MANAGEMENT OF COMPLICATIONS OF BILIARY STONES

ESSAY

Submitted in Partial Fulfilment of
MASTER DEGREE
Of
GENERAL SURGERY

BY

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(M.B.B.Ch, 1984)

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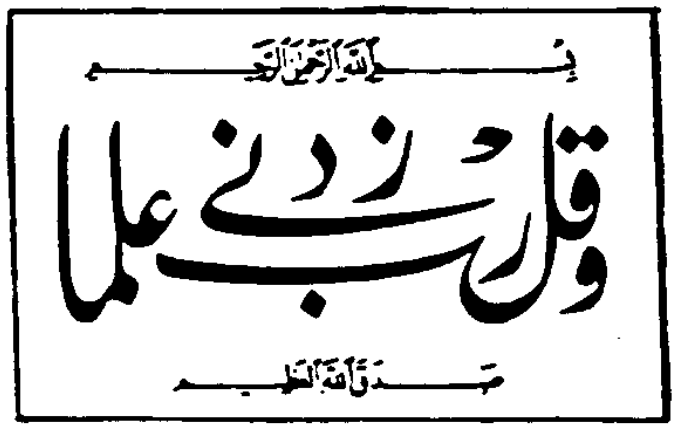
1989



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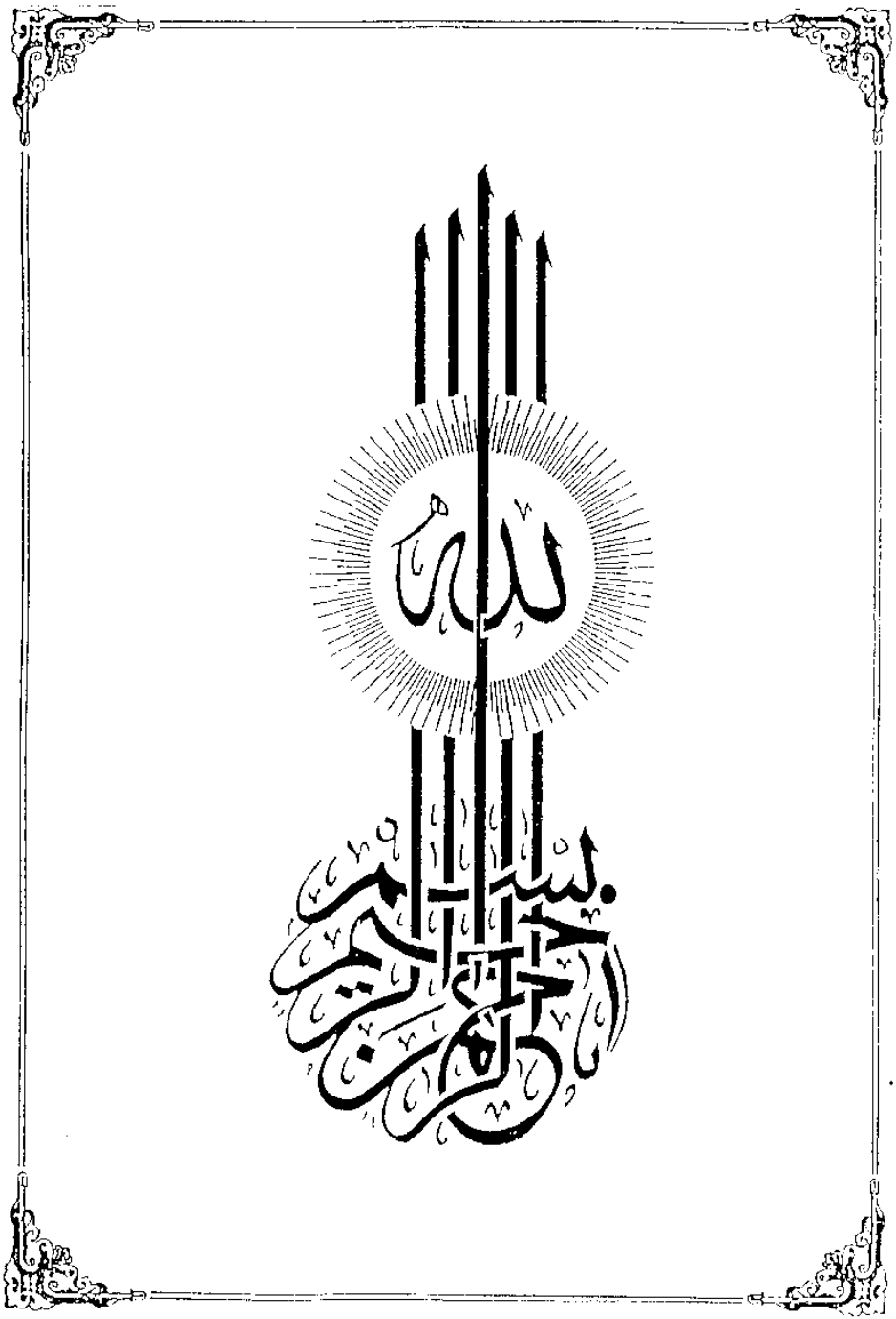


