BILIARY RECONSTRUCTION AFTER IATROGENIC INJURIES OF EXTRA HEPATIC BILIARY DUCTS

ESSAY

Submitted for partial fulfilment
of the Master Degree In General Surgery

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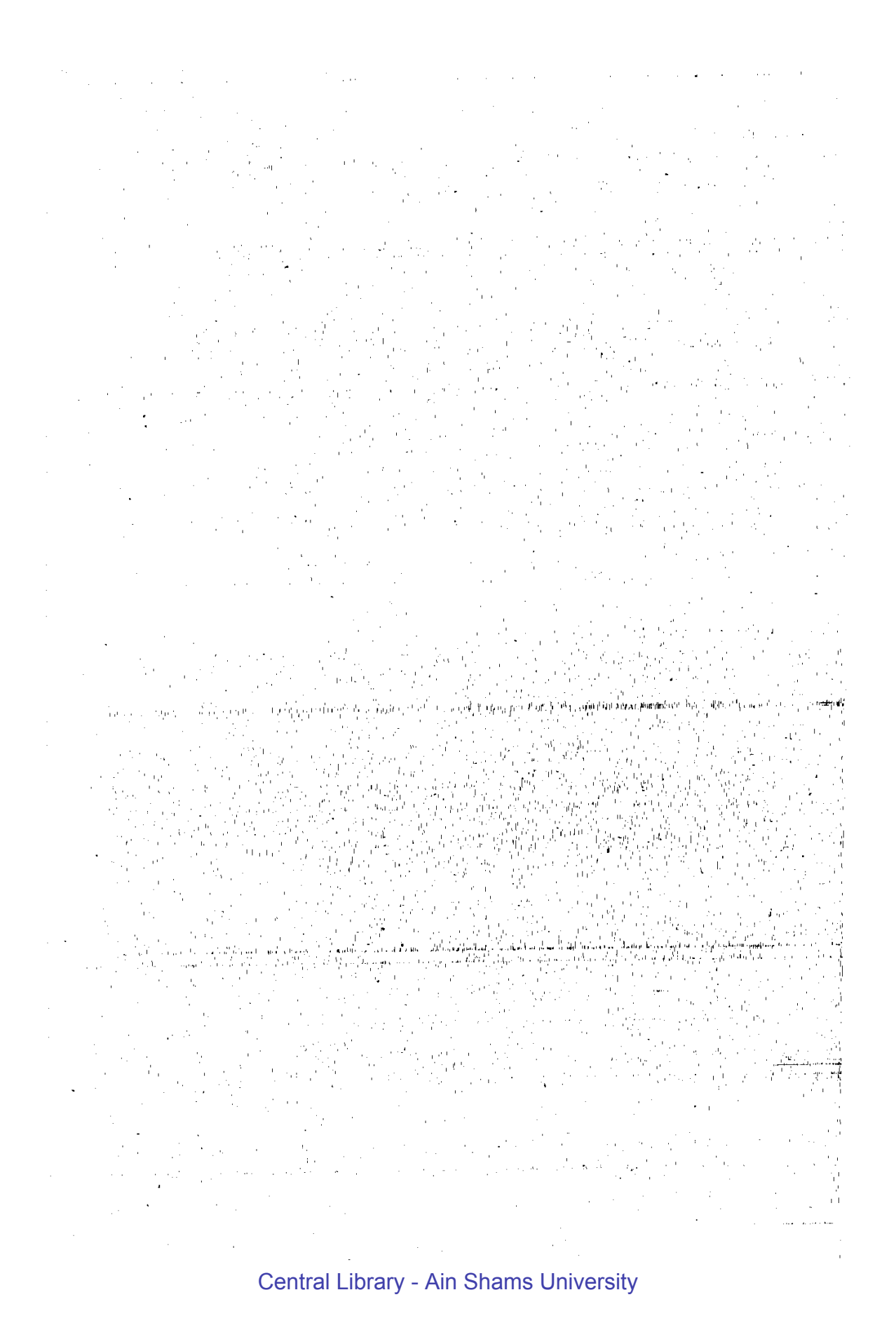
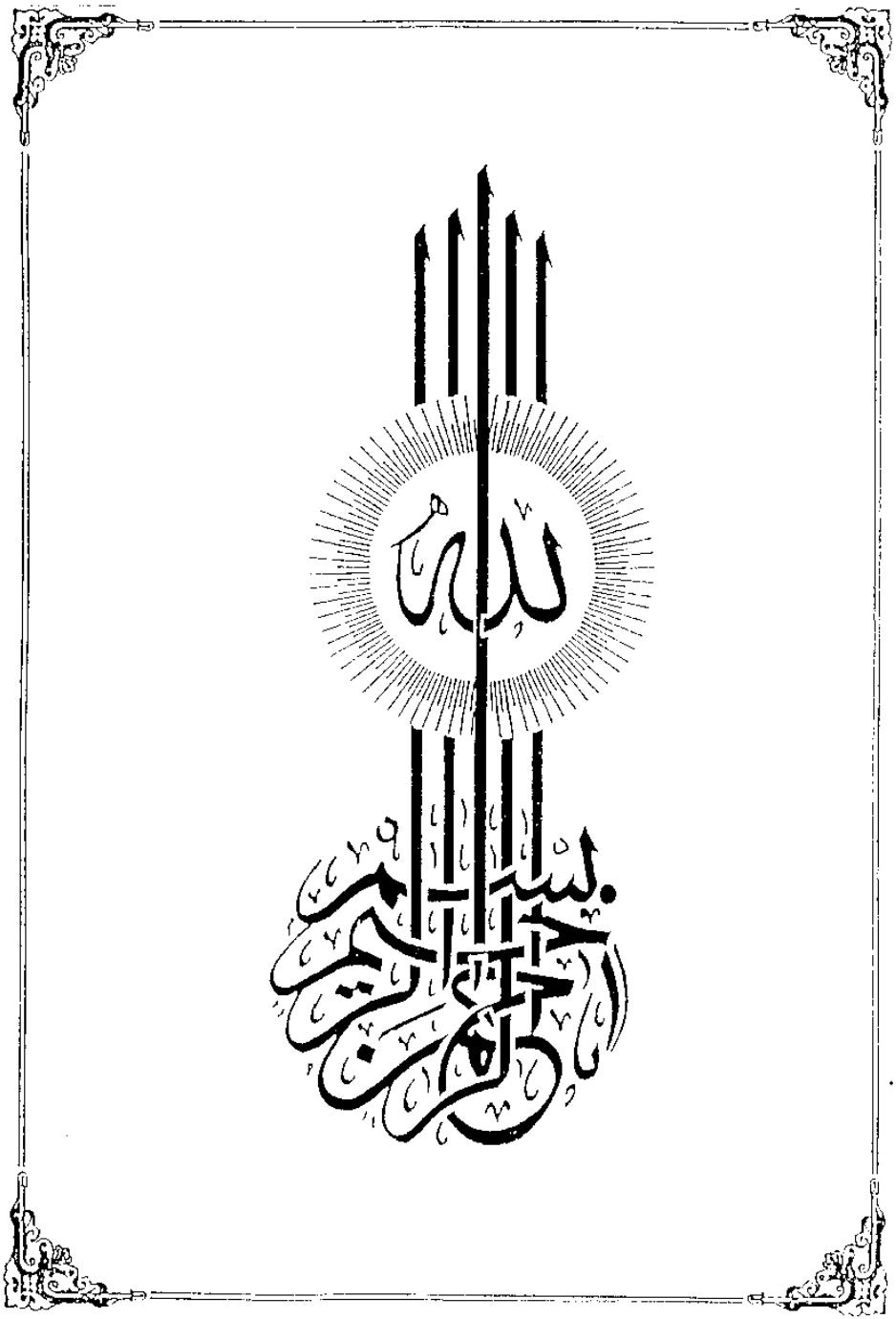
1996





