



LAPAROSCOPIC COMMON BILE DUCT EXPLORATION WITH LAPAROSCOPIC CHOLYCYSTECTOMY AS A SINGLE-STAGE MANAGEMENT COMPARED TO ERCP AND LAPAROSCOPIC CHOLYCYSTECTOMY

Essay

Submitted for Partial Fulfillment of Master Degree
in General Surgery

Presented by

Ahmed Fathy Ibrahim Mousa

M.B, B.CH

Faculty of Medicine – Ain Shams University

Supervised by

Prof. Dr. Tarek Ismael El sayed Moustafa

Professor of General Surgery

Faculty of Medicine – Ain Shams University

Dr. Wafi Fouad Saleb

Assistant Professor of General Surgery

Faculty of Medicine – Ain Shams University

Dr. Ahmed El Nabil

Lecturer of general surgery

Faculty of Medicine – Ain Shams University

Faculty of Medicine

Ain Shams University

2013

Acknowledgements

*First, thanks are all directed to **ALLAH** for helping me to accomplish this research, and for providing me with such very encouraging and supportive supervisors.*

*I would like to express my deepest gratitude to **Prof. Dr Tarek Ismael El sayed**, Professor of General Surgery, Faculty of Medicine, Ain Shams University, for his great support and continuous encouragement throughout the whole work under his guidance and supervision.*

*I am also deeply indebted to **Prof. Dr. Wafi Fouad Saleb**, Assistant Professor of General Surgery, Ain Shams University for his great support and guidance throughout the whole work.*

*My deepest appreciation and grateful thanks are due to **Dr. Ahmed El Nabil** Lecturer of General Surgery, Faculty of Medicine, Ain Shams University, for his kind advices and his great effort throughout this work.*

Also, I cannot fully express my deep gratitude and thanks to my family, who I loved a lot and to whom I dedicate this work.

List Of Contents

Title	Page No.
Introduction	1
Aim of the Work	3
Review of Literature:	
• Anatomy of the Extrahepatic Biliary System	4
• Diagnostic Modalities of Biliary Tree	19
• Endoscopic Retrograde Cholangiopancreatography Followed by Laparoscopic Cholecystectomy	34
• Laparoscopic Exploration of Common Bile Duct Stones	51
Summary and Conclusion	86
References	88
Arabic Summary	—

List Of Abbreviations

<i>Abbrev.</i>	: Meaning.
<i>CBD</i>	: Common bile duct.
<i>CBDS</i>	: Common bile duct stones.
<i>CT</i>	: Computerized tomography.
<i>EHL</i>	: Electrohydraulic lithotripsy.
<i>ERCP</i>	: Endoscopic retrograde cholangiopancreatography.
<i>ES</i>	: Endoscopic sphincterotomy.
<i>EUS</i>	: Endoscopic ultrasnoography.
<i>IOC</i>	: Intraoperative cholangiography.
<i>LCBDE</i>	: Laparoscopic CBD exploration.
<i>MRCP</i>	: Magnetic resonance cholangiopancreatography.
<i>PTC</i>	: Percutaneous transhepatic cholangiography.
<i>US</i>	: Ultrasonography.

List Of Tables

Table No.	Title	Page No.
(1)	Factors influencing approach of laparoscopic CBD exploration	56

List of Figures

Figure No.	Title	Page No.
(1)	Anatomy of extrahepatic biliary tract	4
(2)	The extrahepatic biliary tract and the four portions of the common bile duct	9
(3)	The extrahepatic biliary tract and the four portions of the common bile duct	10
(4)	The hepatocystic triangle and the triangle of Calot	11
(5)	Venous drainage of the biliary tract.	13
(6)	Lymphatic drainage of the biliary tract,	14
(7)	Types of cystohepatic junction.	16
(8)	Accessory hepatic ducts. Additional, minute hepatic ducts are not unusual	18
(9)	Transabdominal Ultrasound demonstrating common bile duct stones	20
(10)	CT scan demonstrating dilated cystic and common bile duct. Gallstone is seen in common bile duct	24
(11)	Magnetic resonance cholangiopancreatography (MRCP) image demonstrates common bile duct (CBD) calculi	26
(12)	Magnetic resonance cholangiopancreatography image documenting presence of stone in distal common bile duct.	28
(13)	Intraoperative cholangiogram showing common bile duct stones	29
(14)	An intraoperative cholangiography after the reconstruction showing the contrast agent passing freely into the patient's duodenum	31

