

Role of Surgery in the Management of Acalculous Cholecystitis

An Essay

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List of abbreviations

3D	= 3 Dimensional
Bas	= Bile acids
CAGD	= Chronic Acalculous Gallbladder Disease
CBD	= Common Bile Duct
CCK	= Cholecystokinin
CD	= Cystic Duct
CHD	= Common Hepatic Duct
CT	= Computed Tomography
ERCP	= Endoscopic Retrograde CholangioPancreatography
GB	= Gall Bladder
GBEF	= Gallbladder Ejection Fraction
IBS	= Irritable Bowel Syndrome
IVC	= Inferior Vena Cava
Kg	= Kilogram
LC	= Laparoscopic Cholecystectomy
LHD	= Left Hepatic Duct
mL	= milliliter
mm	= millimetre
mm Hg	= millimeters of mercury
MR	= Magnetic Resonance
NPO (latin=Nil Per Os)	= nothing by mouth
RHD	= Right Hepatic Duct
SOM	= Sphincter of Oddi Manometry
Tc-99m-HIDA	= Technetium - 99 m - Hepatobiliary Iminodiacetic Acid
μ g	= microgram
μm	= micrometer

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Introduction

Acalculous biliary-type abdominal pain is a commonly encountered clinical problem whose pathophysiology is unclear and evaluation and management are controversial (**Rastogi et al., 2005**). It represents 2% to 14% of cholecystectomies performed for acute cholecystitis (**Vibert et al., 2002**). With male predominance in the AAC group (male : female = 9 : 2) (**Shridhar Ganpathi et al., 2007**).

Acute acalculous cholecystitis (AAC) is a life-threatening condition whose incidence is steadily increasing, although it is still very much lower than that of the corresponding calculus form. The severity of the disease is due to the rapid course towards gallbladder necrosis and biliary peritonitis (**Katsinelos et al., 2008**).

Acute acalculous cholecystitis (AAC) is traditionally known to occur in critically ill patients, following cardiac surgery, abdominal vascular surgery, severe trauma, burns, prolonged fasting, total parenteral nutrition, or sepsis, and is believed to have a worse prognosis as compared with acute cholecystitis associated with stones (**Shridhar Ganpathi et al., 2007**).

AAC can occur in young and middle-aged healthy individuals, the presentation is no different from acute calculous cholecystitis, the prognosis is good if diagnosed and treated early (**Shridhar Ganpathi et al., 2007**).

Chronic acalculous gallbladder and chronic acalculous biliary disease are considered functional hepatobiliary diseases (**Ziessman et al., 2006**).

A presumed etiology of CAC is sphincter of Oddi hypertension (SOH) (**Young et al., 2006**).

Recent developments in cross-sectional imaging in sonography, computed tomography, and magnetic resonance imaging offer numerous tools for depicting the biliary system with high diagnostic accuracy (**Helmberger et al., 2005**).

USG is the most reliable method of early diagnosis of AAC. In addition, follow-up USG criteria are earlier and much more reliable in determining the most favorable time for operative intervention than those of clinical and laboratory criteria used conventionally in AAC patients who had underlying diseases. So, the authors suggest that initially nonoperative treatment of AAC is safe and effective in most cases (**Imamoğlu et al., 2002**).

Fatty meal CS is a very useful technique in the diagnosis of CAC. It predicts a good surgical outcome once GBEF is low in patients with high pre-test probability for CAC. Moreover, fatty meal CS may be a good alternative to CCK CS (**Al-Muqbel et al., 2009**).

For chronic acalculous gallbladder disease, calculation of a gallbladder ejection fraction during sincalide cholescintigraphy can confirm the clinical diagnosis and has become a common routine procedure in many nuclear medicine clinics (**Ziessman et al., 2006**).

The mainstay of therapy for AAC is cholecystectomy, which was traditionally performed by open laparotomy, Recently, laparoscopic cholecystectomy was performed with no complications from the procedure (**Ay-Jiun Wang et al., 2003**).