بسم الله الرحمن الرحيم

وما أوتيتم من العلم إلا قليلاً

صدق الله العظيم

ACKNOWLEDGEMENT

First and foremost thanks to GOD , the most kind and most merciful .

I would Like to declare that I was fortunate to work under the super visien of this group of staff .

I wish to express my deepest appreciation to Prof Dr. Emam Fakhr , professor of general surgery , Faculty of medicine , Ain shams university , for his continuous super - vision , encouragement and unlimited help to complete this essay.

Also , my deepest gratitude is directed to Dr. Khaled Abd EL-Aziz Hosny , lecturer of general surgery , Faculty of medicine , Ain Shams university , For his continuous and kind effort in supervising this work . I would Like to take this occasion , to thank him for all what he has tought me.

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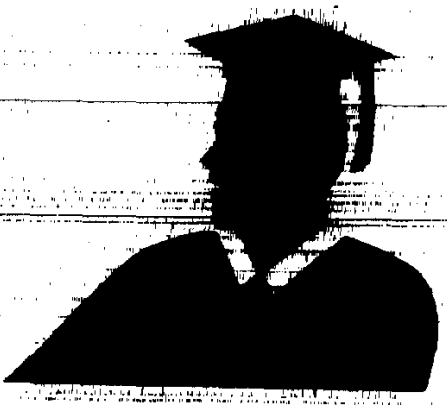

Introduction

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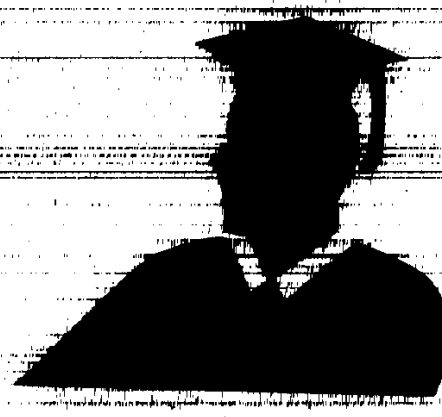
Operations involving the biliary tree, or even those performed upon upper abdominal viscera, may result in iatrogenic injury of the common bile duct, common hepatic duct, right and left hepatic ducts in 0.1% of cases. (Polk Jr. 1990)

These catastrophies may result in numerous morbidities and mortalities e.g. Biliary fistula, jaundice, biliary peritonitis ,septicemia ..etc.

Aim of the work:

In this essay these dangerous episodes together with various management modalities are going to be reviewed, with emphasis on the most recent approaches.



Anatomy

APPLIED SURGICAL ANATOMY Of THE BILLARY TRACT

Introduction

Biliary exposure is the most important step in any biliary operative procedure. A thorough knowledge of the anatomy of the biliary tract is essential if dissection is to be precise and error avoided. Thus intra-operative bile duct injury is generally due to inadequate bile duct exposure or failure to recognize variations in anatomy *(Blumgart and Smadja, 1988).*

Anatomical normality in the biliary tree :

Normality, in the sense of an anatomical pattern which is repeated in the majority of individuals, is a term which cannot be used in relation to the biliary tree. Variations is such that less than 50% of individuals exhibit a pattern common in even major details. Any attempt to define the normal anatomy of the biliary tree, therefore, would be artificial and misleading *(Benson & page, 1976).*

Each major area of the extrahepatic biliary tree and its related vessels will be considered separately, and the most important variational groups described.

BILE DUCTS AT THE LIVER HILUM

The ducts in the hilum may be encountered either deliberately during partial hepatectomy or when dealing with a tumour or stricture at the porta-hepatis, or accidentally in the course of a difficult cholecystectomy. It is important to note that some portions or both the right and left hepatic ducts, and hence their confluence, are always extrahepatic and therefore, accessible at the portahepatis *(Kune & Sali, 1980).* In some cases portions of the major tributaries of the right and left ducts are also outside the liver.

Right hepatic duct (RHD) :

Healey and Schroy (1953) clearly demonstrated that each area of the liver has its own namable bile duct which drains into major segmental ducts.

The functional right lobe (that part of the liver to the right of the lobar fissure, marked by the gall bladder fossa and inferior vena cava)comprises two segments, anterior and posterior. In 75% of individuals, the right anterior and posterior segmental ducts join to form a true right hepatic duct, i.e a single channel carrying the whole bile output from the functional right lobe. In the remaining 25%, there is no true RHD, the segmental ducts emptying into the left hepatic duct (LHD) separately. This important point has bearing on the question of the so called accessory bile ducts . Among individuals (75%) in whom a true right hepatic duct is present , it is wholly extrahepatic . The extra heptic segment is of variable length , being 1.0-2.5 cm long in 80% of cases , but may be up to 6 cm ***(Kune and Sali , 1980).***

In about 25% od cases , the right anterior and right posterior ducts do not join to form the right hepatic duct . Instead , the right posterior duct joins distally.

