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صدق الله العظيم

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DIFFERENT PROCEDURES FOR BILIARY SYSTEM DRAINAGE

An Essay

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of Master Degree
In General Surgery

By

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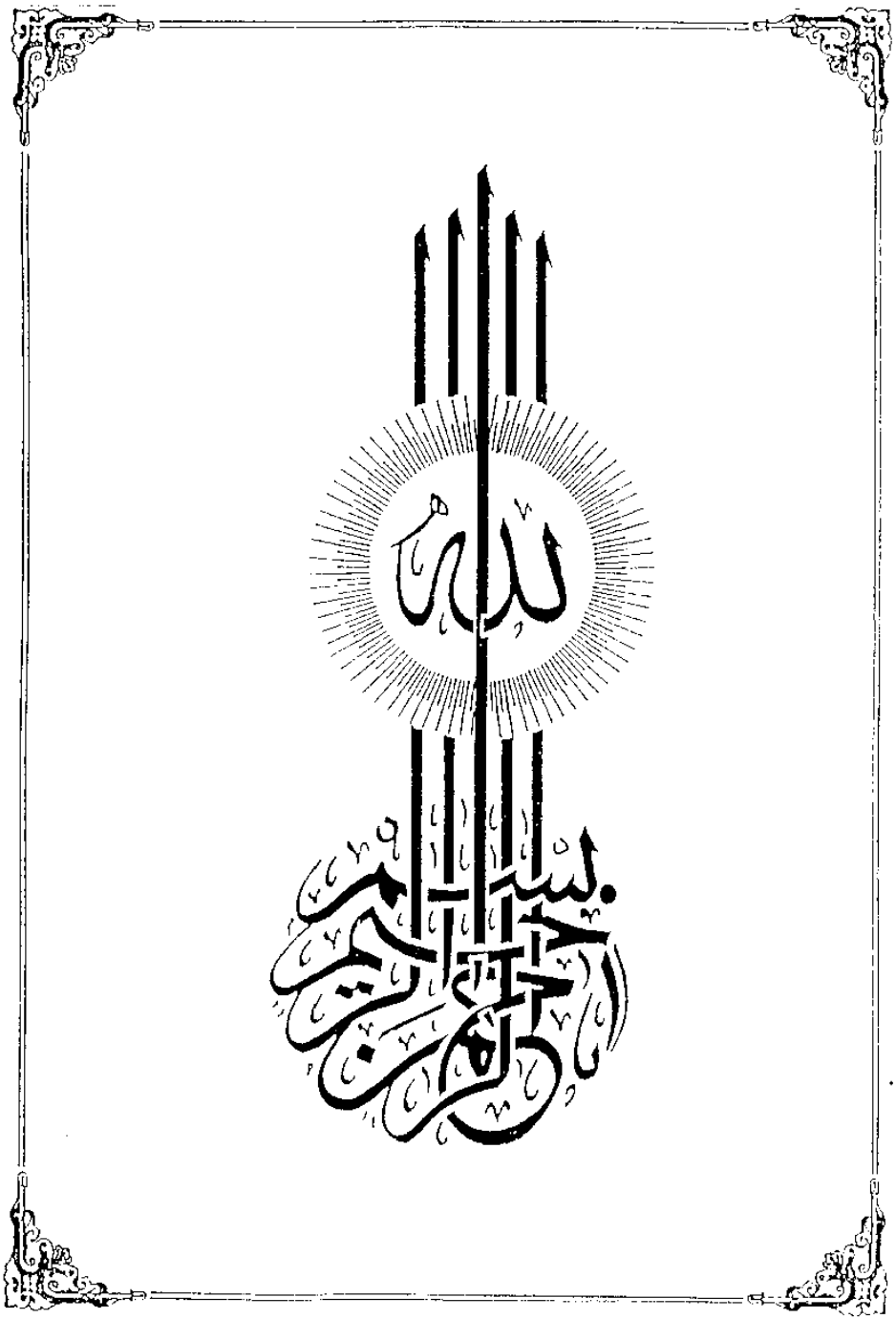

TO THE SOUL OF MY FATHER

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ANATOMY

ANATOMY OF THE BILIARY SYSTEM

Introduction:

The anatomy of the biliary tree is so variable that one should think of its "normal anatomy" as non existent. However, anatomical dissections have established pattern considered as a normal. One should recognize these many deviations from this pattern as normal anatomical variations.