ACKNOWLEDGEMENT

I would like to express my deepest gratitude and sincere thank to ***Prof. Dr. Reda M. Moustafa****, Professor of Surgery, Ain Shams University, who most likely advised, encouraged and guided me in every step needed to push this study in its best way, his remarkable thoughts and notable orientations were of great value in the accomplishment of this study.*

CONTENTS

INTRODUCTION

There is a considerable evidence that man in different areas of the world has suffered from biliary tract disease, even before the era when history was first written **(Glenn and Grafe, 1966).**

Among the various problems of the biliary system stand gall-stones as one of the most important factors.

Complications of gall stones are numerous and comprise a predictable source of morbidity.

In this essay we are going to discuss complications of biliary stones and their different approaches of management.

CHAPTER I

ANATOMY

* ***Anatomy of the biliary tree:***

- The anatomy of the biliary tree is so variable that one should think of its normal anatomy as nonexistent. However, anatomical dissections have established a pattern considered normal which serves as a base line. One should recognize these variations as normal anatomical varieties.

- The normal anatomy consists of a right and left hepatic duct merging in the hilum of the liver to form the common hepatic duct **(Fig. 1)**. The latter descends in the lateral portion of the hepatoduodenal ligament and is joined on the right by a smaller more tortuous structure, the cystic duct. This duct drains the gall bladder, a saccular structure lying in its fossa of the liver. After the cystic duct opens into the common hepatic duct the latter becomes the common bile duct. This structure also continues in the lateral aspect of the hepatoduodenal ligament for a short distance then disappears behind the first part of the duodenum. The common bile duct then traverses the posterior portion of the first part of the duodenum and travels until it enters an oval window in the medial midportion of the second part of the duodenum. It is joined in the duodenal wall by the main pancreatic duct to form the ampulla. The ampulla then empties through an opening in a round elevation on the mucosal wall of the duodenum known as the major papilla **[Dowdy et al., 1962]**.

Embryogenesis of the biliary tract:

In the course of the fourth week of gestation, the embryonic foregut at its junction with the midgut, gives rise to the hepatic diverticulum. From the distal end of the diverticulum develops the parenchyma of the liver; the extrahepatic biliary tract and the gall bladder form from the proximal portion. At the start of the fifth week, all parts of the system are indicated. During this stage the future duct system like the duodenum itself is a solid cord of cells. Towards the end of the fifth week, growth of the left side of the duodenum initiates a shift of the attachment of the liver and the two pancreatic diverticula to their final position on the dorsal surface of the duodenum **(Fig. 2).** During the sixth week, the lumina of the ducts become established, starting with the common bile duct and progressively extending to the remainder of the system. The gall bladder remains solid until the twelfth week.

More than one duodenal opening of the common bile duct is not unusual at this stage. The lower one usually vanishes. The proximal portion of the hepatic diverticulum, the future common bile duct, become absorbed into the expanding duodenum so that the bile and pancreatic ducts enter the wall together [**Skandalakis et al., 1983**].

The Gall bladder

The shape of the gall bladder is approximately that of a pear, with a bulbous fundus at the distal end a middle corpus or body that tapers to a neck, and a proximal cystic duct that enters the common bile duct **(Fig. 3).** The organ is about 7 cm long and has

