comparison of using or not among laparoscopic cholecystectomy patients with non-00complicated gallbladder disease in large hospital

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Abstract

Laparoscopic cholecystectomy provides a safe and effective treatment for patients with gallstones as it reduces post-operative pain with almost negligible scar, short hospital stay and earlier return to work. The study compared drain insertion post laparoscopic cholecystectomy in matter of post-operative pain, port site infection, hospital stay and post-operative collection. 100 patients were included in this study, 70 were females (70%) and 30 were males (30%). The study revealed that there is significant reduction in postoperative pain in patients without drain than in those with drain. Moreover regarding postoperative wound infection it was also lower in patient with no drain. There were also statistically significant reduction in postoperative hospital stay in patients without drain. Furthermore, the results found that postoperative intraabdominal collection was significantly lower in patients with drain in first 24 hours, while after that there were no significant difference regarding intraabdominal collection.

Key words: *Laparoscopic cholecystectomy, Gall Bladder, Hospital*

الملخص العربي

يوفر استئصال المرارة بالمنظار علاجًا آمنًا وفعالًا للمرضى الذين يعانون من حصوات المرارة لأنه يقلل من آلام ما بعد الجراحة مع ندبات قليله جدا, وإقامة قصيرة في المستشفى والعودة إلى العمل مبكرًا.

تستخدم المصارف الوقائية في جراحة البطن على نطاق واسع إما للكشف عن المضاعفات مبكرًا, مثل نزيف ما بعد الجراحة أو تسرب الصفراء, أو لتصريف التجمعات التي قد تكون سامة, مثل

الصفراء. ومع ذلك, فإن البيانات القائمة على الأدلة لا تدعم استخدام الصرف الوقائي في غالبية جراحات البطن.

لا تزال حصوات المرارة من أكثر الحالات شيوعًا بالعيادات الخارجية الجراحية. أثبت استئصال المرارة بالمنظار, بعد ظهوره في عام 1987, نفسه بسرعة باعتباره العلاج القياسي الذهبي لحصوات المرارة. في عام 1913 تم وصف استئصال المرارة بدون تصريف, ومنذ ذلك الحين تم تقسيم الجراحين سواء كانوا سيستخدمونها أم لا في حالات غير معقدة. يواصل معظم الجراحين استخدام التصريف الروتيني خوفًا من تسرب أو نزيف الصفراء. تحدث مثل هذه المضاعفات دائمًا على الرغم من وضع التصريف. لذا فإن هناك حاجة للدراسة, سواء لوضع الصرف أم لا, ونتائجها.

من بين 100 مريضًا شملتهم هذه الدراسة ، كان 70 من الإناث (70%) و30 من الذكور (30%), مع نسبة الإناث إلى الذكور 3.1 :1 تقريبًا. تم توزيع المرضى بشكل عشوائي على مجموعتين: المجموعة الأولى (أ) خضعوا لعملية استئصال المرارة بالمنظار مع إدخال التصريف, وتتكون هذه المجموعة من 50 مريضًا, 12 منهم من الذكور (24%) و 38 من الإناث (76%) بينما خضعت المجموعة الثانية (ب) أيضًا لاستئصال المرارة بالمنظار ولكن بدون إدخال تصريف وتتكون هذه المجموعة من 50 مريضًا, 18 ذكور (36%) و 32 إناث (% 64).

تشمل دراستنا المرضى الذين يعانون من التهاب حصوي مراري مزمن والذي يشار إليه في استئصال المرارة بالمنظار الاختياري.

❖ **<u>فيما يتعلق بألم ما بعد الجراحة:</u>**

كان أعلى في المرضى في المجموعة أ (مع الصرف) منه في المجموعة ب (بدون صرف) ، وكان ذلك ذا دلالة إحصائية (قيمة P أقل من 0.05).

❖ **<u>فيما يتعلق التهاب أماكن دخول المنظار الجراحي:</u>**

تمت متابعة جميع المرضى المشمولين في هذه الدراسة بعد الجراحة لعدوى أماكن دخول المنظار الجراحي (حتى اليوم السابع من إزالة الغرز) ووجدنا أن حدوث عدوى في أماكن دخول المنظار الجراحي

كان أعلى في المجموعة أ (مع الصرف) في الموقع حيث تم إدخال الصرف ، وكانت ذات دلالة إحصائية (قيمة P أقل من 0.05).

❖ **فيما يتعلق الإقامة في المستشفى بعد الجراحة:**

كانت الإقامة في المستشفى أقل بكثير في المرضى الذين ليس لديهم تصريف (المجموعة ب) حيث تم خروج 42 مريضًا (84٪) في نفس يوم العملية من المستشفى وهو ذو دلالة إحصائية (قيمة P أقل من 0.05).