The normal anatomy consists of a right and left hepatic ducts merging in the hilum of the liver to form the common hepatic duct (Fig. 1). The latter descends in the lateral portion of the hepato-duodenal ligament and is joined on the right by a smaller more tortious 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 major papilla (Dowdy et al., 1962).

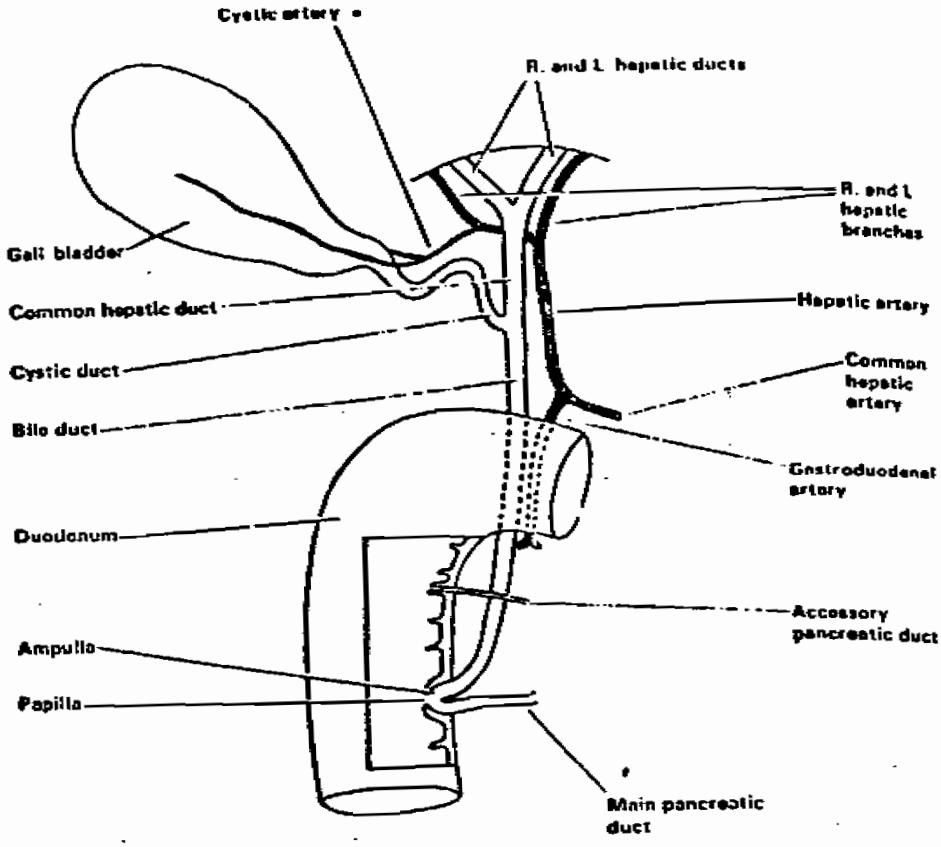


Fig.1 The extrahepatic biliary tract (McMinn. 1974)

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 enter the common bile duct. The organ is about 7 cm. long and has a capacity of 30-50 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 body, which is the major storage and contains most of the elastic tissue. The neck is funnel shaped, and lies in the free border of the hepatoduodenal ligament. The wall of the neck, where it becomes the cystic duct, may show a small diverticulum directed downwards and backwards. Commonly called Hartmann's pouch, it is now known not to be a feature of the normal gall bladder, and is always associated with some pathological conditions. The mucosa at the neck is elevated into fold that form the spiral valve of Heister. There is no evidence of an actual valvular mechanism (Mc Minn, 1981, Skandalakis et al., 1983; Schwartz, 1985).

There is no glands in the gall bladder mucosa, but the mucous glands of the cystic and common hepatic duct secreate 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 contribution 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 acompany the cystic artery and drain into the right branch of portal vein (Mc Minn, 1981).

