ROLE OF RADIOLOGY AND IMAGING IN THE INVESTIGATION OF NORMAL ADULT GALL BLADDER AND BILIARY TREE

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THESIS

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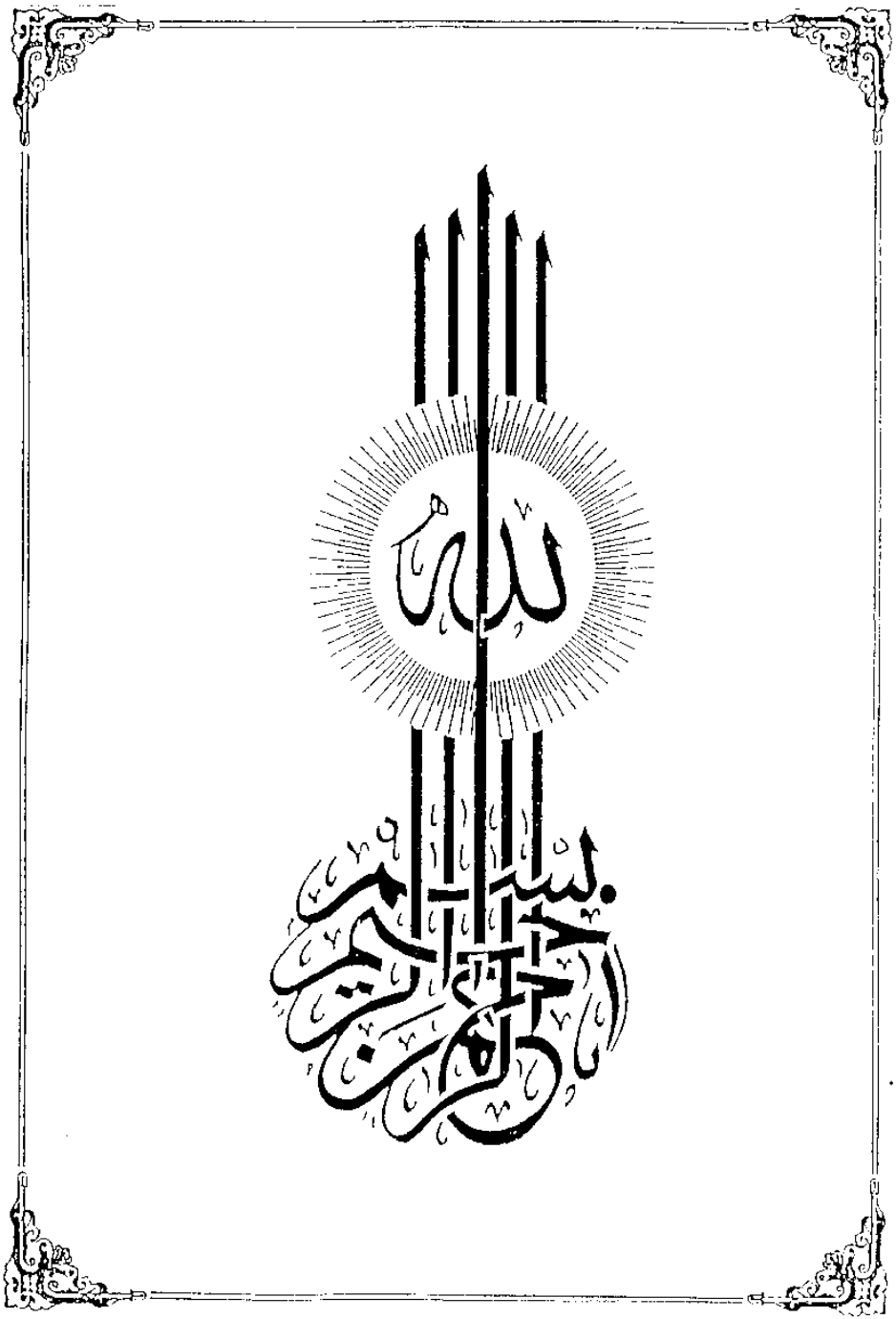

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The last few years witnessed tremendous advances in medical technology specially in the field of radiology. Many of these advances are the direct result of spill over from space technology which stimulated great advances in computers and miniaturization.

Spectacular advances in conventional radiographic equipments have included brighter image intensifiers, better resolution of images, excellent image qualities and computerized generators.

Ultrasound made tremendous advances both in gray scale B mode and in real-time mode.

Computed tomography revolutionized the diagnosis of many diseases of different organs of the body in an easy and non invasive fashion.

The gall bladder is an accessible organ for clinical examination, ultrasonographic studies,conventional radiographic examinations with and without contrast media, as well as other imaging modalities.

Ultrasonography, in the last decade, gained the upper hand over radiographic techniques in examination of gall bladder and biliary pathology. Oral and

intravenous cholangiography are not commonly practised now in most of the X-ray departments.