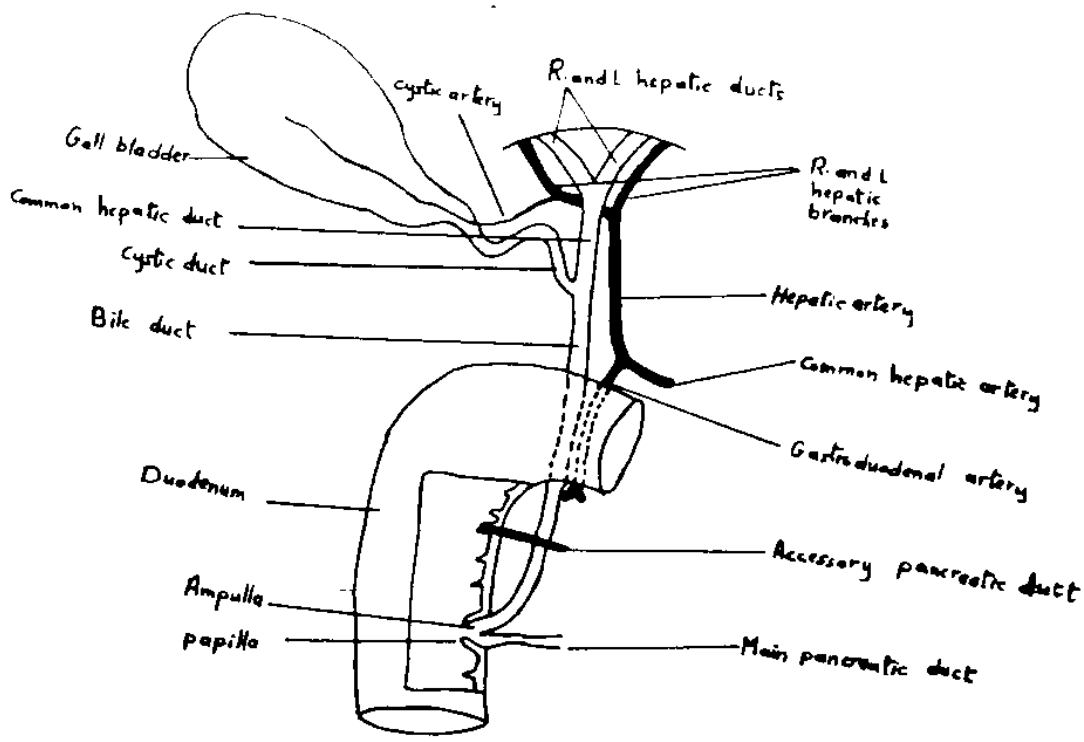


Fig. 1: The extrahepatic biliary tract (McMinn, 1974)

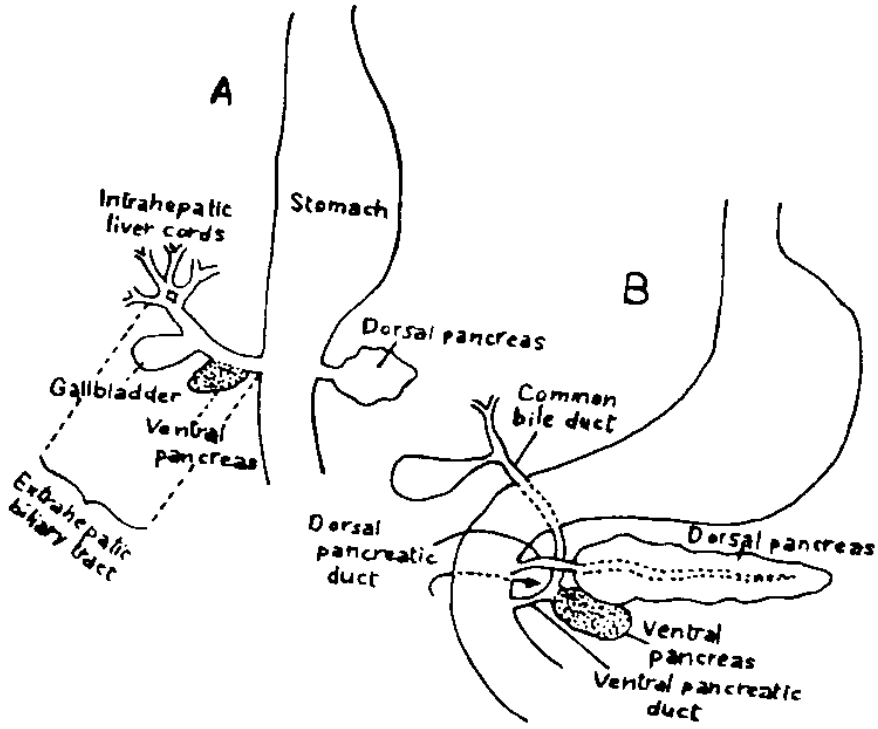


Fig. 2: The development of the extrahepatic biliary tract
A. The hepatic diverticulum, from which are formed the hepatic cords and intrahepatic ducts, the extrahepatic ducts, the gall bladder and ventral pancreas
B. Rotation of the duodenum (Skandalakis et al., 1983)

a capacity of 30 to 50 ml. of bile. The corpus nestles into the substance of the liver and the entire organ is bound to the liver by a peritoneal covering.

