

MANAGEMENT
OF
OBSTRUCTIVE JAUNDICE



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Dedicated

to my parents,

to my wife



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INTRODUCTION

Obstructive or surgical jaundice is that type of jaundice in which operative measures may be necessary to relieve the obstruction.

Two quite separate situations are encountered - jaundice in infancy and childhood, and jaundice in adults. The differences between these situations include the nature of the underlying causes and the significance in terms of practical management.

It is the purpose of this work to discuss the recent advances in the physiology of the biliary tract, biochemical nature of bile, non-invasive and interventional radiographic techniques, as well as the surgical procedures in the management of obstructive jaundice in adults and neonates.

SURGICAL ANATOMY

OF THE

BILIARY SYSTEM

Before starting to discuss the anatomy of the biliary tract, it should be kept in mind that it is a site of many congenital anomalies which should be well appreciated by the surgeon. In this chapter, the normal anatomy of the biliary tract is discussed while its congenital anomalies will be explained in the next chapter.

The extrahepatic biliary tract begins with the right and left hepatic ducts, and ends at the store of the common bile duct in the duodenum. The right and left hepatic ducts emerge from the porta hepatis and unite together, about 1 to 2 cm from it, to form the common hepatic duct. The common hepatic duct (CHD) is 3 to 4 cm long and extends downwards in the free margin of the lesser omentum in front of the portal vein and to the right of the hepatic artery (Iast, 1978)

The internal diameter of the common hepatic duct during childhood is nearly 4 mm and gradually increases with age up to 8 mm in adulthood (Mc Gahan et al., 1982).

The gallbladder is a pear-shaped sac that lies in relation to the gallbladder fossa on the visceral surface of the liver. It is about 7 cm long and has an average capacity of 30 to 50 ml. There is a gradual increase in the length and size of the gallbladder with age. It is 2 to 5 cm long at birth and up to one year of age, then increasing up to 6 cm at 12 to 16 years of age (Mc Gahan et al., 1982).

The gallbladder is anatomically divided into fundus, body, infundibulum or Hartmann's pouch and neck. The fundus

is the rounded blind end which may or may not extend beyond the liver margin to touch the parietal peritoneum of the anterior abdominal wall opposite the tip of the right ninth costal cartilage. The body of the gallbladder extends upwards and backwards towards the right end of the portal fissure where it gradually narrows to form the gallbladder neck.

The gallbladder neck is funnel in shape and narrows to form the cystic duct. It follows a gentle curve, the convexity of which may be distended in a dilatation known as the infundibulum or Hartmann's pouch. The immediate relations of the gallbladder are as follows:

- Anterior :** the liver and the anterior abdominal wall;
- Posterior:** the junction of the first and second part of the duodenum;
- Superior :** the liver;
- Inferior :** the transverse colon (Grant, 1973).

The cystic duct is about 4 cm long with an internal diameter of 2 to 3 mm. It makes a curve before it joins the common hepatic duct at an acute angle, about 3 cm below the porta hepatis, to form the common bile duct (CBD). The cystic artery, which originates from the right branch of the hepatic artery, runs behind the cystic duct and lies in the triangle of Calot which is bounded by the common hepatic duct, the cystic duct and the liver.

The common bile duct about 7 to 8 cm long with an internal diameter of an average of 8 mm. It can be described as having four portions:

The mucus membrane of the cystic duct is lined by columnar mucus-secreting epithelium like that of the gallbladder. It is thrown into longitudinal, but somewhat spirally arranged folds, constituting the valve of Heister; which helps to prevent complete obliteration of the lumen when the duct is angulated (Mc Minn, 1981).

The wall of the common bile duct consists of an inner mucous membrane and an outer fibrous coat. The lining epithelium is columnar mucus-secreting, and the lamina propria contains mucus-secreting glands, particularly in the lower part of the duct. The fibrous coat contains negligible amounts of smooth muscle fibres, which become thickened abruptly around the lower end of the bile duct forming the sphincter of the bile duct. The circular muscle layer is also thickened around the terminal part of the pancreatic duct and around the ampulla of Vater.

The combined muscle fibres in these sites - the terminal part of the bile duct, the pancreatic duct and the ampulla of Vater - constitute the sphincter of Oddi, but only the sphincter of the bile duct is the constantly present one. The sphincter of Oddi controls the flow of bile and pancreatic juice into the duodenum (Hand, 1973).

The mucous membrane of the ampulla is highly folded. Some smooth muscle fibres extend in the connective tissue cores of these folds so that their contraction and relaxation result in aggregation and retraction of the folds. This prevents the reflux of the duodenal contents

into the bile duct and also helps, but less effective than the sphincter of Oddi, in controlling the bile flow into the duodenum.