❖ **فيما يتعلق بالتجمعات ما بعد الجراحة:**

تابعنا التجمعات ما بعد الجراحة في المجموعتين في اليوم الأول والثاني والثالث وتبين أن التجمعات في اليوم الاول بعد العمليه كانت أقل في المجموعة أ (مع استنزاف), حيث 80٪ من المرضى لم يطورو تجمعات بالبطن, بينما طور 16% من المرضى تجمعات أقل من 50 مل, بينما طور 4% من المرضى تجمعات 50–100 مل.

في حين أن المجموعة ب (بدون تصريف) 16% من المرضى لم يطورو تجمعات بالبطن, بينما طور 76% من المرضى تجمعات أقل من 50 مل, بينما طور 8% من المرضى تجمعات 50–100 مل.

وكان ذلك ذا دلالة إحصائية في اليوم الأول بعد الجراحة (قيمة P أقل من 0.05) ، بينما لم تكن ذات دلاله في الـ 72 ساعة التالية.

Introduction

Laparoscopic cholecystectomy has largely replaced open cholecystectomy because of shorter hospital stay, faster recovery, and lower overall morbidity. Unfortunately, however, the morbidity due to bile duct injury has increased with the advent of the laparoscopic approach ***(Henry et al., 2011)***.

Laparoscopic cholecystectomy provides a safe and effective treatment for patients with gallstones as it reduces post-operative pain with almost negligable scar, short hospital stay and earlier return to work ***(El-Labban et al., 2012).***

Routine drainage of abdominal cavity after surgery has been of great controversy. Nevertheless, the policy of routine abdominal drainage is increasingly questioned. Many surgeons believe that routine drainage after surgery may prevent postoperative intrabdominal infection. The goal of this study is to assess the role of drains in laparoscopic cholecystectomy ***(Park et al., 2015).***

Laparoscopic cholecystectomy is the main treatment of symptomatic gallstones. Routine drainage after laparoscopic cholecystectomy is an issue of great debate ***(El-Labban et al., 2012).***

Gallstones are still one of the most common conditions in surgical outpatient department. Laparoscopic cholecystectomy, after its advent in 1987, rapidly established itself as the gold standard treatment of gallstones. In 1913 cholecystectomy without drainage was described, and since then surgeons were divided whether to use it or not in uncomplicated cases. Most surgeons continue to use routine drain for the fear of bile leakage or bleeding. Such complications invariably occurred inspite of sub hepatic drainage. So, there arises a need for study, whether to put drain or not, and its consequences ***(Gadhvi et al., 2018).***

Prophylactic drains in abdominal surgery are widely used either to detect complications early, such as postoperative hemorrhage or bile leakage, or to drain collections which may be toxic, as bile. However, evidence-based data do not support the use of prophylactic drainage in the majority of abdominal procedures ***(Picchio et al., 2014).***

Aim of the Work

Our study is to assess whether to put a drain or not in uncomplicated laparoscopic cholecystectomy.

Review of Literature

Anatomy of the Biliary Tree and the Gall Bladder

1. <u>Gall bladder:</u>

The Gall bladder acts as a reservoir for bile located under surface of the liver at the confluence of the right and left halves of the liver. It is separated from the hepatic parenchyma by a cystic plate, which is constituted of connective tissue applied to the Glisson capsule ***(Schulick, 2012).***

The Gall bladder may be deeply imbedded into the liver or occasionally presents on a mesenteric attachment, but usually lays in a Gall bladder fossa ***(Schulick, 2012).***

The Gall bladder varies in size and consists of a fundus, a body, and an infundibulum. The tip of the fundus usually reaches the free edge of the liver and is closely applied to the cystic plate. The infundibulum of the gallbladder makes an angle with the body and may obscure the common hepatic duct, constituting a danger point during cholecystectomy ***(Schulick, 2012).***