In these instances , there are three ducts emerging from the porta hepatis . In the past , the right anterior segmental duct was called an accessory duct . This is a mistake , since this is the only duct that provides drainage to the right anterior segment of the liver ***(Linder , 1987).***

The right hepatic duct is readily approached by dividing the peritoneum and fat overlying it in the portahepatis . The right hepatic artery runs inferior to it, while the right branch of the portal vein lies posterior to these two structures .

Left Hepatic duct (LHD) :

This structure is hardly ever seen during routine cholecystectomy , though it can be damaged during this procedure ***(Warrn , et al . , 1971).*** Unlike the right lobe , the left lobe is always drained by a single channel , the true left hepatic duct , and in most cases , all its tributaries are intrahepatic ***(Kune and Sali , 1980).*** The left hepatic artery usually runs below or behind the left hepatic duct . The left branch of the portal vein may , unlike the right branch , partly spirals around the upper border of its hepatic duct to form an anterior relation of the latter as the two structures pass into the liver substance.

The left hepatic duct courses to the hilus with the left branch of the portal vein and hepatic artery within a peritoneal reflection of the qastro-hepatic ligament which fuses with Glisson's capsule on the under surface of the quadrate lobe .

The confluence of the hepatic ducts :

The point at which the right and left hepatic ducts join is often known to surgeons as "the bifurcation" . From a functional stand point , however , the term "confluence" is more accurate . further as "bifurcation" suggests two branches . This term is especially inappropriate and misleading in those 25% of individuals in whom two right segmental ducts open separately into the left hepatic duct .

The confluence is always accessible in the normal individuals , beneath the peritoneum in the porta hepatis , infrequently , it is overlaid by the right hepatic artery . Sometimes , the right and left hepatic ducts have a long extrahepatic course , so that the confluence may lie well down into the free edge of the lesser omentum where it is liable to damage during cholecystectomy .

Common hepatic duct (CHD) :

This bile duct segment is of enormous surgical importance , being involved in two thirds of post-operative strictures ***(Warren , et al . , 1971).*** It is found by the final confluence of all ducts issuing from the liver and ends when the lumen of the cystic duct opens into it to form the common bile duct (CBD) . Its width does not differ significantly from the CBD . In most individuals , it is 2.5-3.5 cm in length ***(Flint , 1923)*** , but this is variable . It has an internal diameter of about 8 mm . In approximately 2% of cases , the common hepatic duct is non-existent , the cystic duct opens into the hepatic duct confluence ***(Benson and Page , 1976)*** . In 15%-20% the common hepatic duct extends downwards behind the duodenum before the cystic duct opens into it ***(Flint , 1923).***

The common hepatic duct lies in the right edge of the lesser omentum , with the common hepatic artery to its left and the portal vein situated posteriorly . Its important neighbours are the right hepatic artery , cystic artery and cystic duct . As the common hepatic artery normally bifurcates the hepatic bile duct confluence , the right hepatic artery has to cross the CHD to reach the liver . In about 90% of cases , the right hepatic artery passes behind the duct , while in the rest , it passes in front of the duct and is hence more prone to accidental injury ***(Daseler , et al . , 1974).***

The cystic artery usually arises in Calot's triangle and hence is not normally directly related to the CHD , however , in about 22% it arises from the right hepatic artery to the left of the CHD , hence crossing it anteriorly in 20% and posteriorly in the remainder ***(Daseler , et al . , 1974).*** It is in these individuals

that hurried attempts to secure a retracted bleeding cystic artery are especially dangerous ***(Maingot , 1980).*** The cystic duct normally joins the CHD at an angle , but in about 30% it is intimately bound to the right , anterior or posterior wall for a variable distance before the lumina join .

The gall bladder :

This least variable part of the biliary tree is usually globular , lying in its fossa on the under-surface of the liver . It is normally bound down to the liver surface by peritoneum except at its neck where the origin of the cystic duct is enveloped in serosa . Rarely , the whole gall bladder is on a mesentery , predisposing to torsion ***(Blumgart and Smadja , 1988).***

The blood supply of the gall bladder is by the cystic artery , which has multiple variations . Ignorance of these may provoke unexpected haemorrhage during cholecystectomy and may result in bile duct injury during efforts to secure haemostasis ***(Blumgart and Smadja , 1988).***

The venous drainage is via vessels running directly into the liver and several veins which join pericholedochal venous plexus and drain into the right branch of the portal vein .