The Cystic Duct

It is the continuation of the neck of the gall bladder, with an internal diameter of 2-3 mm., and about 2-4 cm. in length. In most people, the duct follows a straight oblique course to join the common hepatic duct in its right side (Skandalakis et al., 1983).

The Intrahepatic Duct System

The liver is divided into a right and left lobes by the interlobular fissure. The right lobe is divided by the right segmental fissure into two segments, one anterior and one posterior. The left lobe in divided into a medial and a lateral segment by the left segmental fissure (Healey and Schroy, 1953). 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 medial segmental ducts form the left duct, which joins the right hepatic duct to form the common hepatic

duct (Fig. 2) (Nahrwold, 1986). The right and left hepatic ducts are 1-4 cm. long. the left is longer and more accessible because it has a more transverse course. The angle of the junction varies considerably. In about 40% of individuals, it may comprise a right angle with the common hepatic duct (Dowdy et al., 1962). The junction occurs extrahepatically in almost all instances (Fig. 3), but incision and dissection of the fibrous tissue in the "hepatic plate" may be necessary to expose this junction (Schwartz, 1985).

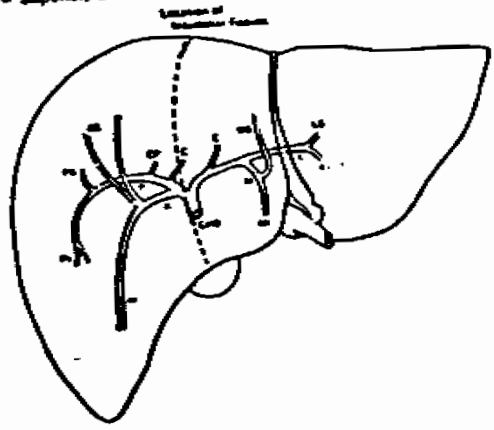
The Common Hepatic Duct

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 about 2.5-3.5 cm. in length, with a calibre of about 4 mm., and it lies in the right free border of the hepatoduodenal ligament (Mc Minn and Hobdell, 1974). The major relations of the common hepatic duct are fairly constant, with the common hepatic artery to its 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 Cholecystohepatic Triangle (The Calot's Triangle)

The cholecystohepatic triangle is formed by the cystic duct and the gall bladder below, the right lobe of the liver above, and the common hepatic duct medially (Fig. 4). Within the boundaries

Fig.2: 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)

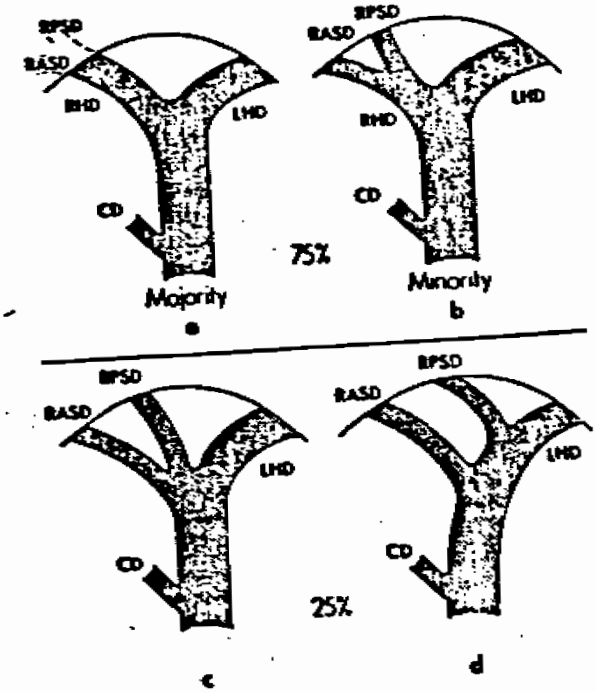


Fig.3 Patterns of formation of hepatic ducts. A true right hepatic duct (RHD) is present in 75% of individuals, usually formed within the liver (a), but sometimes outside (b). In 25% no true RHD is found, the segmental ducts forming a triple confluence with the LHD (c) or joining it separately (d). In the latter instance, the RASD has in the past been wrongly designated an 'accessory' duct. RASD = right anterior segmental duct; RPSD = right posterior segmental duct; RHD = right hepatic duct; LHD = left hepatic duct; CD = cystic duct.