However, after the initial enthusiasm for ultrasonography, many physicians and surgeons started to refer cases of gall bladder disease for radiographic examinations after ultrasonography. Their main objective is to confirm the ultrasonographic result prior to surgery, or to study negative results of ultrasonography which show strong clinical evidence of biliary tract and gall bladder pathology.

The aim of this work is to explain the various radiological modalities used to visualize the normal adult gall bladder and biliary tree. These modalities are classified into the conventional radiological techniques and the imaging techniques.

The conventional radiological techniques include plain X-ray, oral cholecystography, intravenous cholangiography, operative and post operative cholangiography.

The imaging techniques include ultrasonography, isotopic scanning and computed tomography.

All these modalities and the various techniques used during gall bladder and biliary tree investigation will be discussed in details in the following chapters.

EMBRYOLOGY, ANATOMY AND PHYSIOLOGY

Embryology of The Gall Bladder

During the 4th week of foetal life the hepatic diverticulum arises from the ventral wall of the foregut near its opening into the yolk sac. As this diverticulum elongates into a stalk to form the choledochus, a lateral bud is given off, which is distended to become the gall bladder and cystic duct.

During the second month, the human gall bladder is intrahepatic, but because of atrophy of the overlying liver, brought about by mechanical pressure from the distended gall-bladder, three quarters of its circumference become extra hepatic (Bailey, 1959).

Anatomy of the Gall Bladder and Biliary Tract:

The excretory apparatus of the liver consists of the intrahepatic ducts, the common hepatic duct, the gall bladder which serves as a reservoir for bile, the cystic duct and the common bile duct.

The Common Hepatic Duct:

The bile canaliculi lie between the walls of the liver cells which form their borders, i.e., each liver cell is surrounded by a network of polygonal meshes of bile canaliculi. These bile canaliculi join to form

the interlobular bile ductules, which in turn enter the interlobar bile ductules. These interlobar bile ductules unite with each other until the right and left hepatic ducts are formed (Warwick and Williams, 1973).

The common hepatic duct is formed by the junction of the right and left hepatic ducts and lies in the porta hepatis. Its length varies around 4 cm and its calibre around 4 mm (Smith and Sherlock, 1964).

According to Norman (1951), it is formed by the confluence of one duct from the left lobe and two from the right lobe. After 3 cm of its downward course and just below the porta hepatis, the common hepatic duct is joined on its right side and at an acute angle by the cystic duct from the gall bladder to form the common bile duct (Davies and Davies, 1962).

The Gall Bladder:

The gall bladder is usually located in a fossa on the inferior surface of the right hepatic lobe extending from the right end of the porta hepatis to the inferior border of the liver. This fossa in which the G.B. is located separates the right lobe from the quadrate lobe, and along which occurs the division between right and left halves of the liver (Hollinshead, 1961).

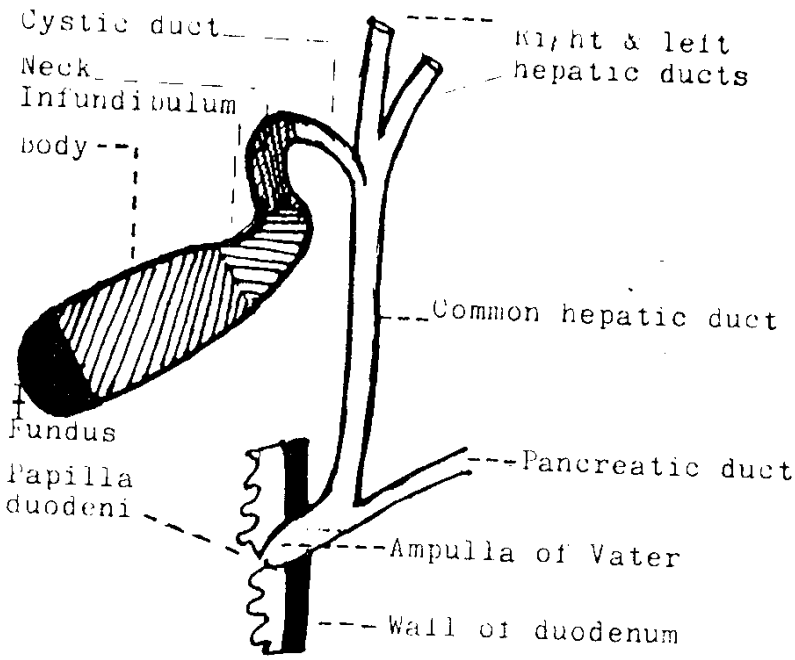

Fig. 1 : Anatomy of gall-bladder.(after Wilkie)

It is an elongated sac, usually pear shaped, but may be rounded (hypersthenic gall bladder), oval (sthenic gall bladder), long and narrow (hyposthenic gall bladder). Its average dimensions are 7 - 10 cm length, 3 - 4 cm width with an average capacity of 30 - 50 ml (Moosman and Coller, 1951).

