Management of Bile Duct Injury

Essay

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of Master Degree in General Surgery

By

Hamdy Mohamed Abd El Rahman Abd El Aleem

M.B., B.Ch.

Under Supervision of

Prof. Dr./ Ashraf Abd El Moghny Mostafa

Professor of General Surgery
Faculty of Medicine
Ain Shams University

Ass. Prof. Dr./ Ayman Ali Reda

Assistant Professor of General Surgery
Faculty of Medicine
Ain Shams University

Dr./ Mohamed Ali Nada

Lecturer of General surgery
Ain Shams University

Faculty of Medicine
Ain Shams University
2009

Introduction

Over the last decade, laparoscopic cholecystectomy has gained worldwide acceptance and considered to be as "gold standard" in the surgical management of symptomatic cholecystolithiasis **(Sari et al., 2005).**

Laparoscopic cholecystectomy (LC) has recently become the more preferred operation over open cholecystectomy (OC). Although LC has shortened hospitalization and decreased mortality and morbidity, reviews have reported that LC has a two-fold higher incidence of bile duct injuries than OC (0.6% vs 0.3%). There are also some reviews which have reported the incidence of biliary leakages as up to 1.1% .**(Parlak et al., 2005).**

Bile duct injury (BDI) occurring during cholecystectomy has been proposed as the most serious and important cause of morbidity after this procedure. The diagnosis, management and prevention of iatrogenic bile duct injuries (IBDI) remain a challenge for all general surgeons (**Wu et al., 2007).**

The most frequently reported cause was poor identification of the anatomical features of the hepatic pedicle, followed by inflammatory changes in the gallbladder, anatomical anomalies, improper use of monopolar coagulation, an unspecified technical mistake, and a problem during the control of intraoperative hemorrhage. Technical mistakes, reflected by the latter 3 factors, accounted cumulatively for about more than 1/4 of the recognized causes of injury. With regard to the technical complexity of the operation during which the injury had occurred, the procedure was described as easy in less than the half and difficult in more than the half of cases, a rate that did not change significantly with the number of laparoscopic cholecystectomy performed **(Nuzzo et al., 2005).**

Of all the complications of laparoscopic cholectecystomy, bile duct injury (BDI) is the most serious complication. The prevention of injury to the common bile duct (CBD) remains a significant concern in laparoscopic cholecystectomy (LC). Different kinds of methods have been advanced to avoid this injury but no single method has gained wide acceptance. Because of various limitations of current methodologies a study began by using cold light illumination of the extrahepatic biliary system (light cholangiography LCP) to better visualize this area and thereby reduce the risk of bile duct injury **(Xu et al., 2004).**

Biliary tree injuries may be decreased by direct coloration (by methylene blue) of the cystic duct, ductus choledochus and even the gall bladder **(Sari et al., 2005).**

Intraoperative cholangiography can help decrease the frequency and severity of CBD injuries by defining the biliary anatomy before duct transection. . Intraoperative cholangiography is a simple technique that can be performed during LC. Before transection of any biliary ducts, a small catheter is inserted into the presumed cystic duct (or gallbladder neck) and contrast material is injected. Real-time fluoroscopy or static films can confirm or correct assumptions made about biliary architecture. Intraoperative cholangiography was originally used in open procedures for the detection of CBD stones; however, in LC it may also serve as a "road map" for operative dissection **(Flum et al., 2001).**

Successful management of bile duct injury after laparoscopic cholecystectomy requires careful understanding of the mechanisms, considerable preoperative assessment by experts, and a multidisciplinary approach. A standard treatment approach was developed which consisted of ERCP for diagnosis, preoperative PTC with the placement of stents, CT drainage immediately after the PTC for drainage of biliary ascites, and usually Roux-en-Y **(Branum et al., 1993).**

In long-term follow-up studies, most patients surgically repaired have a successful outcome as measured by standard clinical parameters. However, there is a general impression that these patients have an impaired quality of life. Data addressing quality of life of these patients are limited. **(Melton et al., 2002).**

AIM OF THE WORK

The objective of this study is to highlight the management of bile duct injury including diagnosis and management.