(Northover and Terblanche. 1982)

of the triangle are a number of structures that must be identified before they are ligated or sectioned.

Over the years, the triangle, described originally by Calot in 1891, has enlarged. For Calot, the upper boundary was the cystic artery; it is now the slower border of the right lobe of the liver (Rocko et al., 1981).

The contents of the triangle are, the right hepatic artery in 83 % of individuals, the aberrant right hepatic artery, when present, in 93%, the cystic artery, and an accessory bile duct, when present, in 85%. These structures are in danger when a clamp is applied on the cystic duct. A thorough knowledge of the variations within Calot's triangle is surely a fundamental requirement for those embarking on biliary surgery (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 omentum. It is about 7-8 cm long and 0.8 cm. wide (Mc Minn, 1981) with the extremes in 100 dissections 1.5 - 12 cm. long and 0.4-1.3 cm. wide (Dowdy et al., 1962).

The duct may be divided into four portions (Fig. 5): Supraduodenal (Avarage length 2 cm.), retroduodenal (average length 1.5 cm.), pancreatic (avarage length 3 cm.), and intraduodenal (avarage

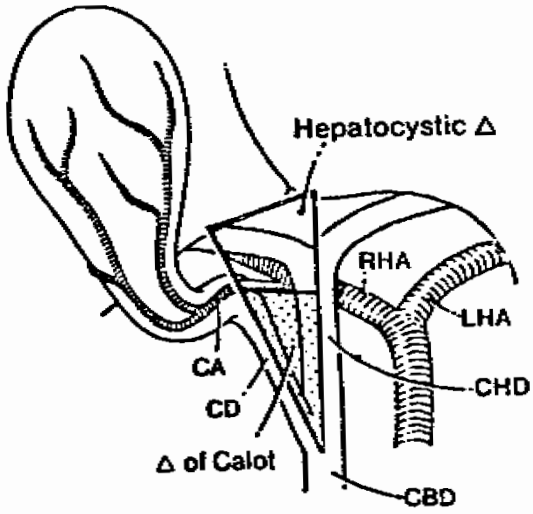
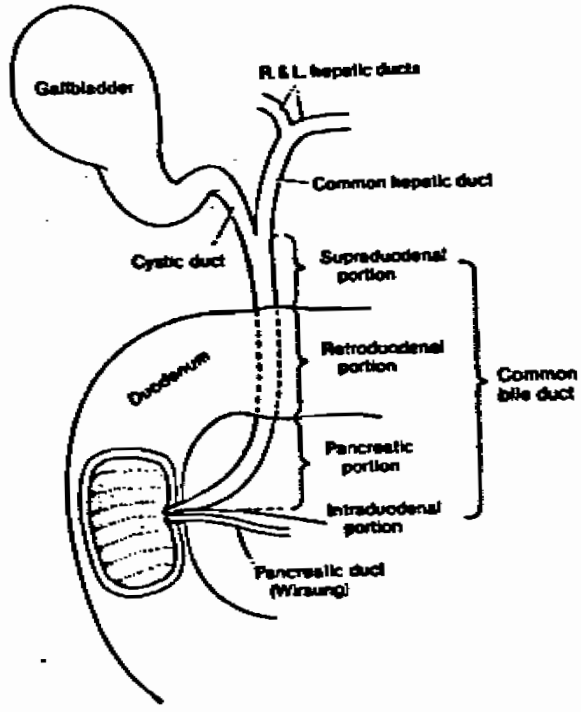


Fig.4 : The hepatocystic triangle and the triangle of Calot. The upper boundary of the former is the margin of the liver; that of the latter is the cystic artery. The triangle of Calot is stippled.

(Skandalakis et al. 1983)

Fig.5: The extrahepatic biliary tract and the four portions of the common bile duct.



(Skandalakis et al. 1983)