Evaluation of Hepatobiliary Scintigraphy in Cases with Hepatocellular and Obstructive Jaundice

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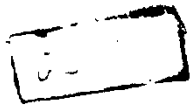

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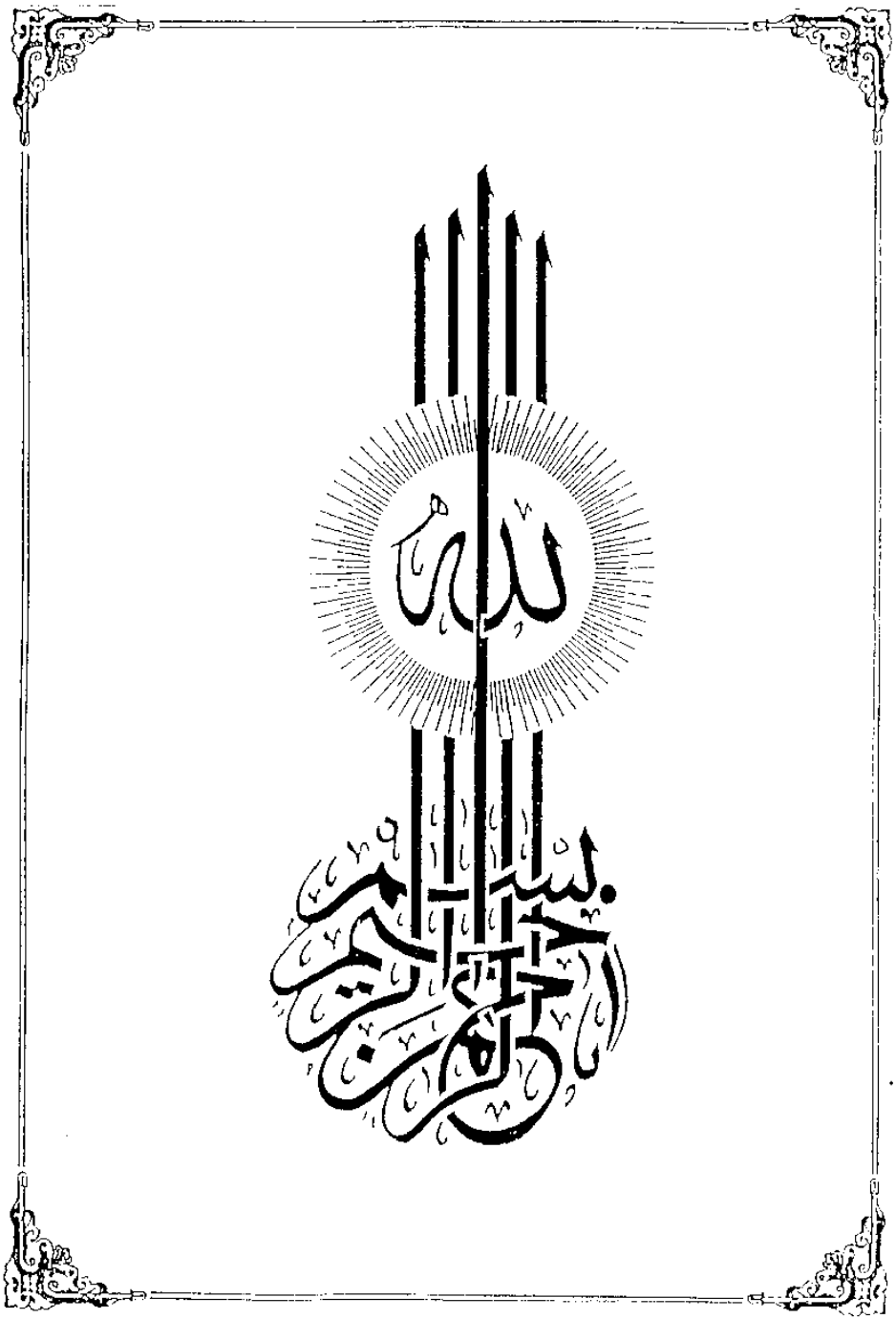

Dedication

To

My Dearest

Great Mother

CONTENTS

Introduction
and
Aim of the Work

Introduction and Aim of the Work

Jaundice can be caused by a variety of disorders. Apart from haemolytic aetiology, hepatocellular and obstructive causes are responsible for what is known as medical or surgical jaundice in a clinical practice.

Patient's clinical criteria and laboratory investigations are essential initial steps to identify the type and to predict the cause of Jaundice. However, establishing a diagnosis can hardly be complete without radiographic and / or imaging procedures.

There is no doubt that ultrasonography is the imaging investigation of first choice. **(Rosenthal, 1982).**

Considerations like the ease of study, the non- invasiveness, and the low cost are all contributing for such preference.

