HEPATIC TRAUMA

Essay

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In
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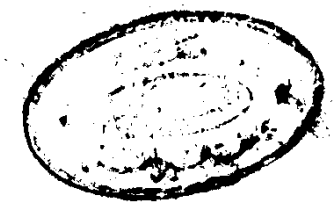

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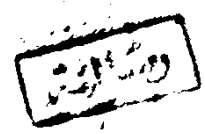

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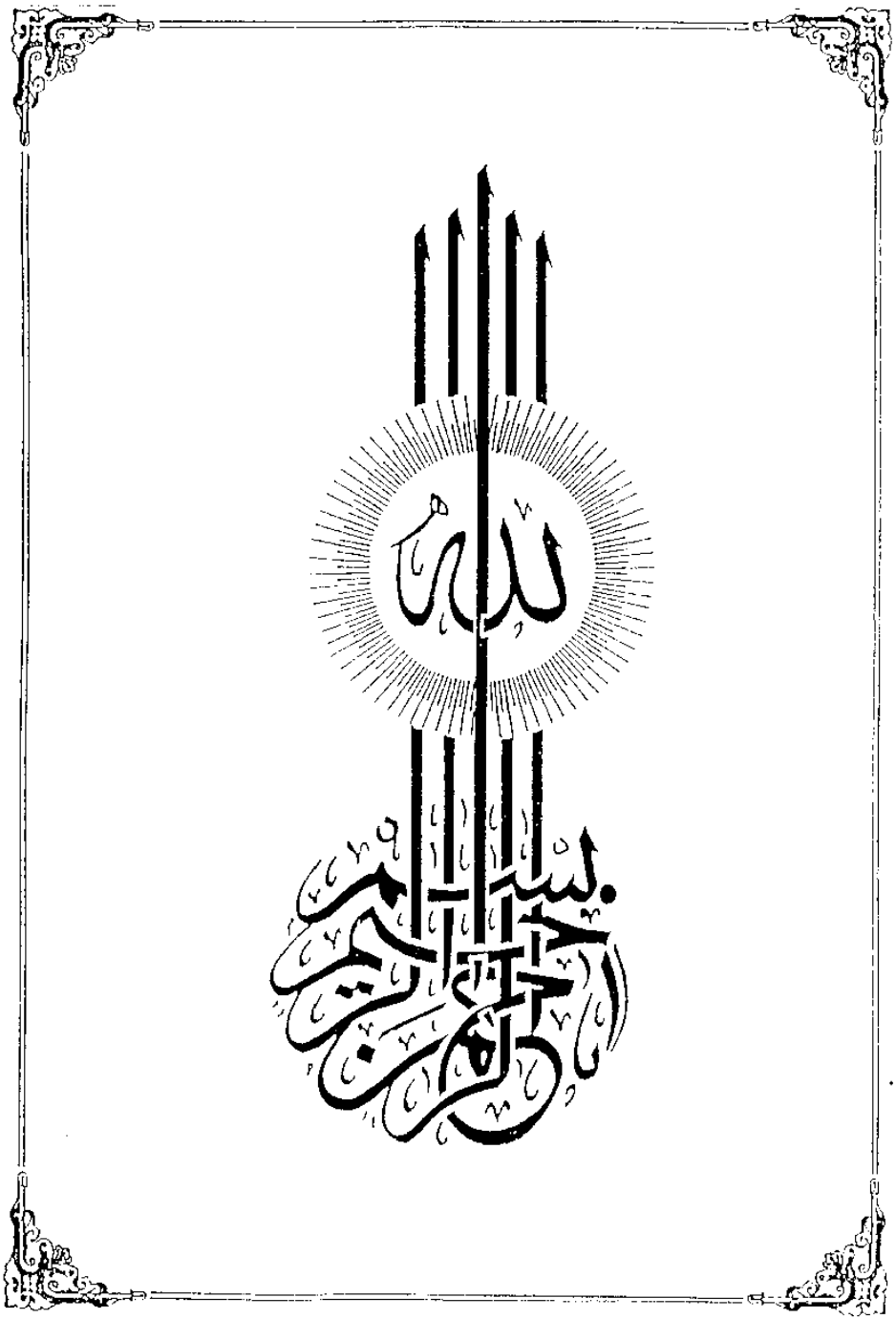

CONTENTS

Introduction

INTRODUCTION

Hepatic trauma is an important subject in trauma surgery. Its importance is due to many facts . The first is that the liver is the most commonly organ injured in patients with abdominal trauma . A liver injury is accompanied with high morbidity and mortality rates even in the specialized trauma centers . Inadequate surgical treatment of liver injuries may be the source of such major and potentially lethal complications .