The fundus extends beyond the liver margin and lies anteriorly in the region of the costal arch at the lateral border of the rectus muscle.

It contains most of the smooth muscle of the organ in contrast to the corpus, which is the major storage area and contains most of the elastic tissue. The neck is funnel shaped, and lies in the free border of the hepatoduodenal ligament. The convexity of the neck may be distended into a dilatation known as infundibulum or Hartmann's pouch. The mucosa at the neck is elevated into folds that form the spiral valve of Heister. There is no evidence of an actual valvular mechanism [**Skandalakis et al., 1983; Schwartz 1985; Narwold 1986**].

There is no glands in the gall bladder mucosa, but the mucous glands of the cystic and common hepatic ducts secrete at a higher pressure than liver cells secrete bile. Thus the ducts may produce mucus (white bile), even though the diseased gall bladder produces no true bile secretion [**Skandalakis et al., 1983**].

The gall bladder is mainly supplied by the cystic artery which usually arises from the right hepatic artery, with a small supplement from the gall bladder bed. The venous drainage is the reverse of the arterial pattern-mainly by vessels that pass directly into the gall bladder bed to enter the quadrate lobe of the liver and only

rarely supplemented by small veins that accompany the cystic artery and drain into the right branch of the portal vein [**McMinn 1981**].

The cystic duct:

It is the continuation of the neck of the gall bladder; it is commonly about 4 cm long, with an internal diameter of 2 to 3 mm. [**McMinn 1981, Skandalakis et al., 1983**].

The extremes among 100 dissections were 0.4 to 6 cm. [**Dowdy et al., 1962**].

In most people the duct follows a straight oblique course to join the common hepatic duct in its right side [**Northover and Terblanche, 1982**].

The intrahepatic duct system:

The liver is divided into right and left lobes by the interlobar fissure. The right lobe is divided by the right segmental fissure into two segments one anterior and the other posterior. The left lobe is divided into medial and lateral segments by the left segmental fissure. Normally, the right anterior and posterior segmental bile ducts join to form the right hepatic duct, a confluence that usually is just within the substance of the liver.

The left lateral and left medial segmental ducts form the left hepatic duct, which joins the right hepatic duct to form the common hepatic duct **(Fig. 4)** [**Nahrwold 1986**]. The right and left hepatic ducts are 1 to 4 cm long, the left is longer and more accessible because it has a more transverse course. The angle of the junction varies considerably. It may comprise a right angle with the common

hepatic duct in about 40% of individuals [**Dowdy et al., 1962**]. The junction occurs extrahepatically in almost all instances **(Fig. 5)**, but incision and dissection of the fibrous tissue in the hepatic plate may be necessary to expose this junction [**Schwartz, 1985**].

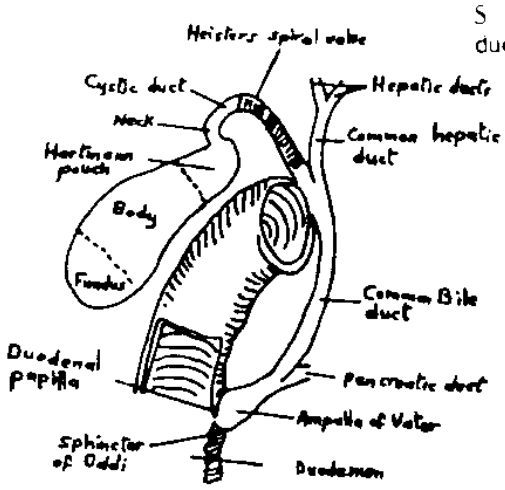
The common hepatic duct:

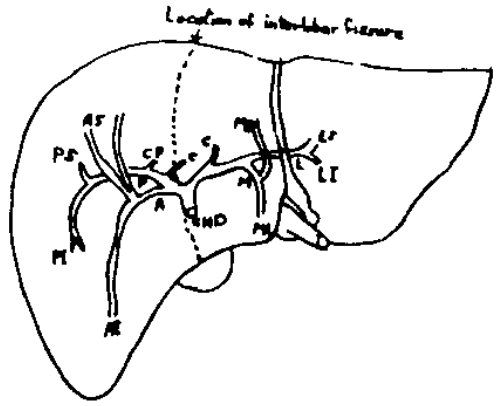
It is formed by the final confluence of all ducts issuing from the liver and ends when the lumen of the cystic duct opens into it to form the common bile duct. It is 2.5 to 3.5 cm in length, with a calibre of about 4 mm, and it lies in the right free border of the hepatoduodenal ligament **[McMinn and Hobdell, 1974**]. The major relations of the common hepatic duct is fairly constant, with the common hepatic artery to the left and the portal vein situated posteriorly. Its important variable neighbours are the right hepatic artery, cystic artery and cystic duct. In about 90% of cases, the right hepatic artery passes behind the duct [**Northover and Terblanche, 1982**].

The common bile duct:

It is formed by the confluence of the common hepatic and cystic ducts, normally located in the free edge of the lesser amentum. It is about 7 to 8 cm. long and 0.8 cm. wide [**McMinn, 1981**] with the extremes in 100 dissections 1.5 to 12 cm. long and 0.4 to 1.3 wide [**Dowdy et al., 1962**]. The duct may be divided arbitrarily into four portions **(Fig. 6)** supraduodenal (average length 2 cm.), retroduodenal (average length 1.5 cm.), pancreatic (average length

Fig. 4: Diagram of the intrahepatic distribution of the bile ducts. The segmental branches are labeled A = anterior, C = caudate, I = inferior L = lateral, M = medial, P = posterior, S = superior CHD = common hepatic duct.





(Skandalakis et al., 1983)

Fig. 3: The gall bladder and biliary tract (Sherlock, 1985)

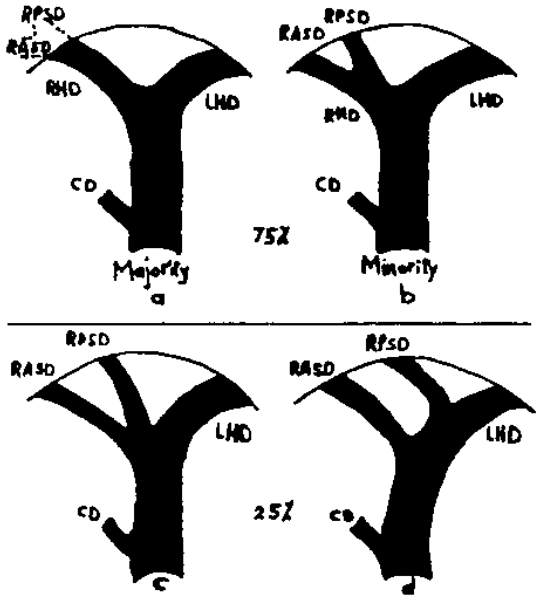


Fig. 5: Patterns of formation of hepatic ducts. A true right hepatic duct (RHD) is present in 75% of individuals usually formed within the liver (a) but sometimes outside (b) In 25% no true RHD is found, the segmental ducts forming a triple confluence with the LHD (c) or joining it separately (d) In the latter instance the RASD has in the past been wrongly designated an accessory duct (Northover and Terblanche, 1982)

3 cm.), and intraduodenal (average length 1.1 cm.) [**Skandalakis et al., 1983**] .

The supra duodenal portion lies between the two leaves of the hepatoduodenal ligament, in front of the foramen of Winslow, to the right of the hepatic artery and anterior to the portal vein. It may be crossed anteriorly by the right gastric, right hepatic, supra duodenal or even gastroduodenal artery. The retroduodenal portion lies between the superior margin of the first part of the duodenum and the susperior margin of the head of the pancreas. The pancreatic portion may be partly covered by a tongue of pancreas (44%), completely within the pancreatic substance (30%), uncovered on the pancreatic surface (16.5%), or completely covered by two tongues of pancreas (9%) **(Fig. 7)** [**Skandalakis et al., 1983**].

The intraduodenal, or intramural portion of the common bile duct passes obliquely through the duodenal wall together with the main pancreatic duct. The two ducts lie side by side with a common adventitia for several millimeters. The dividing septum becomes reduced to a mucosal membrane just before the confluence of the ducts [**Skandalakis et al., 1983**].

The duodenal papilla of Vater lies at the end of the intramural portion of the common bile duct. It is on the posteromedial wall of the second part of the duodenum. In about 5% the papilla is in the third part of the duodenum, but very rarely proximal to its normal position [**Northover and Terblanche, 1982**]. The musculature of the intramural common bile duct has a long and confusing history.