The information gained from sonography in a case of Jaundice are essentially anatomic data regarding the liver parenchymal appearance and the state of intra or extrahepatic biliary system.

The need to localize the site of obstruction or to determine the degree of hepatocyte function might not be satisfied by sonographic studies alone. Cholangiography, whether percutaneous, transhepatic or endoscopic retrograde techniques **[PTC and ERCP]** add essential diagnostic criteria in that respect.

However, these Procedures are rather invasive and necessitate a personal skill. Moreover, these techniques are also dependant on the anatomic resolution and diseases are recognized through disturbance of the normal anatomy.

On the other hand, hepatobiliary scintigraphy is a functional imaging technique, where the information gained reflect the physio - pathological changes. Hence cholescintirgraphy plays an adjuvant role and is used in those cases with technical difficulties or when unreliable results are present. Also whenever information about bile flow dynamics are required, scintigraply can be employed. **(Rosenthal, 1982).**

Hepatobiliary scanning does reflect the degree of hepatocyte function and the bile flow behavior and any abnormality is elected due to disturbed physiological integrity of the hepatobiliary system. Many literatures have discussed the role of cholescintigraphy in jaundiced patients, and there is an overall agreement that the information gained by such technique are unique and might add to the diagnostic efficacy of these cases.

On the other hand, hepatobiliatry scintigraphy has been employed as a simple reliable post-operative imaging modality. It seems that such imaging modality is helpful in monitoring the bile flow dynamics postoperatively, and further work is needed to assess its role in detecting abnormal bile flow sites after surgery. **(Robinson, 1986).**

Accordingly , the aim of this work can be put as follows :

1- To evaluate hepatobiliaryscintiraphy as a diagnostic tool and to compare it with other common imaging modalities such as sono graphy and contrast cholangiography.

2- To assess the limitation of the technique.

3- To evaluate hepatobiliary scintigraphy as a post-operative monitor.

Anatomical Considerations

Anatomy of the Liver

The liver is the largest organ in the body , forming approximately 1/40 of the weight of the adult and proportionately more in the child . It is roughly pyramidal in shape, with its base on the right its apex directed to the left. It occupies the right hypochondrium, the upper part of the epigastrium, and extends to a limited extent into the left hypochondrium. **(Romanes, 1981).**

Hepatic Lobes :

The liver is divided into a large right lobe and a much smaller left lobe. On the anterior surface the two lobes meet along the line of attachment of the falciform ligament. On the posterior & inferior surfaces the separation is by the fissure for ligamentum venosum and the fissure for ligamentum teres. The portion of the right lobe which adjoins the left lobe on the inferior and posterior surfaces is further subdivided into two smaller lobes termed the quadrate and caudate lobes . The quadrate lobe is somewhat rectangular in outline. It is bounded in front by the inferior border of the liver, on the left by the fissure for the ligamentum teres, behind by the portahepatis and on the right by the gall bladder fossa. The caudate lobe is situated on the posterior surface. It is bounded on the left by by fissure for ligamentum venosum below by the porta hepatis and on the right by the deep groove which lodges the upper portion of the I.V.C. It is connected to the rest of the right lobe by a narrow tongue of liver

substance, termed the caudate process, which lies immediately behind the porta hepatis. **(Warwick and Williams, 1984).**

Hepatic Surfaces :

The liver has anterior, superior, right and postero-inferior surfaces. The postero-inferior surface is the visceral surface, and the other four together form a curved diaphragmatic surface. The borders are rounded and ill- defined, except the inferior, which is sharp and separates the postero-inferior surface from the anterior and right surfaces.

The anterior surface is triangular in shape with the apex directed towards the left. Above the costal margins, it is in contact with the diaphragm, but in the epigastrium, where it escapes below the costal margins, it is related to the anterior abdominal wall. The superior surface is slightly convex to the right and to the left of the midline, between the convexities there is a slight depression, the cardiac depression. The right surface is convex and lies in contact with the diaphragm, opposite the seventh to the eleventh ribs in the midaxillary line. The diaphragm is separating its upper part from the lung and pleural cavity, its middle part from the pleural cavity, and its lowest part from the thoracic wall.

The postero-inferior (visceral) surface points downwards, backwards & to the left. Near its posterior border there is a centrally placed transverse fissure, the porta hepatis which serves for the passage, in order from before backwards, of the common hepatic duct, the hepatic artery, and portal vein. Attached to the margins of the porta hepatis is the right or free border of the lesser omentum. Between the right end of the porta hepatis and the inferior border of the liver there is a shallow de-

pression occupied by the gall- bladder. The fissure for ligamentum teres extends from the left end of porta hepatis to the inferior border of the liver. The visceral surface retains the impressions of the viscera with which it comes in contact.