Another fact is that the incidence and severity of liver injuries are as high as they were in the past ; indeed , one could argue that they are worse considering the more " advanced weapons " available to the general public and the frequency with which they are currently used . However , fortunately , trauma centers are much better able to deal with severely injured patients primarily because the trauma systems in most large cities are well organized and able to transport critically injured patients to hospitals rapidly .

In recent years there has been a continuing evolution in the management of patients with hepatic trauma . While , much remains the same , a variety of new diagnostic , operative , and preoperative techniques are being used . This essay will discuss the management and emphasize the changes that have , hopefully , decreased complications and improved survival in patients with hepatic injuries.

Review of Literature

Surgical Anatomy of the Liver

REVIEW OF LITERATURE

SURGICAL ANATOMY OF THE LIVER

Essential to the successful management of hepatic injuries is a comprehensive understanding of the surgical anatomy of the liver (Feliciano and Pachter , 1989).

The liver is the largest organ in the body , weighing approximately 1200 - 1500 gm in the adult . It is situated in the right upper quadrant and extends across the midline to the left upper quadrant . Despite protection by the overlying ribs and cartilages , it is still a commonly injured organ . (Ger , 1989).

SURFACES AND MARGINS :

The liver is wedge shaped , with the base of the wedge to the right and the apex to the left . The superior surface is moulded to the diaphragm and reaches the fifth rib on the right and the fifth space on the left .The diaphragm separates the liver from the lung and pleura as far as the eighth and tenth ribs respectively .

The inferior border is sharp and , on the right , lies just below the costal margin , from which it runs leftward to the level of the apex beat of the heart .

The anterior surface , lying between the superior blunt and inferior sharp margins , lies behind the ribs and cartilages , separated by the diaphragm , pleurae and lungs . A small portion in the epigastrium lies immediately behind the anterior abdominal wall.

The posterior and inferior surfaces merge into each other and are seen by elevating the anterior margin . The inferior concave surface presents a prominent porta hepatis for the passage of the major vessels and bile ducts and is related to structures that impress on the liver . These structures , from right to left , are right kidney and suprarenal gland , hepatic flexure of the colon , duodenum , oesophagus and stomach .

The posterior surface is largely retroperitoneal and lies in contact with the retrohepatic inferior vena cava and upper pole of the right kidney and suprarenal gland .

This retroperitoneal (bare) area is enclosed by the leaves of the coronary ligaments and access to this area can only be obtained by division of these ligaments. (Ger , 1989).

LIGAMENTS AND STABILITY OF THE LIVER :

With the exception of the gallbladder bed , porta hepatis , and the " bare area " , the liver has a peritoneal covering over its entire surface . In addition , the liver is surrounded by numerous important ligamentous structures . Safe and efficient mobilization of the liver cannot be achieved without an understanding of the relationship of these ligaments to the liver . Specific attention must be focused on the following structures : (1) the right coronary ligament , a diaphragmatic peritoneal reflection onto the parietal surface of the liver ; (2) the right triangular ligament , the right free lateral margin of the more centrally located right coronary ligament ; (3) the left coronary ligament , reflected onto the left hemidiaphragm ; (4) the left triangular ligament , a less developed structure than its counterpart on the right , which arises from the left coronary ligament and fuses as a single structure at the tip of the lateral segment of the left lobe to form the appendix fibrosa hepatis ; (5) the falciform ligament , which connects the liver with the diaphragm and anterior abdominal wall from the diaphragm to the umbilicus and incorporates in its free border the ligamentum teres which represents the oblilerated left umbilical vein ; and (6) the lesser omentum , connecting the liver with the lesser curvature of the stomach and first inch of the duodenum . In its right free margin (hepatoduodenal ligament) , it encloses the portal vein , hepatic artery and bile duct . This hepatoduodenal ligament forms the anterior boundary of the epiploic foramen of Winslow (Feliciano and Pachter , 1989).

The right and left coronary ligaments have both anterior and posterior leaflets . They do not , however , meet on the posterior

surface of the liver , thus creating a " bare area " . Medial and somewhat superior to the bare area lies the right adrenal gland with its short wide adrenal vein entering directly into the inferior vena cava . Extreme caution must be exercised during medial mobilization of the right lobe of the liver so as not to inadvertently lacerate this vein . Likewise , an awareness that the major hepatic veins lie within the bare area should prompt careful dissection when approaching this region (Feliciano and Pachter , 1989).