Figure No.	Title	Page No.
(15)	Percutaneous transhepatic cholangiogram show dilatation of the extrahepatic bile ducts	32
(16)	Fluoroscopic image of common bile duct stone seen at the time of ERCP	35
(17)	Fluoroscopic image showing dilatation of the pancreatic duct during ERCP investigation	37
(18)	Contrast material (a dye) is injected through the catheter into the opening of the duct	39
(19)	Post-ERCP pancreatitis in a 50-year-old man.	40
(20)	Duct gall stone blocking common bile and pancreatic duct	41
(21)	Endoscopic retrograde cholangiopancreatography image showing multiple CBD stones	42
(22)	ERCP showing multiple filling defects at pancreatic duct	44
(23)	Endoscopic biliary sphincterotomy with stone removal	45
(24)	Hemorrhage and perforation after ERCP in a 67-year-old woman.	46
(25)	Duodenal perforation after ERCP in a 49-year-old woman.	48
(26)	CBD stone extracted by dormia basket	49
(27)	ERCP showing stones in CBD	50
(28)	Insteumentation Used for common bile duct exploration	53
(29)	laparoscopic ports are placed in a standard fashion for laparoscopic cholecystectomy	54
(30)	Intraoperative cholangiography is performed with a silicon catheter introduced with a fenestrated forceps	55

Figure No.	Title	Page No.
(31)	Irrigation techniques for common bile duct stones less than 3 to 4 mm in diameter	59
(32)	a stone retrieval basket may be inserted through the cholangiogram catheter into the common bile duct.	63
(33)	The trans cystic choledochoscope pass in sheath approximately 12 Fr in diameter is placed over the wire through the abdominal wall duct	68
(34)	Rigid nephroscope and biprong forceps	69
(35)	Spontaneous stone discharge presenting at choledochotomy site	76
(36)	(A) External biliary drainage: by using a transcystic drain or a T tube (B) Internal biliary drainage using an endoprosthesis	78
(37)	Laparoscopic common bile duct exploration	79
(38)	Laparoscopic choledochotomy model	81
(39)	Laparoscopic Common Bile Duct Exploration	84

Introduction

The incidence of common bile duct stones in patients having gall bladder stones varies between 8 and 20% (*Girard, 2000*), Choledocholithiasis complicates the workup and management of cholelithiasis, necessitates additional diagnostic and therapeutic procedures, and adds to the morbidity and mortality of gallstone disease (*Alhayaf et al., 2008*).

Several different modalities are available for the nonsurgical treatment of choledocholithiasis. The choices include ERCP, percutaneous extraction, and the remote consideration of lithotripsy (*Donkervoort et al., 2009*).

Surgical treatment may be required for CBD stones that are discovered preoperatively or intraoperatively. Retained stones in the CBD postoperatively are usually dealt with endoscopically or by interventional radiology. If both methods fail, operative management is contemplated (*Donkervoort & Van Ruler, 2009*).

Recently, laparoscopic common bile duct exploration emerges as a safe and effective therapy for CBD stones, Many stones can be quickly and simply cleared by transcystic means or through the CBD, providing patients with single stage

Introduction

management and a recovery similar to laparoscopic cholecystectomy alone (*Ahrendt & Pitt, 2004*).

The advantages of laparoscopic CBD exploration are clear, the stones of the common bile duct & the gall bladder are taken care of simultaneously in a minimally invasive manner that leads to shorter hospital stays and less pain than the corresponding open procedure or laparoscopic cholecystectomy/ERCP combination (*Ahrendt & Pitt, 2004*).

However the technique requires advanced laparoscopic skills, including suturing, and the use of a choledochoscope, guidewires, dilators and dormia basket (*Veccio & Macfadyen, 2002*). On the other hand, it still carries the advantages of being done by the same treating physician & eliminates the need for the presence or in some situations the referral of the patient to another center for an endoscopist for ERCP, more over it does not carry the hazards of the ERCP.

Aim of the Work

The aim of our work is to review the laparoscopic common bile duct exploration with laparoscopic cholecystectomy as a single-stage management compared to ERCP and laparoscopic cholecystectomy as two-stage management for treatment of a patient with common bile duct stones, regarding efficacy, safety, feasibility, short & long term outcome in the literature & the previous studies.

ANATOMY OF THE EXTRAHEPATIC BILIARY SYSTEM

Biliary exposure and precise dissection are the most important steps in any biliary operative procedure. A thorough anatomical knowledge is essential if optimal results are to be obtained (*Blumgart and Hann, 2007*).

The extrahepatic bile ducts are represented by the extrahepatic segments of the right and left hepatic ducts joining to form the biliary confluence and the accessory biliary apparatus, which constitutes a reservoir, comprising the gallbladder and the cystic duct (*Blumgart and Hann, 2007*).