CONTENTS

REFERENCES

Ahrendt SA, Pitt HA. Biliary tract. In : CM Townsend. Sabiston textbook of surgery. WB Saunders Company, Philadelphia, Pennsylvania 2001:1076-1111

Neuhaus P, Schmidt SC, Hintze RE, Adler A Veltzke W, Raakow R, et al. Classification and treatment of bile duct injuries after laparoscopic cholecystectomy . Chirurg 2000; 71(2): 166-73

Idar S, Sabo E, Nash E, Abrahamson J, Matter I. Laparoscopic versus open cholecystectomy in acute cholecystitis Surg Laparosc Endosc 1997;7(5):407-14

Pleas HCC, Garden OJ. Bile duct injury: prevention and management. Johnson CD, Taylor I.Ed. Recent Advances in surgery. Churchill Livingston. 1998,21:1-16

Chaudhary A, Negi SS, Puri SK, Narang P. Comparison of magnetic resonance cholangiography and PTC in the evaluation of bile duct strictures after cholecystectomy. Br J Surg 2002;89(4):433-6.

Sawaya DE Jr, Jonson LW, Sittig K, McDonald JC, Zibari GB. Iatrogenic extrahepatic biliary tract injuries: a multi-institutional review . Am Surg 2001; 67(5):473-7

Al-Ghnaniem R, Benjamin IS. Long term out come of hepaticojejunostomy with routine access loop formation following iatrogenic bile duct injury. Br J Surg 2002;89(9):1118-24

Azagra JS, De Simone P, Goergen M. Is there aplace for laparoscopy in management of post cholecystectomy biliary injuries? Worled J Surg 2001;25(10):1331-4

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الطبيب/ حمدى محمد عبد الرحمن عبد العليم
بكالوريوس الطب والجراحة

تحت إشراف

الأستاذ الدكتور/ أشرف عبد المغنى مصطفى
أستاذ الجراحة العامة
كلية الطب - جامعة عين شمس

الدكتور/ أيمن على رضا
أستاذ مساعد الجراحة العامة
كلية الطب - جامعة عين شمس

الدكتور/ محمد على ندا
مدرس الجراحة العامة
كلية الطب - جامعة عين شمس

كلية الطب
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Embryology and Anatomy of Gall Bladder and Biliary Tract

EMBRYOLOGICAL DEVELOPMENT OF BILIARY SYSTEM

By the 4th week of embryologic growth, ventral (caudal) and dorsal (cranial) outpouchings develop at the junction of the foregut and midgut. The gallbladder, extrahepatic bile ducts (EBDs), central intrahepatic bile ducts (IBDs), and ventral pancreas with its ductal network are derived from the ventral outpouching, (the hepatic diverticulum)(Fig. 1). The dorsal bud arises from the dorsal mesogastrium and is the precursor of the dorsal pancreas and its ductal system. At about this time, the developing ventral pancreas, gallbladder, and bile duct rotate clockwise (when viewed from the top) posterior to the duodenum and join the dorsal pancreas in the retroperitoneum. The ventral pancreatic duct and the CBD are, therefore, linked by their embryologic origins, resulting in the adult configuration of their common entrance into the duodenum at the major duodenal papilla (**Mortele et al., 2006).**

The hepatic diverticulum gives off other structures in addition to the extrahepatic biliary tree and ventral pancreas. The gallbladder arises from the extrahepatic ductal system, with the hepatic parenchyma and intrahepatic ducts being derived from the endoderm at the tip of the diverticulum. The IBDs develop as part of a complex process. At first, there is a web of interconnecting channels within the liver substance. These channels are then obliterated, after which recanalization occurs to form the mature intrahepatic ducts.If interconnecting ducts persist,accessory, anomalous, or aberrant bile ducts may result **(Taylor and Mortele, 2005).**

