Preoperative Risk Factors Predicting the Possible Difficulties in Laparoscopic Cholecystectomy

An Essay

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Contents

List of Tables

Page No.

List of Figures

Page No.

List of Abbreviations

CBD	: Common bile duct.
CHD	: Common hepatic duct.
CT	: Computed tomography.
ERCP	: Endoscopic retrograde cholangioparcreatography.
HIDA	: Hepatobilary iminodiacetic acid.
LC	: Laparoscopic cholecystectomy.
LHD	: Left hepatic duct.
MRCP	: Magnetic resonance cholonquiopancreatography.
OC	: Open cholecystectomy.
PTC	: Percutaneous transhepatic cholongiography.
RA	: Right anterior.
RAD	: Right anterior bile duct.
RHA	: Right hepatic artery.
RHD	: Right hepatic duct.
RP	: Right posterior.

Introduction

Minimal access surgical techniques are now considered to be the gold standard for biliary, anti-reflux and bariatric surgeries ***(Hinder, 1994).*** This is mainly due to improved patient recovery with reduced pain, shorter hospital stay and a quicker return to normal daily activities ***(Soper et al., 1992).***

Following the first laparoscopic cholecystectomy, performed by Phillipe Mouret in 1987, there were a large number of surgeons attempting this new technique. Indeed, many of the early operations were fuelled by strong public demand, and supported by commercial companies ***(Brosens et al., 2003).***

Today the removal of gall bladder is the safest, the most effective and widely recommended treatment for gallstone disease ***(Laws et al., 1999).*** **S**ince the introduction of laparoscopic cholecystectomy into general practice in 1990, it has rapidly become the gold standard treatment for symptomatic cholelithiasis, while open cholecystectomy is now reserved to difficult and problematic cases ***(Robert et al., 2000).***

Laparoscopic cholecystectomy has been advocated for the treatment of uncomplicated symptomatic gallstone disease, but recently it has been considered for the management of more complicated gallbladder disease such as acute cholecystitis and associated common bile duct stones ***(Nervi et al., 2003).***

The safety of the procedure was discussed recently, comparing laparoscopic operations in elective and acute cases and concluded that there are benefits for the patient with acute cholecystitis if the laparoscopic route is used. However, the conversion rate and the rate of complications are higher than in elective cholecystectomy ***(Peng et al., 2005).***

In 1991 the technique of laparoscopic exploration of the CBD was first published from several centers and several surgeons have adopted this technique ***(Binmoeller et al., 2001).***

The difficult gallbladder is the most common “difficult” laporoscopic surgery performed by general surgeons. It is also “potentially” the one that places the patient at significant risk, so nearly all surgeons will encounter difficult cholecystectomies. Many tyring and untenable situations can be prevented or made easier by the cautious surgeon who has a carefully thought-out plan for each potential problem ***(Laws et al., 1999).***

Consequently, the prospect to preoperatively predict conversion is important, in order to a “prior” schedule open surgery or takes appropriate measures if laparoscopy is scheduled ***(Peng et al., 2005).***

Patients with a high risk of conversion could be operated up on either by or under the supervision of a more experienced surgeon. Surgeons in the early phase of their training could operate on patients with low risk of conversion, especially if they are not operating under the supervision of an experienced laparoscopic surgeon. Also, a high predicted risk of conversion may allow the surgeon to take an early decision to convert to open cholecystectomy when difficulty is encountered during dissection; this may shorten the duration of surgery and decrease the associated morbidity ***(Kama et al., 2001).***

Accurate prediction of the risk of conversion is of a great interest to the clinician, and to define “high-risk” groups of patients, as well as identifying those among whom few will require conversion. This information would be helpful when surgery is scheduled ***(Van der Velden et al., 1998).***

Aim of the Work

The aim of the study is to evaluate the efficacy of preoperative risk factors in detecting the possible degree of difficulty in laparoscopic cholecystectomy as well as possibility for conversion to an open surgery in order to minimize the complications by taking the appropriate decision about the type of surgery preoperatively.