Patients without gallstones who have right upper quadrant pain and a positive HIDA scan result are more likely to experience symptom relief following cholecystectomy than those treated medically. There is, however, wide variability in data reporting, particularly with respect to symptom relief and

duration of follow-up. Cholecystectomy is indicated in symptomatic patients without gallstones who have a low-ejection fraction HIDA scan (***Mahid et al., 2009***).

PCS is a comparatively safe and efficient procedure in the treatment of acute cholecystitis in high-risk patients with serious comorbidity and in elderly patients, contraindicating the general anaesthesia required for laparoscopic or open cholecystectomy (***Leveau et al., 2008***).

Endoscopic stent placement in the gallbladder is a safe and an effective palliative treatment for patients with symptoms caused by gallbladder disease who are poor surgical candidates (***Conway et al., 2005***).

Aim of the work

To spotlight the Acalculous cholecystitis as a challenging surgical condition and to verify the role of surgery in solving this problem.

Surgical anatomy of the Biliary system

That every surgeon will experience complications is a certainty. 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 (**Chamberlain and Blumgart 2003**).

The human biliary system consists of an organ and ductal system that creates, transports, stores, and releases bile into the duodenum to aid digestion of fats. The anatomy comprises the liver, gallbladder, biliary tract (cystic, hepatic and common bile ducts) (**Ooi et al., 2004**).

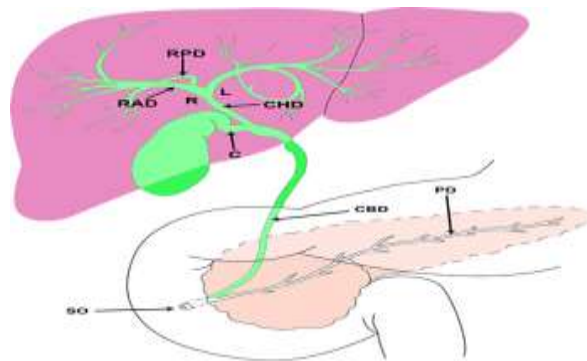


Fig (1): Diagram of the normal biliary anatomy (**Silva et al., 2004**).

Anterior (RAD) and posterior (RPD) segmental right hepatic ducts join to form the main right hepatic duct (R), which may vary in length. The right and left (L) main intrahepatic ducts become extrahepatic proximal to their confluence in the common hepatic duct (CHD), which joins with the cystic duct (C) to form the common bile duct (CBD). Biliary and pancreatic duct (PD) flow is regulated by the sphincter of Oddi (SO).

Developmental anatomy :

Biliary tract pathology is commonly encountered and it can also present significant diagnostic and therapeutic challenges to the practitioner. One of the main challenges is attributable to the variability in the anatomy of the biliary system. The development of the liver and biliary system is a complex process that can lead to numerous anatomic variations. A thorough knowledge of this anatomy is essential in radiologic, endoscopic, and surgical approaches to the biliary system (***Vakili et al., 2008***).

The liver, gallbladder and the extra-hepatic biliary tree arise from the hepatic diverticulum of the foregut in the beginning of the fourth week of embryological development. This diverticulum rapidly proliferates into the septum transversum and divides into two parts, the distal pars hepatica, and the proximal pars cystica (***Abeyasuriya et al., 2008***).

When the embryo is about 5 mm in length, the cranial and caudal branches become further connected by a common stalk, which later becomes the common bile duct. By the time the embryo is about 7 mm in length, the cranial branch (pars hepatica) divides into two cellular columns, which later become the physiologic right and left hepatic lobes. The gallbladder develops from the caudal branch (pars cystica) and continues its connection with the common stalk through a channel, which later becomes the cystic (***Krishnamurthy and Krishnamurthy 2009***).

The pars cystica of the hepatic diverticulum begins initially from the anterior side of the future duodenum. Approximately the fifth week, the duodenum rotates to the right, so that the attachment of the developing common bile duct becomes displaced to its definitive position on the dorsal side of the duodenum (***Roskams and Desmet 2008***).

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 (***Mortele´and Ros 2001***).