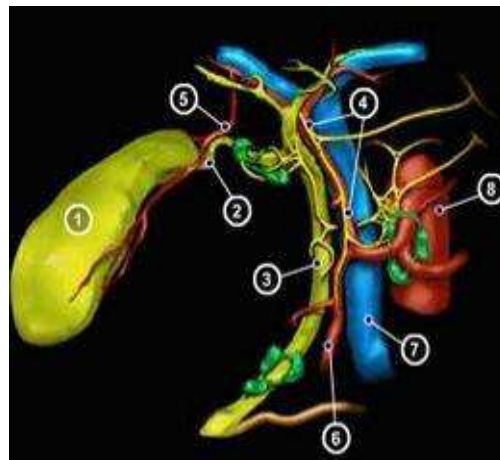


Figure (1): Anatomy of extrahepatic biliary tract

- | | | |
|-------------------|------------------|--------------------------|
| 1- Gallbladder | 2- Cystic duct | 3- Common bile duct |
| 4- Hepatic artery | 5- Cystic artery | 6- Gastroduodenal artery |
| 7- Portal vein | 8- Coeliac trunk | |

(Available at: <http://www.websurg.com/ref/laparoscopic>)

Anatomy of the Extrahepatic Biliary System

The right and left hepatic ducts emerge from the right and left lobes of the liver in the porta hepatis. After a short course, the hepatic ducts unite to form the common hepatic duct (*Mary and Klingensmith, 2008*).

Anatomical Description:

The Left Hepatic Duct:

It drains three segments (2, 3 and 4) which constitute the left liver. It traverses beneath the left liver at the base of segment 4, just above and behind the left branch of the portal vein, crosses the anterior edge of that vein and joins the right hepatic duct to constitute the hepatic ductal confluence (*Blumgart and Hann, 2007*).

- The Right Hepatic Duct:

It drains segments 5, 6, 7 and 8 of liver segments it is short and joins the left hepatic duct to constitute the confluence lying in front of the right portal vein, forming the common hepatic duct (*Blumgart and Hann, 2007*).

The left duct is longer (1.7 cm, average) than the right duct (0.9 cm, average). The junction of these two ducts lies 0.25-2.5 cm from the surface of the liver (*Skandalakis et al., 2000*).

- The Main Bile Duct:

The main bile duct, the mean diameter of which is about 6 mm, is divided into two segments: the upper segment is called the common hepatic duct and is situated above the cystic duct, which joins it to form the lower segment, which is called the common bile duct (*Blumgart and Hann, 2007*).

- The Common Hepatic Duct:

The common hepatic duct is about 1.5 in. (4 cm) long and descends within the free margin of the lesser omentum. It is joined on the right side by the cystic duct from the gallbladder to form the bile duct.

The common hepatic duct courses downwards anterior to the portal vein in the free edge of the lesser omentum and is closely applied to the hepatic artery which runs upwards on this left, giving rise to the right branch of the hepatic artery, which crosses the duct usually posteriorly, though in about 20% of cases anteriorly (*Blumgart and Hann, 2007*).

- The Common Bile Duct:

The length of the common bile duct varies from 5 to 15 cm. depending on the position of the entrance of the cystic duct. The duct may be divided arbitrarily into four portions :

1- Supraduodenal: Average length 2cm, ranges from 0-4cm.

Anatomy of the Extrahepatic Biliary System

- 2- Retroduodenal: Average length 1.5cm, ranges from 1.0-3.5cm.
- 3- Pancreatic: Average length 3cm, ranges from 1.5-6cm.
- 4- Intramural: Average length 1.1cm ranges from 0.8-2.4cm.

(Skandalakis et al., 2009)

The supraduodenal portion lies between the two leaves of the hepatoduodenal ligament, in front of the foramen of Winslow, to the right of the hepatic artery, and anterior to the portal vein (*Skandalakis et al., 2009*).

The retro duodenal portion lies between the superior margin of the first part of the duodenum and the superior margin of the head of the pancreas. The gastro duodenal artery is to the left and the posterior superior pancreatico-duodenal artery crosses first anterior to the bile duct and then posterior to the duct just before it enters the duodenum (*Skandalakis et al., 2009*).

Pancreatic portion: The common bile duct may be partly covered by a tongue of pancreas (44%), completely within the pancreatic substance (30%), uncovered on the pancreatic surface (16.5%) or completely covered by two tongues of pancreas (9.5%) (*Skandalakis et al., 2009*).

Intramural portion passes obliquely through the duodenal wall together with the main pancreatic duct. Within the wall,