

Recent Trends in Management of biliary ducts injuries

Essay

Submitted for partial fulfillment of Master Degree in

General surgery

By

Taha Ismaiel Al sayed

M.B.B.Ch.

supervised by

Prof. Dr./ Adel Abdel Aziz Ewada

Professor of General Surgery

Faculty of Medicine - Ain Shams University

Dr./ Medhat Mohamed Helmy

Lecturer of General Surgery

Faculty of Medicine - Ain Shams University

Faculty of medicine

Ain Shams University

2015

ACKNOWLEDGMENT

First of all, the great thanks to ALLAH “the greatest” who enable me to start and complete this work.

I wish to express my deepest appreciation and respect to:

Prof. Dr. Adel Abdel Aziz Ewada , professor of general surgery, faculty of medicine, Ain shams University for his kind supervision, guidance and valuable suggestions through out the course of this work.

My appreciation and thanks to Dr. Medhat Mohamed Helmy, lecturer of general surgery, faculty of medicine, Ain shams University for his continuous guidance and outstanding support.

Finally, special thanks to my parents and family, without their support this work would not see the light.

CONTENTS

Acknowledgment	I
List of Abbreviation	III
List of Figures	IV
List of Tables	VII
Introduction	1
Aim of Work	3
Anatomy of Biliary Tree	4
Classification of Biliary Injury	26
Causes and risk factors of Biliary Injury	34
Management of Biliary Injury	51
Prevention	51
Diagnosis	57
Operative management	72
Non operative therapy	98
Summary	103
Conclusion	106
References	108

LIST OF ABBREVIATIONS

BDI	Bile Duct Injury
CA	Cystic Artery
CBD	Common Bile Duct
CD	Cystic Duct
CHD	Common Hepatic Duct
CT	Computed Tomography
EH	Extrahepatic
ERCP	Endoscopic Retrograde Cholangiopancreatography
GB	Gallbladder
IBDI	Iatrogenic Biliary Duct Injuries
IH	Intrahepatic
IOC	Intraoperative Cholangiography
IOUS	Intraoperative Ultrasound
LC	Laparoscopic Cholecystectomy
LFTs	Liver Function Tests
LHA	Left Hepatic Artery
LUS	Laparoscopic Ultrasonography
MRCP	Magnetic Resonance Cholangiopancreatography
OC	Open Cholecystectomy
PTC	Percutaneous Transhepatic Cholangiography
RHA	Right Hepatic Artery
US	Ultra Sonography

LIST OF FIGURES

	Page
Fig 1. Bile cycle.	4
Fig 2. Surface anatomy of the liver.	6
Fig 3. Normal celiac axis anatomy.	9
Fig 4. Hepatic arterial anomalies.	11
Fig. 5. Biliary drainage of the two functional hemilivers.	13
Fig. 6. Lowering of the hilar plate and exposure of the left hepatic duct.	14
Fig. 7. Variations in cystic ductal anatomy.	15
Fig. 8. Cystic artery anomalies.	17
Fig. 9. Variations in cystic duct .	18
Fig. 10. Hepatocystic triangle and triangle of Calot	19
Fig. 11. Sites of potential malformations of the extrahepatic biliary tract.	20
Fig. 12. Types of double gallbladder arising from a split primordium.	22
Fig. 13. Types of "accessory" gallbladder. See text for explanation.	22
Fig. 14. Variations of cystic duct. (Separate entrance of common hepatic duct and cystic duct into duodenum).	23
Fig. 15. Normal and aberrant sectoral ductal anatomy.	25
Fig. 16. Strasberg classification of biliary injuries.	28
Fig. 17. Bismuth Classification of IBDI.	29
Fig. 18. Bismuth classification of bile duct strictures based on location with respect to the hepatic duct confluence	30
Fig. 19. Stewart-Way classification of BDI.	31
Fig. 20. The deception of the hidden cystic duct and the infundibular technique of laparoscopic cholecystectomy.	37
Fig. 21. The “critical view of safety.” .	38
Fig. 22. Postoperative ERCP(A) and PTC(B).	40