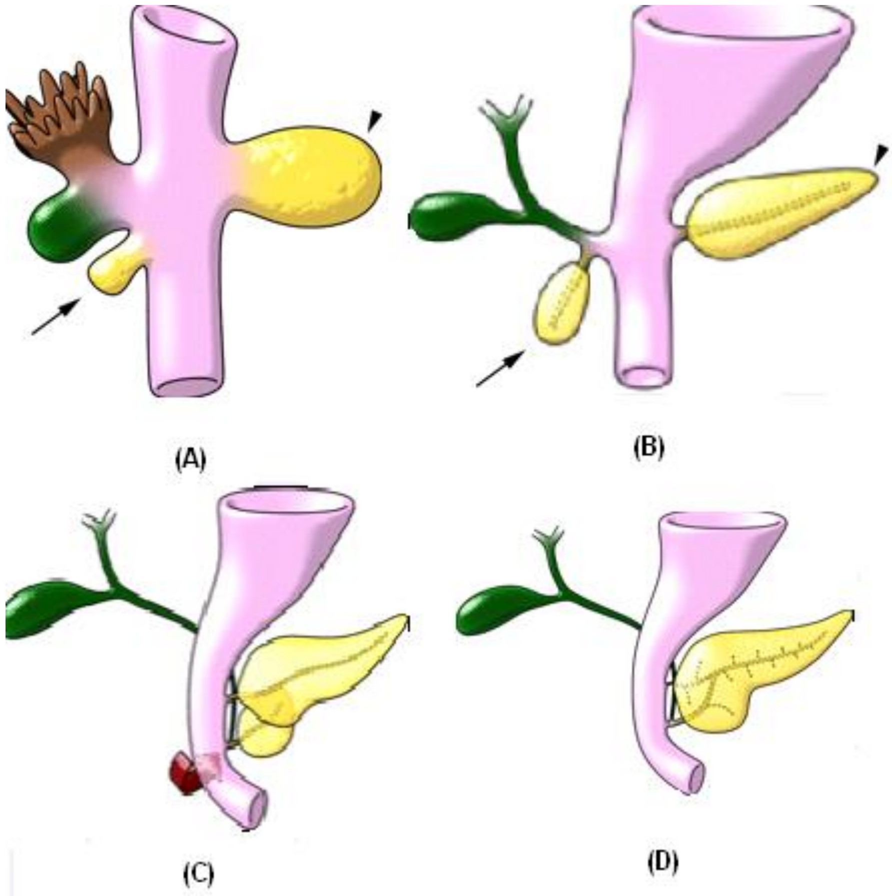

Fig. (1): Normal embryologic development of the pancreas and biliary tree. The ventral pancreatic bud (arrow in **a** and **b**) and biliary system arise from the hepatic diverticulum, and the dorsal pancreatic bud (arrowhead in **a** and **b**) arises from the dorsal mesogastrium. (**c**) After clockwise rotation of the ventral bud around the caudal part of the foregut, there is fusion of the dorsal pancreas (located anterior) and ventral pancreas (located posterior). (**d**) The ventral and dorsal pancreatic ducts fuse, and the pancreas is predominantly drained through the ventral duct, which joins the common bile duct (CBD) at the level of the major papilla. The dorsal duct empties at the level of the minor papilla **(Mortele et al., 2006)**.

Anatomy of the gall bladder

The gall bladder is a pear shaped organ situated in a fossa on the liver undersurface. It is variable in shape and volume. Normally present at the junction of segments 4 and 5 (and at the lower limit of the principal plane or Cantlie's line) its position in relation to the liver may vary. It may be partially or completely embedded within the liver parenchyma, the so-called 'intrahepatic' gall bladder. This may create difficulties in dissection and may increase the chance of intraoperative injury to the liver. Although the main right pedicle is fairly deep in the liver parenchyma, large portal, and hepatic venous branches traverse the liver at a depth of around one cm from the gall bladder. Thus, a deep liver tear during the dissection of the gall bladder off its fossa can occasionally bleed profusely. **(Nagral, 2005).**

The gall bladder is divided into a fundus, body, and neck (Fig. 2). The fundus, or broad extremity is directed downward forward and to the right, and projects beyond the anterior border of the liver; the body and neck are directed upward and backward to the left. The upper surface of the gall-bladder is attached to the liver by connective tissue and vessels. The under surface is covered by peritoneum, which is reflected on to it from the surface of the liver. Occasionally the whole of the organ is invested by the serous membrane, and is then connected to the liver by a kind of mesentery. The body is in relation by its upper surface, with the liver by its under surface, with the commencement of the transverse colon; and farther back usually with the upper end of the descending portion of the duodenum, but sometimes with the superior portion of the duodenum or pyloric end of the stomach. The fundus is completely invested by peritoneum& it is in relation in front with the abdominal parietes immediately below the ninth costal cartilage behind with the transverse colon. The neck is narrow and curves upon itself like the letter S at its point of connection with the cystic duct where it presents a well-marked constriction **(Lawerence and Gray, 1995).**

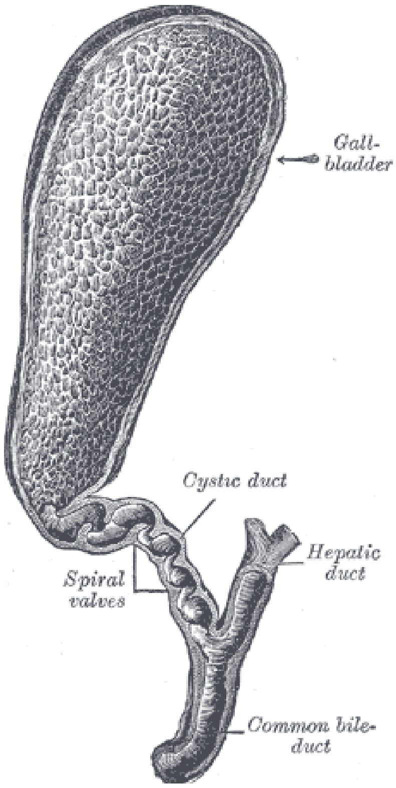

Fig. (2): The gall-bladder and bile ducts laid open
(Lawerence and Gray, 1995).