Controversy surrounds the occurrence and clinical importance of the subvesical and cholecystohepatic ducts . The former is a duct which runs in the liver substance deep to the gall bladder fossa , and is present in about 50% of individuals ***(Balasegarem , 1970).*** These ducts may be damaged during cholecystectomy causing troublesome bile leakage ***(Kune and Sali , 1980).*** This risk contributes to the need for routine use of a drain following cholecystectomy . Despite some reports of a high incidence of cholecystohepatic ducts , these ducts are probably rare and usually secondary to disease rather than congenital ***(Kune and Sali , 1990).***

The cystic duct :

This structure is very variable in length and mode of union with the common hepatic duct . It arises from the neck of the gall bladder , usually rapidly narrowing to 1-3 mm internal diameter . In most people , the duct follows a straight oblique course to join the CHD, the junction is easily seen with minimal dissection in about 65% , while in the remainder , often deceptively , the duct runs a longer course , parallel with or spiraling around the CHD .

The distal part of the cystic duct in these circumstances is often incorporated into the wall of the CHD so that attempts to remove it entirely may lead to duct damage and stricture *(Warren et al . , 1971 , Kune and Sali , 1980).*

Calot's triangle :

This area . bounded by the cystic duct . the CHD and the inferior surface of the liver . is the key to cholecystectomy (Fig . 1) . The triangle includes the various structures to be sought or avoided when isolating the gall bladder . *Mossman and Coller (1951)* lighted the dangers of that area . The right hepatic artery . the aberrant right hepatic artery . when present . and a right posterior segmental duct . when present . are the structures being in danger in cases of accidental reach of a clamp placed on the cystic duct .

Common bile duct (CBD) :

Formed by the confluence of the common hepatic and cystic duct . the CBD is normally located in the free edge of the lesser omentum . It passes behind the pancreas to enter the second part of the duodenum .

The CBD is approximately 8.5 cm in length with an external diameter ranging from 4-19 mm. Formerly . the diameter of the CBD is taken in consideration during exploration . Nowadays . after the advent of operative cholangiography the individual importance of diameter as an indication for duct exploration has diminished . Sometimes . however . when the cholangiogram is difficult to interpret . duct diameter is useful parameter in the decision to explore . *Leslie (1968)* . in useful practical study . found that ducts below 9 mm in diameter never contained stones . while those over 17 mm always have distal obstructive pathology . hence deserving exploration *(Northover and Terblanche , 1982).*

It is helpful to describe the CBD as having three main parts each is about 2.5 cm long (Fig . 2) . These parts might be named surpraduodenal . retrodudenal and paraduodenal . Finally . there is an intraduodenal portion .

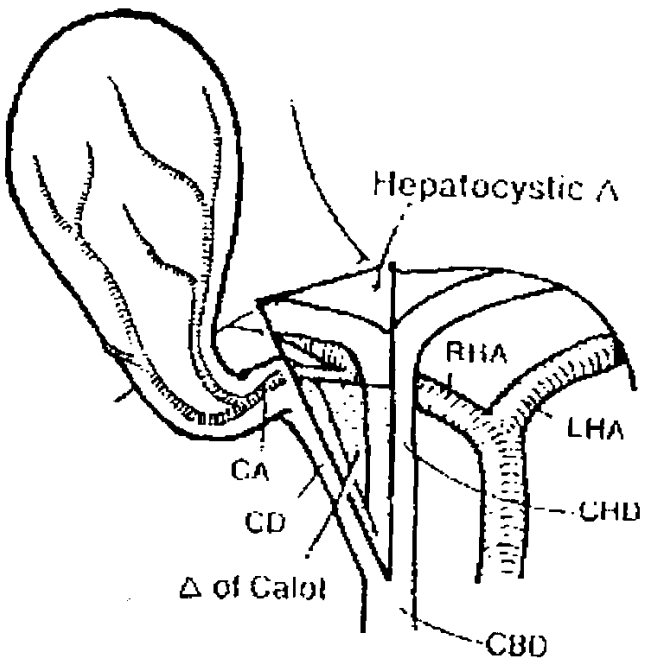


Fig . (1) :

The hepatocystic triangle and the triangle of calot . The upper boundary of the former is the margin of the liver , that of the latter is the cystic artery . The triangle of calot is stippled .