The left lobe has a shallow gastric impression formed by the fundus and the upper part of the stomach. The quadrate lobe comes into contact with the pylorus and the superior part of the duodenum. To the right of the gall bladder the inferior surface has two well defined impressions . a posterior, formed by the upper part of the anterior surface of the right kidney, and anterior formed by the right colic flexure of the colon . Medial to the renal impression and posterolateral to the neck of the gall bladder, there is a sight cavity for the beginning of the descending part of the duodenum . **(Fig1 demonstrates the inferior surface of the liver and its relations).**

The posterior surface points backwards and is more extensive over the right lobe. It comes into contact with the posterior part of the diaphragm and with abdominal oesophagus. The inferior vena cana lies in a groove immediately to the right of the caudate lobe.

Much of the posterior surface of the right lobe is devoid of peritoneum thus forming a "bare area" of the liver.

The fissure for ligamentum venosum passes vertically on the posterior surface between the right and left lobes . **(Romanes , 1981).**

Hepatic Segments :

The recognized anatomical lobes of the liver are the right and left

lobes, separated by the falciform ligament, and the much smaller caudate and quadrate lobes.

Physiological lobes, of much more importance to the surgeon and radiologist, are also recognized as right and left lobes separated by a physiological fissure that extends in an oblique sagittal plane from the gall bladder fossa posteriorly and to the groove of the inferior vena cana surperiorly **(Fig. 1&2)** . No surface markings indicate this physiological fissure.

Vinyl acetate casts of the liver in which the hepatic veins are not injected demonstrate this " main boundary fissure".

The physiological divisions of the liver follow the anatomical distribution of the hepatic arteries, bile ducts , and portal vein.

The physiological fissure is occupied by the middle hepatic vein. No significant branches of the bile ducts, hepatic arteries, or portal veins cross the main lobar fissure, hence it is a relatively safe plane for surgical resections of the liver . The physiological resections of the right and left lobes are each subdivided by fissures into two segments.

An oblique right segmental fissure divides the right lobe into an anterior and a posterior segment. It runs from a posterior superior position inferiorly and anteriorly to the left lobe into a medial and a lateral segment. This left segmental fissure lies in the plane where the falciform ligament is attached to the parietal surface and is in line with the ligamentum venosum on the visceral surface. The medial segment of the left lobe corresponds to the guadrate of the left lobe corresponds to the quadrate lobe of the anatomist. Each segment has a superior and inferior area, with one specific major bile duct and artery for that area except the medial segment of the left lobe, which has double bile ducts and arteries

for each superior and inferior area. The caudate lobe is divided into three parts, the caudate process and the right and left parts of the caudate lobe proper.

Usually three bile ducts drain the caudate lobe and two arteries supply it - one bile duct for each part, one artery for the caudate process and the right half of the caudata lobe proper and one artery for the left part of the caudate lobe. **(Mc Nulty, 1977) .**

Peritoneal Attachments of the Liver :

The liver is completely covered by peritoneum except over a bare area on the right extremity of its posterior surface. It is connected to the diaphragm and the anterior abdominal wall, and to the stomach and duodenum by a number of peritoneal folds namely, the falciform ligament, the right left triangular ligaments, the coronary ligament and the lesser omentum.

The Falciform ligament is a sickle-shaped fold of peritoneum which connects the anterior surface of the liver to the diaphragm and anterior abdominal wall. Its free lower edge contains the ligamentum teres and the small para-umbilical vein.

The coronary ligament is formed by reflection of peritoneum from the upper and posterior parts of the diaphragmatic surface of the liver on the diaphragm. This ligament consists of an upper or anterior and lower or posterior layer. These layers meet at their extremities, their junction constitute the right triangular ligament which is continuous with the

peritoneum of the diaphragm. The upper layer of the coronary ligament is continuous with the right layer of the falcifrom ligament, while the lower layer is continuous with the right layer of the lesser omentum.

The left triangular ligament is formed by the left layer of the falciform ligament and the left layer of the lesser omentum. It connects the upper surface of the left loble with the under surface of the diaphragm.

The lesser omentum extends from the lesser curvature of the stomach and the first inch of the duodenum to the porta hepatis and the fissure for ligamentum venosum. The right part of the lesser omentum, that is the hepatoduodenal ligament, contains the bile duct at its free margin, the hepatic artery proper lies at the left of the duct, and the portal vein is behind it. **(Last, 1984).**

Surface Anatomy of the Liver :

In the midline its upper margin is in level with the xiphisternal joint, rising on the right as high as the 5th rib in the mid clavicular line and on the left to the 5th intercostal space. The liver does not usually extend beyond the left midclavicular line.

From the right mid axillary line the inferior border follows the right costal margin as far as the tip of the 9th costal cartilage, and then passes behind the anterior abdominal wall (below the infrasternal angle) towards the left 5th intercostal space. **(Hamilton, 1976).**