The 'Hartmann's pouch' an out pouching of the wall in the region of the neck is recognized more as an outcome of pathology in the form of dilatation or presence of stones. This pouch is variable in size but a large Hartmann's pouch may obscure the cystic duct and the Calot's triangle. This may be result of plain enlargement or due to adherence to the cystic duct or bile duct. Thus a small cystic duct can get completely hidden and traction on the gallbladder can lead to the bile duct looking like the cystic duct. An exaggerated form of the same process is the 'Mirizzi's syndrome' in which a large stone in the Hartmann's pouch area is either adherent to or erodes into the bile duct this can create major difficulty during a Cholecystectomy **(Adams, 1993).**

The cystic artery which supplies the gall bladder, usually arises from the proximal portion of the right hepatic artery and lies superior to the cystic duct (Fig. 3) It is usually given off in the Calot's triangle. It has a variable length and enters the gall bladder in the neck or body area. The course and length of the cystic artery in the Calot's triangle is variable. Although classically the artery traverses the triangle almost in its center, it can occasionally be very close or even lower than the cystic duct. The cystic artery usually gives off an anterior or superficial branch and a posterior or deep branch. This branching usually takes place near the gall bladder. When the point of dissection is very close to the gallbladder as in a laparoscopic cholecystectomy or the branching is proximal, one may have to separately ligate the two branches. Also if the presence of a posterior branch is not appreciated it can cause troublesome bleeding during posterior dissection. In addition the cystic artery gives of direct branches to the cystic duct. These small vessels have been better appreciated in the era of laparoscopic cholecystectomy and need to be divided to obtain a length of cystic duct before division **(Nagral, 2005).**

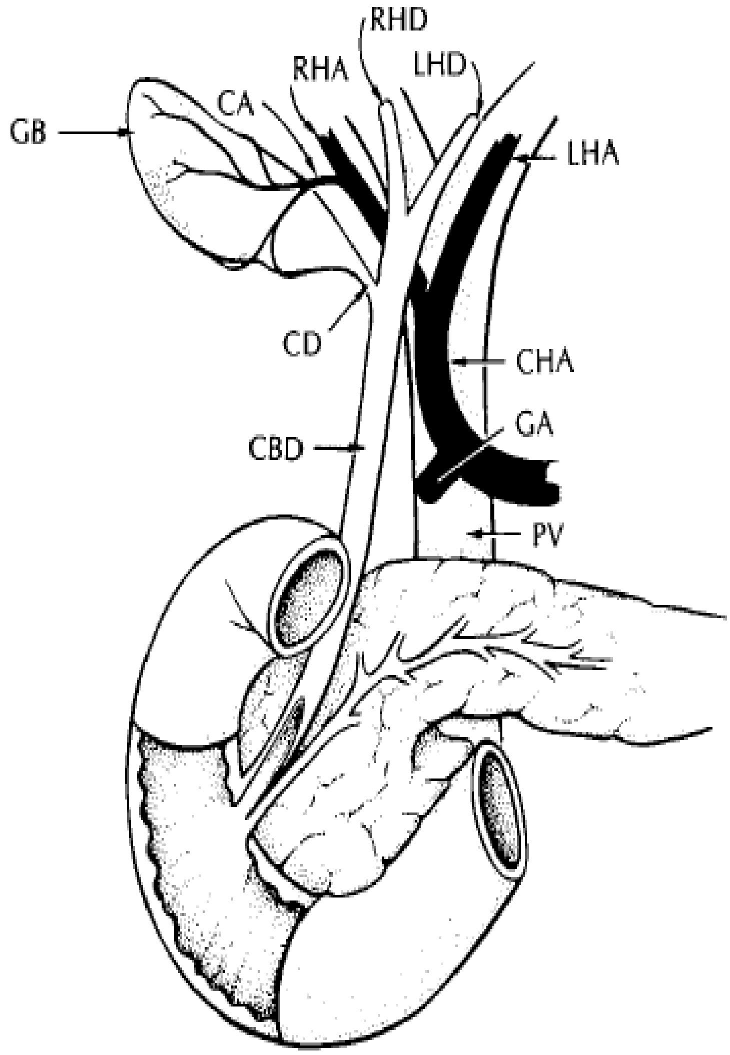

Fig. (3): Relationships of extrahepatic bile ducts, portal vein and branches of right hepatic artery**.** PV: Portal vein, GB: Gallbladder, CA: Cystic artery, CD: Cystic duct, CBD: common bile duct, GA: Gastroduodenal artery, CHA: Common hepatic artery, LHA: Left hepatic artery, RHA: Right hepatic artery, LHD: Left hepatic duct, RHD: Right hepatic duct **(Nagral2005).**