Chapter (1):
Surgical Anatomy of the Gallbladder and Biliary Tree

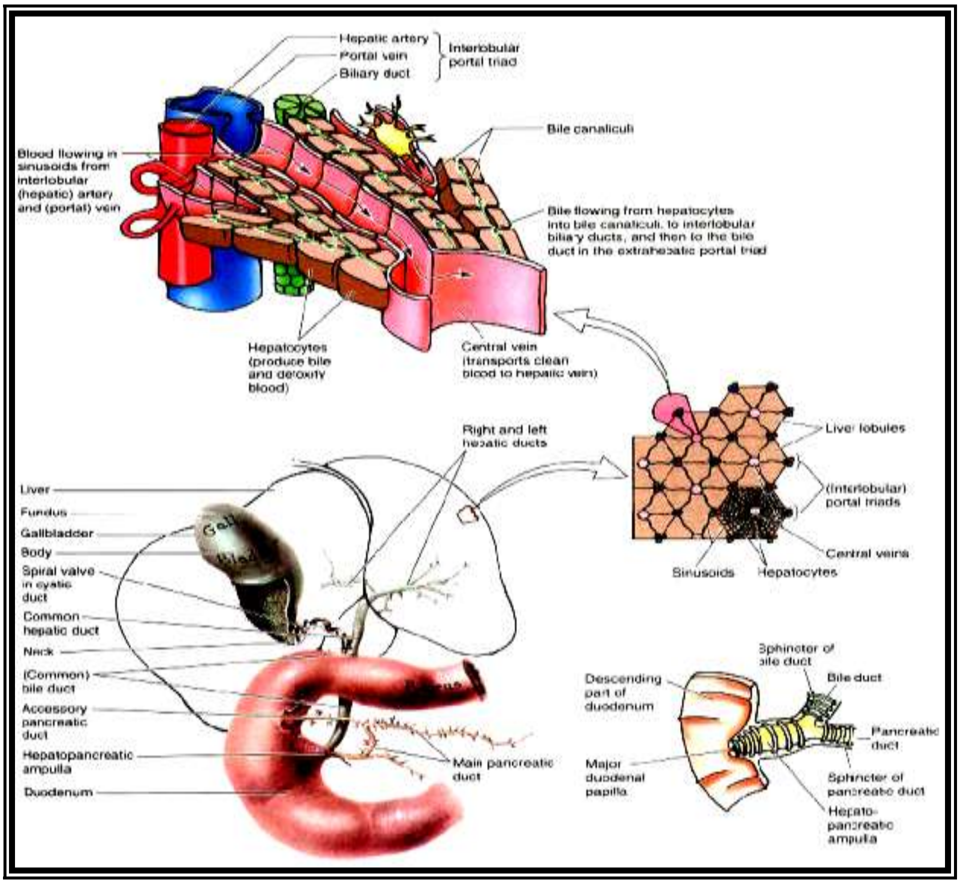

Fig. (1): Anatomical overview of liver lobule and extrahepatic biliary system ***(Moore and Dalley 1999).***

Discussion of laparoscopic cholecystectomy would not be complete without a thorough review of the anatomy of the liver, biliary tree, and gallbladder. Much of today's hepatobiliary anatomy was described by Couinaud in the mid-1900s and further delineated by corrosion casts, stereoscopic radiographs, and computerized three-dimensional imagery. The biliary system and hepatic vasculature are generally much more variable than any other part of the human anatomy ***(Paul, 2004).***

Bile Duct Confluence and Common Hepatic Duct Anatomy:

The left and right hepatic ducts merge to form the CHD. The bile duct confluence is located in the hilar plate anterior to the portal vein. Extrahepatically, a sheath covers the bile duct and hepatic artery branches, which is continuous with the hepatoduodenal ligament. Opening the connective tissue of the hilar plate inferior to segment IV of the liver exposes the LHD and the confluence of hepatic duct. The intrahepatic portion of the bile ducts is covered by the Glisson sheath except for the bile ducts of the left medial section ***(Kawarada et al., 2000).***

The formation of the CHD can be variable. The most commonly encountered confluence pattern is where RHD and LHD merge to form the CHD (Fig. 2). Couinaud reported this to be present in 57% of cases and Healey and Schroy reported a 72% incidence. The next most prevalent configuration is when the right posterior duct joins the LHD (Fig. 2) in 16-19%. As can be seen in Fig. 2, the right posterior duct may join the LHD more peripherally in 5% of cases. In 11% of cases, the LHD and the right anterior and posterior ducts formed a trifurcation. The relationship of the right posterior (RP) or right anterior (RA) ducts to one another at the trifurcation may vary as illustrated in Fig. 2B1, B2. It is about three times more likely for the RP hepatic duct to be superior to the RA duct (Fig. 2).Finally, 4.5% had the RP hepatic duct join the CHD after the RA and LHD had merged. The point at which the RP joins may be close to the confluence of the RA and LHD (Fig. 2) or more distal (Fig. 2**) *(Khashayar and Elizabeth, 2008).***