Fig. 23.	Patterns of biliary injury due to misidentification.	42
Fig. 24.	Type E2 injury with a stenosis just below the bifurcation of the hepatic ducts.	46
Fig. 25.	An intraoperative cholangiogram.	53
Fig. 26.	Endoscopic retrograde cholangiopancreatography image.	54
Fig. 27.	A percutaneous cholangiogram in a patient with a type C injury.	64
Fig. 28.	Post cholecystectomy C.T. examination which shows Large biliary leak	67
Fig. 29.	The most common complications after biliary tree and GB surgery.	69
Fig. 30.	Biliary leak from CD.	69
Fig. 31.	Choledocho duodenostomy.	78
Fig. 32.	Primary repair of BDI.	78
Fig. 33.	Choledchojejunostomy.	79
Fig. 34.	Hepaticojejunostomy (transhepatic biliary stent drains bile ducts).	80
Fig. 35.	Side to side anastomotic approach for Bismuth injuries.	82
Fig. 36.	End to side choledochojejunostomy.	83
Fig. 37.	Roux-en-Y hepaticojejunostomy with transhepatic stent.	83
Fig. 38.	Roux en Y Hepaticojejunostomy with stent.	88
Fig. 39.	Creation of an access loop.	89
Fig. 40.	Schematic representation of anatomy of the Hepp–Couinaud repair.	91
Fig. 41.	Schematic diagram of the operative technique for display of isolated right ductal injuries.	91
Fig. 42.	Schematic diagram of a later stage in the dissection.	92
Fig. 43.	Approach to the left hepatic duct (Hepp–Couinaud approach)	94

Fig. 44.	Multiple Hepaticojejunostomy.	94
Fig. 45.	Endoscopic management of biliary injury.	100

LIST OF TABLES

	<i>page</i>
Table 1. Strasberg Classification of Biliary Injury and Stricture	27
Table 2. Bismuth Classification of Biliary Stricture	29
Table 3. Steward- Way classification of IBDI.	31
Table 4. Schmidt classification of IBDI.	32
Table 5. Mattox classification of IBDI.	32
Table 6. Hannover classification of IBDI.	33
Table 7. Inherent features of laparoscopy that may precipitate complication	49

Introduction

and

Aim of the work

Introduction

LC represents the gold standard for surgical treatment of cholelithiasis after substituting traditional cholecystectomy. Despite the progress achieved, BDI still represent an important complication and have become more frequent than in the past. Since the introduction of LC, more than 20 years ago, the rate of BDI does not seem to be substantially changed, even if some researchers report a trend toward a decrease. Moreover, evaluation of the literature on treatment of BDI suggests indirectly that the actual rate of BDI may be higher than that commonly estimated. **(Gennaro, et al., 2005)**

Patients undergoing this procedure have substantially less postoperative pain and a shorter recovery time. These are some reasons for the rapid dissemination of LC. Despite higher risks of BDI, patients undergoing LC have fewer overall complications and lower mortality rates than patients undergoing open surgery. Its dissemination is driven by both patient demand and clinical efficacy, and LC now accounts for more than 75% of all cholecystectomies in many populations. **(William, et al., 2000)**

Although in laparoscopic surgery the approach is minimally invasive, the complexity of the procedure is generally at least equal to its traditional open counterpart. This is also reflected in the scope of possible complications, which characteristically encompasses all the complications known from open surgery and in addition to that a number of complications that are specific to the endoscopic approach. **(Chandler, et al., 2001)**

Benign biliary injuries and strictures are caused by surgical trauma in about 95% of cases. The most common cause of major BDI during LC is mistaking the CBD for the CD. Most bilomas can be managed successfully with noninvasive methods. Major biliary injury usually requires reoperation. Roux-en-Y hepaticojejunostomy are usually necessary for CBD repair. **(Soper, et al., 1993)**

Knowledge about these complications is essential for their prevention. Additionally, this understanding helps the laparoscopic surgeon to identify possible complications intraoperatively. It is the timely recognition, which in many cases allows the surgeon to manage the complication laparoscopically and thereby preserve the patient some of the benefits of the minimally invasive approach. **(Chandler, et al., 2001)**

Prevention of injury to the duct depends on combination of technical skills, experience and a thorough knowledge of the normal anatomy and its variations in the hilum of the liver. **(Doherty and Way, 2006)**

Aim of the work

The aim of this study is to discuss the recent trends on diagnosis and treatment of iatrogenic biliary ducts injuries and how to prevent its occurrence.