The upper surface of the G.B. is attached to the liver by connective tissue which contains some lymphatics and veins that connect these systems in gall bladder with those of the liver, more over this space contains accessory bile ducts between the intrahepatic duct system and the gall bladder (Hollinshead, 1961); the ducts of Luschka (Applied Surgical Pathology, 1975).

Its sides and undersurface are covered with peritoneum continued from the surface of the liver. Occassionally, it is completely invested with peritoneum and may be connected to the liver by a short mesentery. It is divided into a fundus, body and neck. The fundus is directed downwards, forwards and to the right. It projects beyond the inferior border of the liver and comes into relationship with the posterior surface of the anterior abdominal wall below the ninth right costal cartilage. Posteriorly, the fundus is in relation with the transverse colon, near its commencement. It is entirely covered with peritoneum.

The body is directed upwards, backwards and to the left. Near the right end of the porta hepatis, it is continuous with the neck. Its upper surface is related to the liver, while its lower surface is related to the right part of the transverse colon.

The neck is narrow and curved upwards and forwards then it turns abruptly backwards and downwards where it becomes continuous with the cystic duct. At the point of continuity with the cystic duct there is a constriction. The neck is attached to the liver by areolar tissue in which the cystic artery is embeded (Warwick and Williams, 1973).

A small pouch called Hartmann's pouch projects downwards and backwards to the duodenum from the right wall of the neck of the gall bladder. This Hartmann's pouch was considered as a constant feature of the normal gall bladder, but investigations have shown that it is always associated with pathological conditions, especially dilatation (Davies and Harding, 1942; Smith and Sherlock, 1964).

The Cystic Duct:

It is joined to the neck of the gall bladder at the

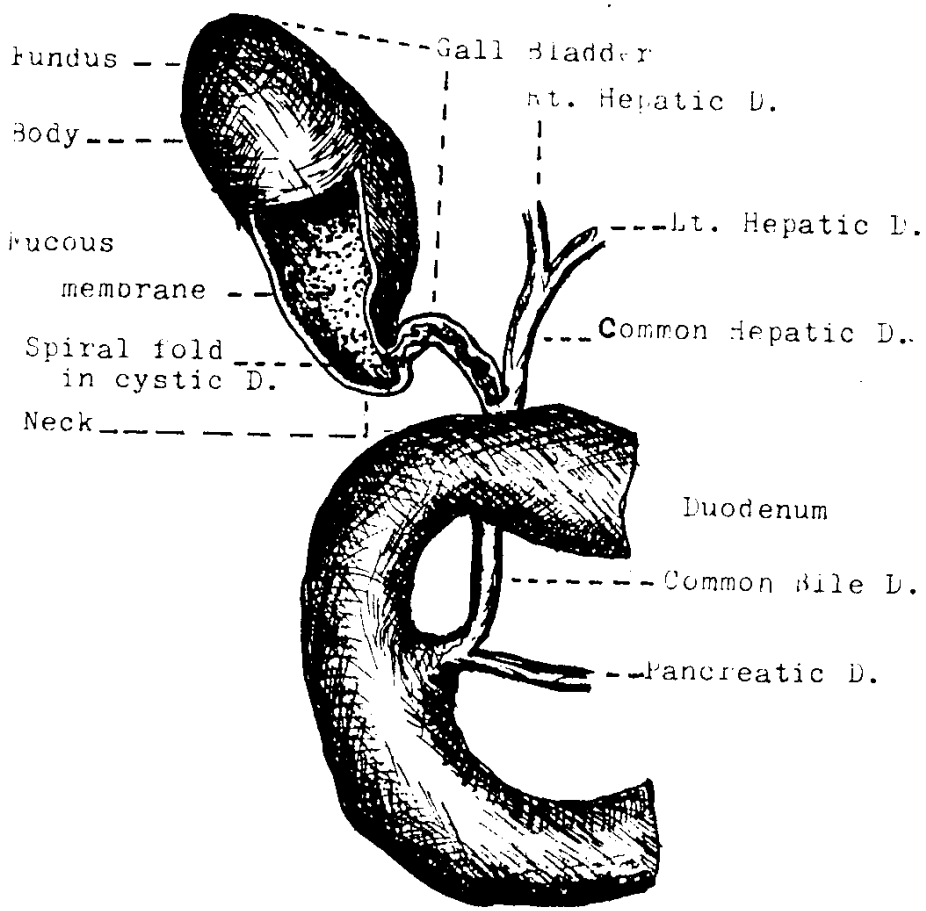

Fig. 2 : Anatomy of the gall bladder & extrahepatic bile passages .