The position of the liver is maintained by the fibrous fixation of the bare area and , to a major degree , by the attachment of the hepatic veins to the inferior vena cava . The liver can be partially mobilized by entering this bare area by dividing the coronary ligaments and separating the organ from the diaphragm (Ger , 1989).

LOBAR AND SEGMENTAL ANATOMY :

The division of the liver into segments , which are delineated by fissures , and the distribution of the vascular and ductal structures , has led to a much more aggressive approach to liver surgery (Ger , 1989).

The description of the functional (surgical) anatomy of the liver was first initiated by Cantlie in 1898 and followed by the works of others . Couinaud's (1957) , although somewhat complex , is the most complete and its exactitude and usefulness for the surgeon have been proven by a large experience (Bismuth , 1986) . It is that description which is used in this essay .

Of the four fissures , only one is represented superficially , the portoumbilical fissure . The other three fissures are related to the three large hepatic veins .

Main Portal Fissure :

In 1898 Cantlie reported that the division between the true right and left lobes of the liver was not at the falciform ligament as had previously been believed , but rather at a line passing through the bed

of the gallbadder and projecting posteriorly toward the left side of the inferior vena cava , known as Cantlie's line , also called the main portal (median) fissure or scissura (Iwatsuki et al , 1989)

This line describes an angle of 75° with the horizontal plane opened to the left. The true right and left livers (hemilivers) are independent as regards the portal and arterial vascularization and the biliary drainage . The middle hepatic vein follows the main portal fissure (Bismuth , 1986).

Right Portal Fissure :

This fissure divides the right liver into two segments: anteromedial (anterior) and posterolateral (posterior) segments. It is represented by a line from the right margin of the inferior vena cava to a point on the inferior margin about mid-way between the gallbladder fossa and the right margin of the liver . Lying almost in the coronal plane , the fissure contains the right hepatic vein . The right portal fissure is inclined 45° to the right (Bisumuth , 1986).

Left Portal Fissure :

The left portal fissure divides the left liver into two sectors : anterior and posterior . This left portal fissure (scissura) is not the umbilical fissure since this fissure is not a portal scissura ; in a portal scissura , there is a hepatic vein , whereas in the umbilical fissure there is a portal pedicle . The left portal scissura is in fact , located posteriorly to the ligamentum teres and is found inside the left lobe of the liver where the left hepatic vein runs (Bismuth , 1986) . In another word it runs from the left side of the inferior vena cava to a point between the dorsal one third and ventral two thirds of the left margin of the liver (Ger , 1989) .

Portoumbilical Fissure :

This fissure is marked superficially by the attachment of falciform ligament , which contains the ligamentum teres hepatis in its inferior border . Angled less generously than the right fissure , it

meets the inferior margin of the liver at an angle of about 50° (Ger , 1989).

According to Couinaud's (1957) these right and left livers are divided by the right and left portal fissures (Scissurae) into four sectors. (Fig .1) . The right portal fissure divides the right liver into anteromedial (anterior) and posterolateral (posterior) sectors. Each of these two sectors is divided into two segments : anterior sector , segment V inferiorly and segment VIII superiorly , and the posterior sector , segment VI inferiorly and segment VII superiorly . The left liver is also divided by the left portal scissura into two sectors . The anterior sector is divided by the umbilical fissure into two segments : medially the segment IV , the anterior part of which is the quadrate lobe , and laterallly segment III which is the anterior part of the left lobe . The posterior sector is comprised of only one segment , segment II , which is the posterior part of the left lobe .