Anatomy of Biliary Tree

Anatomy of the biliary tree and gallbladder:

That every surgeon will experience complications is a certainty. Indeed, it has been said that if one has no complications, one does not do enough surgery. Yet, major surgical complications are often avoidable and frequently the result of three tragic surgical errors. These errors are:

1) a failure to possess sufficient knowledge of normal anatomy and function, 2) a failure to recognize anatomic variants when they present, and 3) a failure to ask for help when uncertain or unsure. All but the last of these errors are remediable with study and effort. In regard to the last error, most surgeons learn humility through their failures and at the expense of their patients, while some never learn. (**Flum, et al., 2003**)

The biliary tract is the conduit between the liver and the duodenum and is designed to store and transport bile, under control of neuronal and hormonal regulation. Bile is formed in the hepatocytes and steadily secreted into canaliculi, which transport it to the larger extrahepatic ducts. The sphincter of Oddi regulates the flow of bile into the duodenum or to the cystic duct and the gallbladder. When stimulated, the gallbladder contracts steadily, the sphincter relaxes and bile flow into the duodenum increases. Fig 1 (**Henry and Thomas, 2007**)

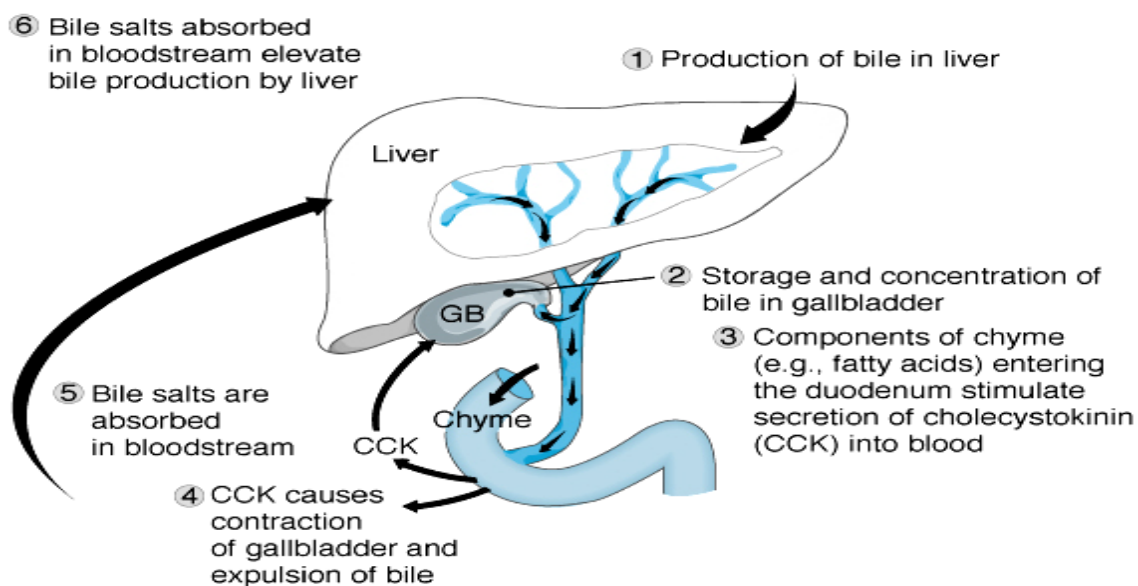


Fig 1: Bile cycle (**Henry and Thomas, 2007**)

- **Liver anatomy:**

- **Surface anatomy:**

The liver is situated primarily in the right upper quadrant, and usually benefits from complete protection by the lower ribs. Most of the liver substance resides on the right side, although it is not uncommon for the left lateral segment to arch over the spleen. The superior surface of the liver is molded to, and abuts the undersurface of the diaphragm on both the right and left side. During normal inspiration, the liver may rise as high as the 4th or 5th intercostal space on the right. The liver itself is completely invested with a peritoneal layer except on the posterior surface where it reflects onto the undersurface of the diaphragm to form the right and left triangular ligaments. The liver is attached to the diaphragm and anterior abdominal wall by three separate ligamentous attachments, namely the falciform, round, and right and left triangular ligaments. (Fig 2) The falciform ligament, which is situated on the anterior surface of the liver, arises from the anterior leaflets of the right and left triangular ligaments and terminates inferiorly where the ligamentum teres enters the umbilical fissure. **(Jarnagin and Blumgart, 2007)**

Additional left-sided important surface features include the gastrohepatic omentum that is located between the left lateral segment and the stomach. The gastrohepatic omentum may contain replaced or accessory hepatic arteries. Finally, there is usually a thick fibrous band that envelops the vena cava high on the right side and runs posteriorly towards the lumbar vertebrae. This band, which is sometimes referred to as the vena caval ligament, must be divided to allow proper visualization of the suprahepatic cava and right hepatic veins. **(Blumgart and Hann, 2007)**