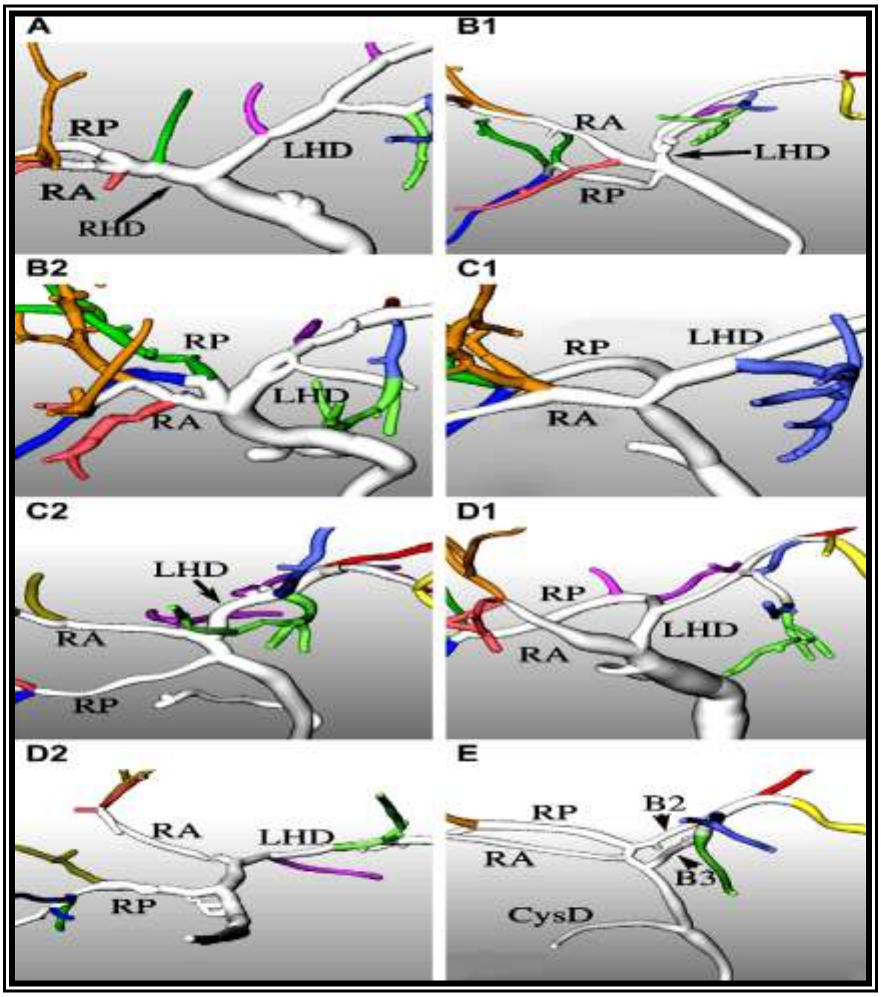

Fig. (2): Most common variations of the hepatic duct confluence. (A) Usual configuration of the confluence, (B1, B2) triple confluence, (C1) right posterior sectoral duct (RP) draining into LHD, (C2, D2) RP draining into CBD, (D1) RP draining into LHD more peripherally than in C1, (E) absence of hepatic duct confluence ***(Khashayar and Elizabeth, 2008).***

Common Bile Duct Anatomy:

The cystic duct drains into the common hepatic duct to form the CBD. The CBD is situated anterior to the portal vein along right edge of the lesser omentum. It courses caudad behind the first portion of the duodenum then runs in an oblique fashion on the dorsal aspect of the pancreas in the pancreatic groove. Most of the time, the CBD in the pancreatic groove is covered by pancreatic tissue or embedded within pancreatic tissue and in 12% of cases it has a posterior bare area.CBD usually joins the pancreatic duct (70%) and they enter the second portion of the duodenum on its posteromedial wall at the major papilla.The union of the CBD and the major pancreatic duct creates the ampulla of Vater. A sheath of circular smooth muscle fibers surrounds the ampulla and the intraduodenal portion of the CBD and the major pancreatic duct and is known as the sphincter of Oddi. In some cases, the pancreatic duct and the CBD do not join and each enters the duodenum separately on the duodenal papilla. The site of entrance of the CBD into the duodenum has been studied by several groups and it was found that the CBD enters the descending portion of the duodenum in greater than 80% of the cases. Other sites of entrance of the CBD are the transverse duodenum and at the angle created by the junction between the descending and transverse duodenum. Anatomic studies have shown the external diameter of the suprapancreatic CBD to range from 5 to 13 mm with a mean diameter of 9 mm. The internal diameter range is 4 to 12.5 mm with a mean diameter