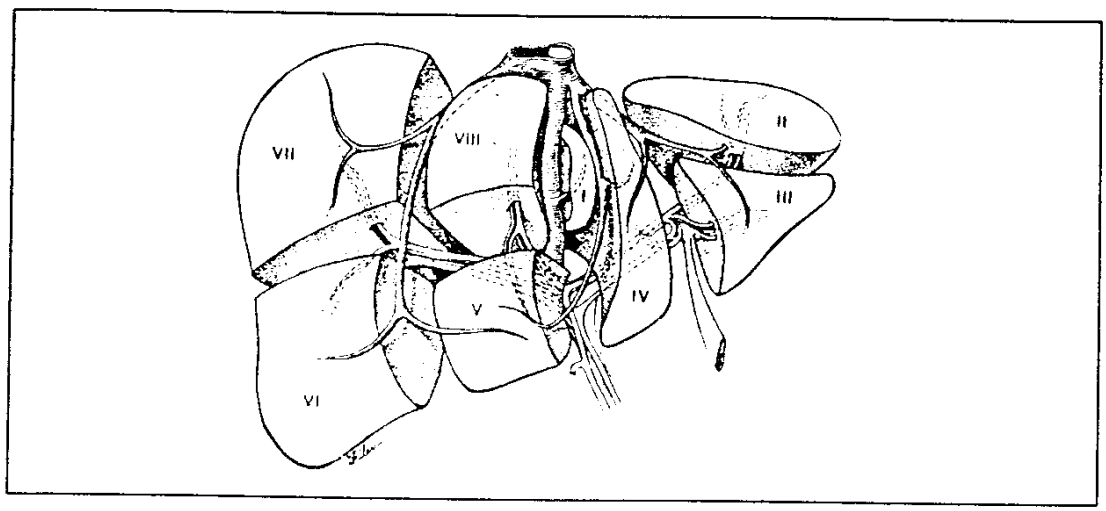

Figure 1

Couinaud's eight hepatic segments (subsegments) . (From Iwatsuki S , Sheahan DG , Starzl TE : The changing face of hepatic resection Curr Probl Surg 1989 ; 26 (5) : 281 - 179) .

However , some surgeons described the left liver as being divided by the falciform ligament into two segments : medial and lateral segment (Fig . 2) . The medial segment is segment IV and the lateral

segment is divided by the left portal fissure into two subsegments : Segment III anteriorly and segment II posteriorly (Iwastsuki et al, 1989).

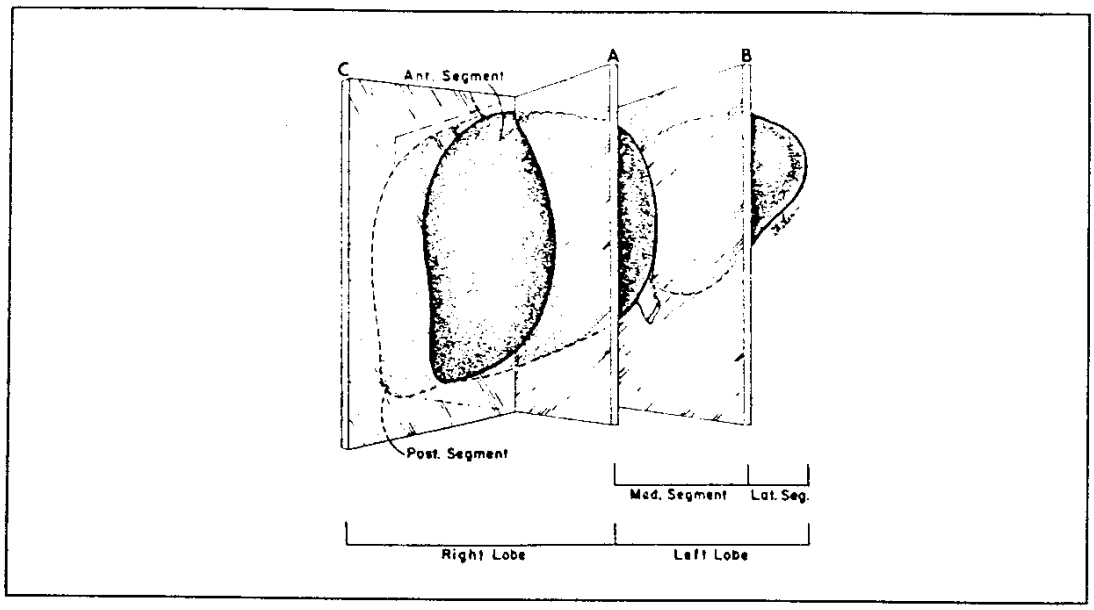

Figure 2

The liver is divided into the right and left lobes by a sagittal plane (A) . The left lobe is further divided into the lateral and medial segments by another sagittal plane (B) . The right lobe is divided into the anterior and posterior segments by a coronal plane (C) .

The Spigel lobe (or segment I) must be considered from the functional point of view as an autonomous segment , for its vascularization is independent of the portal division and of the three main hepatic veins . It receives its vessels from the left , but also from the right , branches of the portal viens and hepatic artery . Its hepatic veins are independent and end directly into the inferior vena cava . The autonomy of this third liver is revealed in some pathological circumstances , as in Budd- Chiari disease due to the obstruction of the three main hepatic veins the hepatic blood outflow is ensured through the Spigel lobe , which hypertrophies (Bismuth , 1986) .