The common bile duct could be described as being formed of two segments or portions according to the width of its lumen and thickness of its wall. The first portion is called the main or proximal portion. It lies in the free margin of the lesser omentum and passes behind the first part of the duodenum and in relation to the posterior aspect of the head of the pancreas. This segment is also described as the wide segment (5-7 mm) with thin walls. Its fibrous coat contains scanty or no smooth muscle fibres.

The second segment or portion is called the terminal segment. It starts 2 mm before the bile duct enters the duodenal muscle coat and runs obliquely for a variable distance (11-12 mm) in the submucosa of the duodenum. This segment opens into the lumen of the duodenum at the summit of the major duodenal papilla. The minor duodenal papilla is located about one inch above the major papilla and contains the opening of the accessory pancreatic duct.

This segment is also described as the narrow or thick segment as it shows an abrupt narrowing of its lumen (2-3 mm) as a result of a sudden increase in the thickness of its wall caused by the abrupt appearance of a circular layer of smooth muscle fibres in its wall. This increased musculature of the bile duct wall is derived mainly from the intrinsic choledochal muscle with small contribution from the duodenal musculature (Bolton and Le Quesne, 1981).

In most instances (about 85% of individuals), the terminal segment is joined during the passage in the submucosa of the duodenum by the main pancreatic duct forming a common channel (2-17 mm), with no true ampulla.

The common bile duct is at its narrowest lumen just before this junction. The diameter of the common channel does not exceed the diameters of the two ducts and it narrows slightly throughout its length so that its orifice is the narrowest part.

The junction between the main and the terminal segment is clearly seen in cholangiograms as a notch below which the lumen of the duct becomes fine and narrow. In the past, this sudden narrowing of the bile duct, as seen radiographically, had often been interpreted as a pathological stricture in the duct.

A clear appreciation of this anatomy, therefore, is essential for the correct interpretation of any form of cholangiograms (Le Quesne, 1974).

Blood Supply Of The Biliary Tract

The common hepatic artery is a branch of the coeliac trunk that runs forward and slightly to the right. It ascends in the free margin of the lesser omentum in front of the portal vein and to the left of the common bile duct. It divides into right and left hepatic arteries about 1.5 cm from the liver.

The right hepatic artery passes behind the common hepatic duct and enter the triangle of Calot. It gives the

cystic artery within the triangle of Calot to the right side of the common hepatic duct. The cystic artery passes behind the cystic duct close to the neck of the gallbladder where it divides into a superficial branch supplying the peritoneal surface of the gallbladder and a deep branch which supplies the surface of the gallbladder in direct relation to the liver.

The gallbladder is supplied mainly by the cystic artery with some twigs from the gallbladder fossa. The various hepatic ducts receive arterial supply from the adjacent hepatic artery and its branches. The common bile duct is supplied by branches from the cystic artery, the hepatic artery itself and the retroduodenal branches of the gastroduodenal artery (Mc Minn, 1981).

The venous return from the gallbladder is carried mainly by small veins which enter directly into the liver from the gallbladder fossa. A cystic vein or veins, may accompany the cystic artery to the right branch of the portal vein.

The venous return from the common hepatic duct and the upper part of common bile duct enter the liver directly. Venous blood from its lower part passes to the portal vein (Shields, 1977).

Lymphatic Drainage

Lymphatics from the gallbladder and the upper part of the common bile duct drain into the hepatic lymph nodes in the lesser omentum, including the cystic node at the

EMBRYOLOGY
OF THE
BILIARY SYSTEM

The liver and the ductal system develop during the third or fourth week of the intrauterine life as an endodermal outgrowth called the hepatic diverticulum. It arises from the ventral aspect of the future duodenum and extends into the septum transversum. The latter is formed by the mesoderm lying below the pericardium after the formation of the head fold. The hepatic diverticulum enlarges gradually and becomes divided into a large cranial portion (pars hepatica) and a smaller caudal portion (pars cystica) (Snell, 1975).

The pars hepatica is divided into right and left branches and its endodermal cells continue to proliferate and form, branching and anastomosing cords of cells into the vascular mesoderm of the septum transversum.

The pars hepatica gives rise to the parenchymal elements of the liver, the intrahepatic bile ducts and the right and left hepatic ducts. The main part of the pars hepatica adjacent to the pars cystica becomes canalized, and forms a common hepatic duct. The mesoderm of the septum transversum forms the connective tissue network, the capsule of the liver (of Glisson) and the ligaments of the liver (Hamilton and Mossman, 1972).

The paired vitelline veins and the umbilical veins of the septum transversum become broken by the growing columns of liver cells and form the liver sinusoids.

The pars cystica gives rise to the gallbladder and the cystic duct. At first, it grows in the form of a solid outgrowth with a distal expanded part and narrower proximal part. Later on, canalisation occurs and the distal part forms