Canalization takes place to form a patent biliary tree (gallbladder, cystic duct, right and left hepatic duct, common hepatic duct, and the common bile duct). The liver begins bile secretion by the 12th intrauterine week, thus completing the formation of the hepatobiliary system, the most complex metabolic factory in the human body (***Krishnamurthy and Krishnamurthy 2009***).

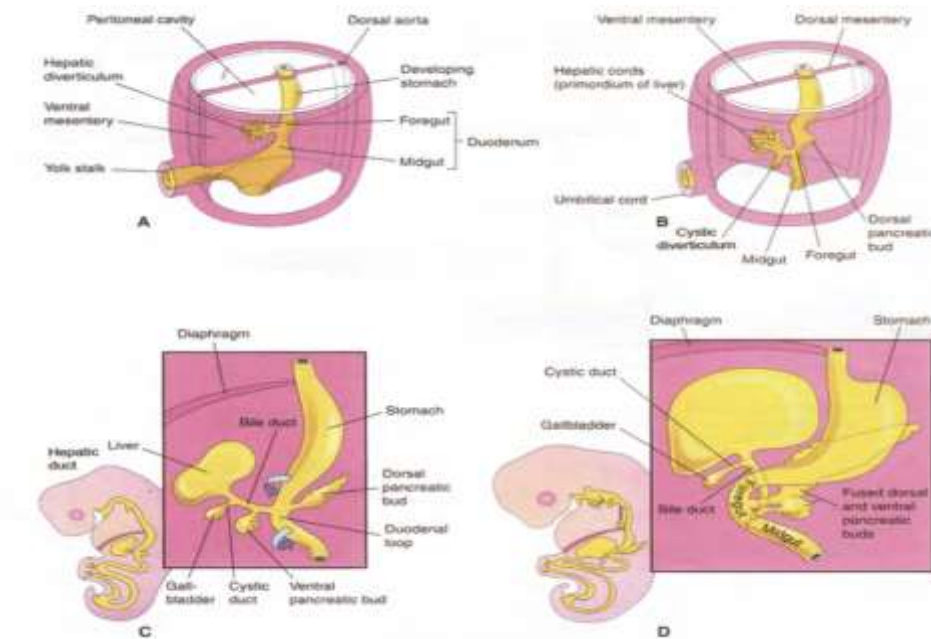


Fig (2): Progressive stages in the development of the duodenum, liver, extrahepatic biliary system, and pancreas. A, 4 weeks; B and C, 5 weeks; D, 6 weeks. Note that the entrance of the bile duct into the duodenum gradually rotates from its initial ventral position (A- C) to a dorsal one (D). This explains why the bile duct passes posterior to the 1st part of the duodenum and head of the pancreas, and how the ventral pancreatic bud joins to the dorsal pancreatic bud (**Dalley and Moore 2006**).

Surgical anatomy of the liver :

The liver is the largest internal organ in the body, accounting for approximately 2% to 3% of the total body weight of an adult (**Skandalakis et al., 2004**).

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 sides. (**Chamberlain and Blumgart 2003**).

Liver anatomy can be described using two different aspects: morphological anatomy and functional anatomy (**Rutkauskas et al., 2006**).

Morphological anatomy :

The liver shape is that of a triangular pyramid, the top of which is formed by a thin flattened part, the left lobe. The base is formed by its right lateral surface, which is located under the right septum and the right thoracic wall. The sides of the pyramid are formed by its anterior, posterior and lower surfaces. The boulder between the anterior and lower surface is the anterior edge of the liver. The liver is covered by peritoneum, except of the gallbladder region, the hilum, the region surrounding the course of the inferior vena cava and a region in contact to the right adrenal gland. The peritoneal reduplications, which extend from the anterior abdominal wall and the diaphragm to the liver, form the ligaments of the organ that maintain the organ at its place. The classic descriptions characterize the liver as having four lobes: right, left, quadrate and caudate. The liver is divided into right and left anatomic lobes by the attachment of the falciform ligament on the anterosuperior surface (**Kekis and Kekis 2006**).