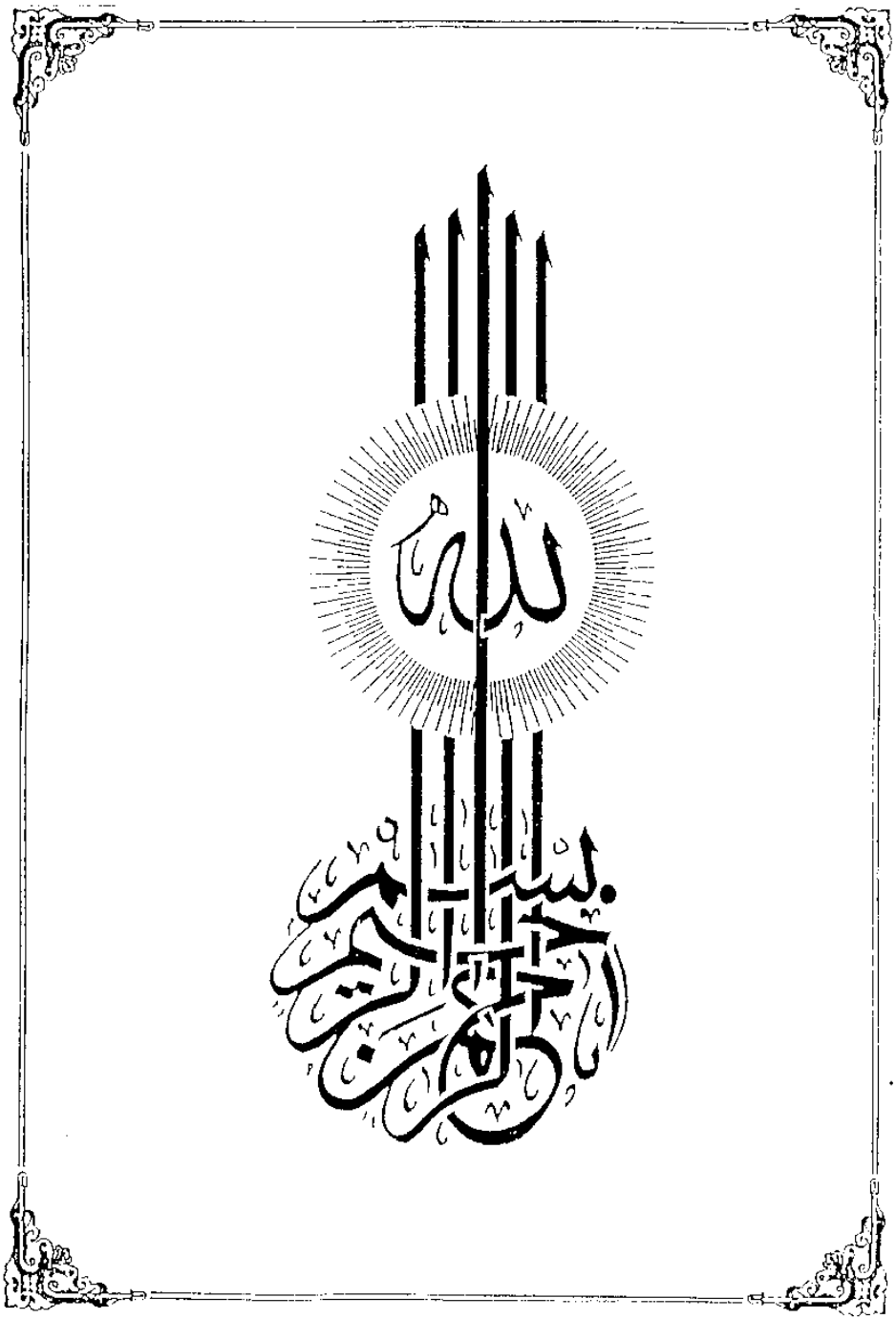

C O N T E N T S

INTRODUCTION

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The intra-ocular pressure within the eye is subject of physiological and pathological variations in response to many changes or alterations in the dynamic forces responsible for the formation and drainage of the aqueous humor at the region of the ciliary epithelium and the angular recess of the anterior chamber. These changes are affected by ocular, extraocular and sometimes systemic factors (Duke-Elder, 1969 -12-).