The right hepatic artery normally courses behind the bile duct and joins the right pedicle high up in the Calot's triangle. It may come very close to the gall bladder and the cystic duct in the form of the 'caterpillar' or 'Moynihan's' hump (Fig. 4). Although the incidence of this variation is variable it seems common enough to merit detailed description and may be as high as 50%. If such a hump is present, the cystic artery in turn is very short. In this situation the RHA is either liable to be mistakenly identified as the cystic artery or torn in attempts to ligate the cystic artery. The ensuing bleeding in turn predisposes to biliary injury **(Adams, 1993).**

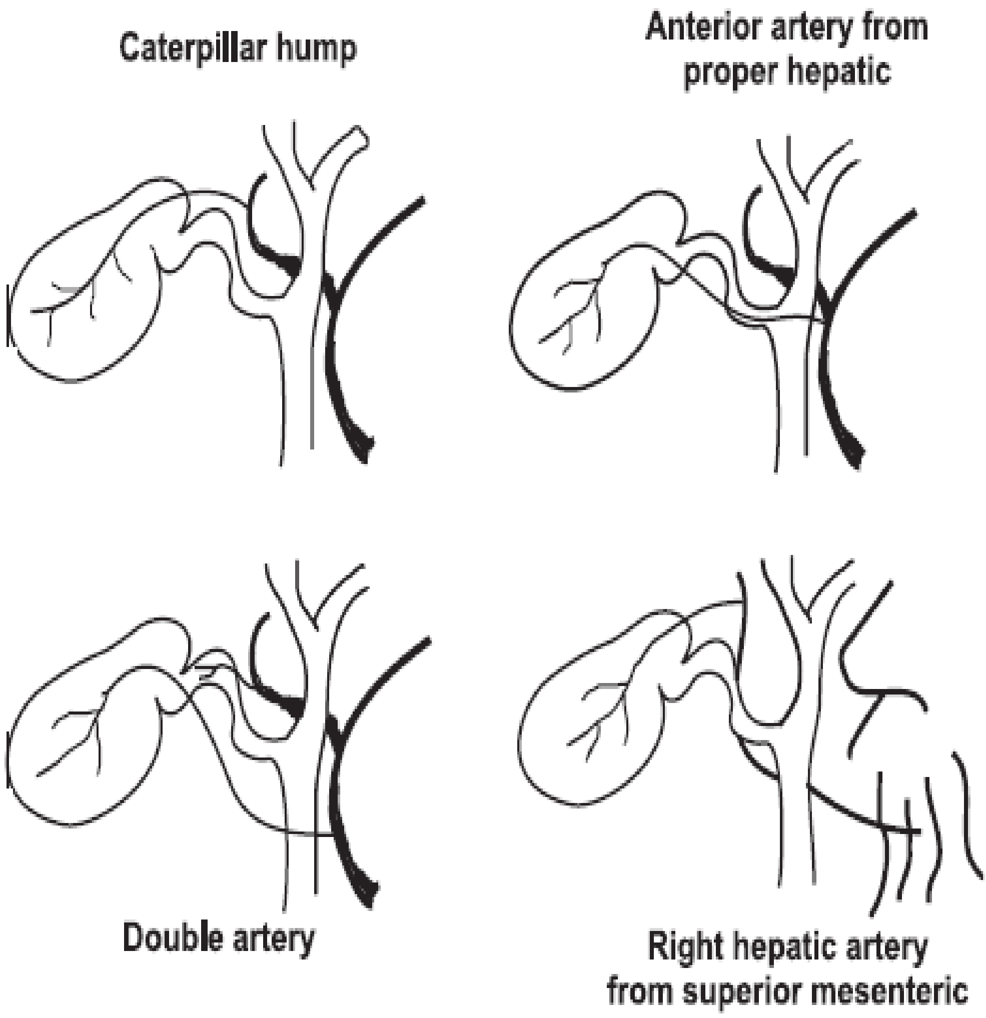

Fig. (4): Some variations of arterial supply to gallbladder **(Nagral, 2005).**

The venous drainage of gall bladder consists of small venous channels on the hepatic side of the gallbladder that lead directly into the liver. Other small veins flow toward the cystic duct and merge with channels from the common bile duct before terminating in the portal venous system. There is no large single cystic vein **(Nagral,2005).**