Obstruction of the venous return away from the eye results in marked increase in the episcleral venous pressure with subsequent ocular hypertension. This occurs experimentally in such events as, passing a ligature around the neck, Compressing the thorax or compression of the abdomen and the valsalva's maneuver (Comberg & Stower, 1926 -11-)(Adler, 1970 -24-).

In cases of dehydration and hypertonicity of the circulation, the intaocular pressure is markedly reduced The same is produced by the use of glycerol by mouth or the intravenous infusion of mannitol,

On the other hand, the intraocular presure temporarily increases in the water drinking test(Adler, 1987 -8-) .

In chronic liver diseases with ascites, there are many factors which may be incriminated in the pathogenesis of ascites and other pathological phenomena in the

body, primarily hepato-cellular dysfunction and portal hypertension, among these are haemodynamic , vascular, biochemical and hormonal disturbances which lead to salt and water retension with generalised venous engorgement and hyperdynamic circulation (Graham H. Jeffries 1975).

Added to these factors, some immune complexes escape the hepatic reticuloendothelial filters into the systemic circulation and may precipitate in distant organs e.g. the renal glomeruli (Sherlock S., 1985) .

From the above mentioned pathophysiological sequelae of chronic advanced liver diseases with ascites , one may try to illuciclate the correlative changes in the intraocular pressure that may occur in such patients.

REVIEW OF LITERATURE

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In patients with chronic liver diseases affecting the hepatic cell function, the appearance of ascites indicates a profound impairment of hepatic and splanchnic hemodynamics secondary to portal hypertension.(V. Arroyo, et. al., 1986)(Guiton, 1976).

Owing to the differences in the functional characteristics of both the hepatic and the splanchnic circulations, ascites is a frequent complication in diseases causing sinusoidal(intrahepatic) portal hypertension e.g. hepatic cirrhosis, severe alcoholic hepatitis and hepatic vein obstruction (Budd Chiari Syndrome) , while it is uncommon in presinusoidal portal hypertension.

The sinusoidal wall is almost completely permeable to high molecular weight substances including albumin (pore size up to one micron) which will escape with fluids to the space of Disse. This space is connected with terminal lymphatics. (Guiton, 1976).

The flux of fluid between the sinusoidal lumen and the interstitial space is influenced only by differences in hydrostatic pressures without any contribution of oncotic forces.(V. Arroyo, et. al., 1986) In contrast, the splanchnic capillaries, as elsewhere , are

minimally permeable to plasma proteins and are autoregulated through the precapillary and post capillary muscle tone. Therefore, the low permeability and the autoregulation would limit the passages of fluid into the planchnic interstitial spaces. On the other hand every one mm Hg elevation of the sinusoidal portal pressure is followed by a 60% increase in hepatic lymph production(V. Arroyo, et. al., 1986). This is controlled through some regulatory blowoff value mechanisms which eventually accomodate the fluid in the thoracic duct and peritoneal cavity.

In some experimental animals and in patients with cirrhosis and ascites, the thoracic duct lymph flow may amount up to 8-20 L/day, in contrast to the 800 - 1000 ml/day in non-cirrhotic subjects (V. Arroyo, et. al. , 1986).

Physiological and hemodynamic considerations:

1- The portal venous blood flow is about 1000-1200ml/minute with a portal vein pressure about 7 mm Hg (Sherlock S. 1985).

2- The hepatic vein flow is about 1600ml/minute with a hepatic vein pressure about 4 mm Hg.

3- In normal conditions, 100 % of the portal vein blood can be recovered from the hepatic vein , whereas in cirrhosis only 13 % may be obtained. the remainder enters the collateral channels (Sherlock S., 1985).

4- The peritoneal cavity is subject to fluid filtration and dynamic exchange of substances as many other serous cavities in the body. It is more susceptible to the development of excess fluid than most of the other cavities for two reasons:

i - If the pressure rises in the hepatic sinusoids at any time more than 5-10 mm Hg a large amount of a protein-rich fluid(Almost 90 % similar to plasma) begins to transudate through the liver surface into the peritoneal cavity (Sweating)(Sherlock S. 1985)(Guiton, 1976).

ii- The capillary pressure in the visceral peritoneum is probably higher than elsewhere in the body due to the high resistance to portal blood flow through the liver. (Guiton, 1976).

5- The rate of secretion of aldosterone by the zona glomeruloza cells of adrenal cortex is

largely controlled by a very potent feed-back mechanism, the hallmark of which is the tremendous increase(three fold) in aldosterone secretion in response to a very minute increase in extracellular fluid potassium ion concentration(less than 1 m Eq./liter). This increase of aldosterone concentration causes a marked increase in renal potassium excretion and a powerful increase in tubular sodium reabsorption.(Guiton, 1976) The renin-angiotensin system also plays an essential role in the regulation of aldosterone secretion but the extracellular fluid potassium concentration is 100 times more potent.(Guiton, 1976).

6- Although aldosterone has a great and power ful effect on renal tubular sodium reabsorption, it plays a very little effect on sodium concentration in the extracellular fluid. This is discussed as follows;: aldosterone causes reabsorption of sodium which simultaneously causes water reabsorption and increase in the extracellular fluid volume which leads to an increase in the arterial pressure. This will increase the glomerular filtration rate thus the rapid flow of filtrate compensates for the effects of aldosterone on tubular reabsorption and therefore nullifies the effect on sodium concentration in the extracellular fluid. Indeed,

even in patients who have primary aldosteronism, with tremendous amounts of aldosterone, the sodium concentration still rises only 2-3 m Eq. above normal. In contrast, the body osmolality (Sodium concentration of extracellular fluid) is more powerfully controlled by the Antidiuretic hormone-thirst mechanism through stimulation of the osmoreptors present in the supra optic nuclei of the anterior hypothalamus.(Guiton, 1976).

7- Since several studies have shown that in cirrhotics, the hepatic blood flow is normal or even increased, it follows that there must be marked increase in splanchnic blood flow secondary to arteriolar vasodilatation which could be induced by portal hypertension due to an unknown mechanism.(V. Arroyo, et. al., 1986).

Hepato - cellular functional abnormalities:

These may complicate almost all forms of liver diseases. The syndrome is a functional rather than an anatomcial, since no constant hepatic pathology has been demonstrated.(Sherlock S. 1985).

It comprises some or all of the following features:

1- Generalised failure of health.

2- Jaundice.

3- Circulatory changes and cyanosis.

4- Fever.

5- Neurological changes.

6- Ascites.

7- Changes in nitrogen metabolism.

8- Skin and endocrine changes.

9- Disordered blood coagulation.

Jaundice: This is largely due to failure of liver cells to metabolise and excrete bilirubin. In the cirrhotics, it is mild or even absent due to the balance between necrosis and regeneration (Sherlock, 1985).

Circulatory changes: Hyper kinetic circulation as manifested by:

- Flushed extremities.
- Collapsing pulse.
- Capillary pulsation.

There is increase in the cardiac output, the splenic and splanchnic blood flow and peripheral blood flow, meanwhile, there is reduction of the renal cortical perfusion which will be explained later.

The vasomotor tone is decreased resembling cases of arterio-venous fistulae. It seems possible that large numbers of normally present but functionally inactive

anastomoses have opened under the influence of a vaso dilator substance.

It is Said that false neurotransmitters of gut origin may be related but this is unproven. (Sherlock, 1985).

There is a decrease in the systemic vascular resistance and an increase in the cardiac index.

Fever and Septicaemia: (Sherlock, 1985)

About a third of patients with active advanced cirrhosis show continuous low grade fever,rarely exceeds 38^{oc}, which is unaffected by antibiotics. Normally the human liver is bacteriologically sterile and the portal venous blood only rarely contains organisms . Such organisms, however, reach the general circulation Via:

a- Faulty hepatic filters i.e inhibited phagocytic capacity.

b- Portal systemic collaterals.

Patients with cirrhosis have been shown to develop Gram negative bacteriaemia in this way and spontaneous bacterial peritonitis and bacterial endocarditis are complications of such a condition.