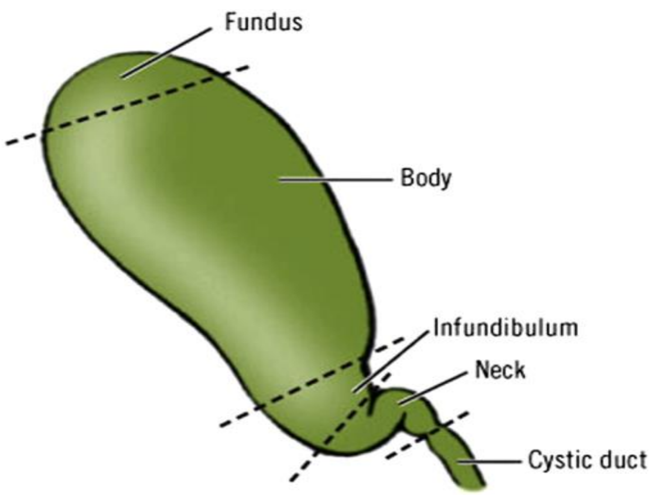

Figure 1: The Gallbladder parts

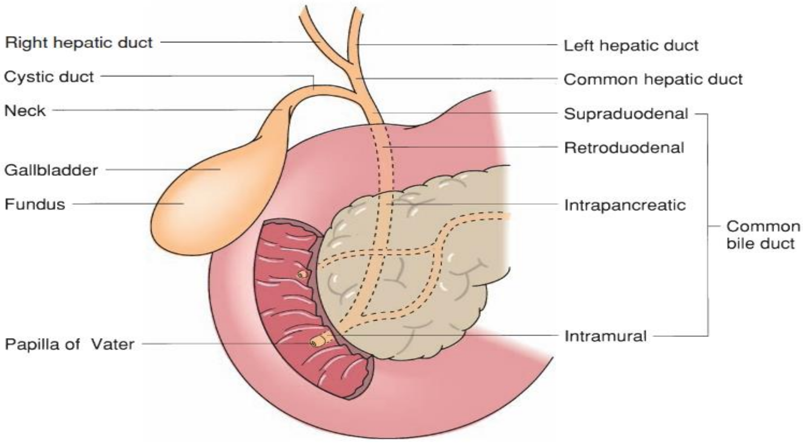

Figure 2: Anatomy of the Extrahepatic Biliary Tree

2. Cystic Duct and artery & Calot's triangle:

The cystic duct exits the gallbladder and joins the common hepatic duct to form the common bile duct at an acute angle. The length and course of the cystic duct can variable. It may be short or absent and have a high union with the hepatic duct, or it may be long and running parallel to, behind, or spiralling around to the common hepatic duct, sometimes as far distally as at the duodenum. Variations of the cystic duct and its point of union with the common hepatic duct are surgically important and misidentification can lead to bile duct injuries [Figure 3] ***(Schwartz's Principles of Surgery, 2019).***

The cystic duct arises from the infundibulum of the gallbladder and extends to join the common hepatic duct. The lumen measures between (1-3) mm in diameter, and its length varies depending on the type of union with the common hepatic duct.

Arterial blood reaches the Gall bladder via the cystic artery, which usually originates from the right hepatic artery. There are several known variations in the origin and course of the cystic artery.

The venous drainage of the gallbladder is directly into the liver parenchyma or into the common bile duct plexus ***(Schulick, 2012).***

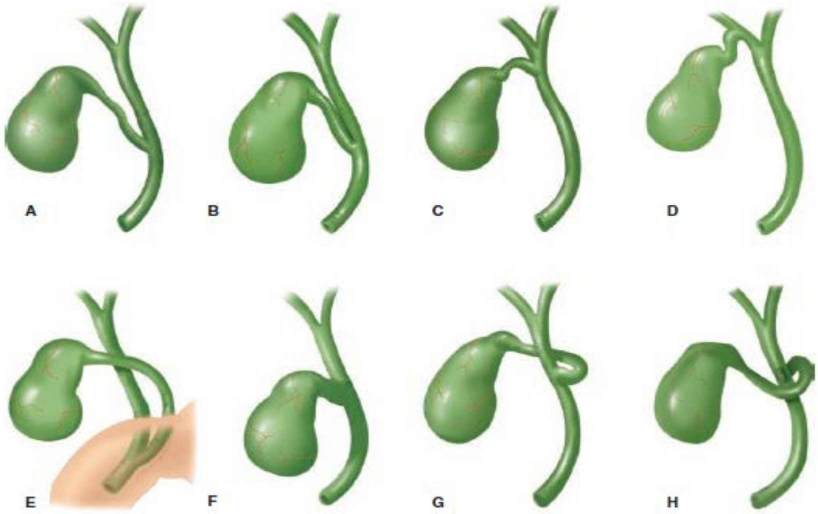

Figure 3: Variations of the cystic duct anatomy. **A.** Low junction between the cystic duct and common hepatic duct. **B.** Cystic duct adherent to the common hepatic duct. **C.** High junction between the cystic and the common hepatic duct. **D.** Cystic duct drains into right hepatic duct. **E.** Long cystic duct that joins common hepatic duct behind the duodenum. **F.** Absence of cystic duct. **G.** Cystic duct crosses posterior to common hepatic duct and joins it anteriorly. **H.** Cystic duct courses anterior to common hepatic duct and joins it posteriorly ***(Schwartz's Principles of Surgery, 2019).***

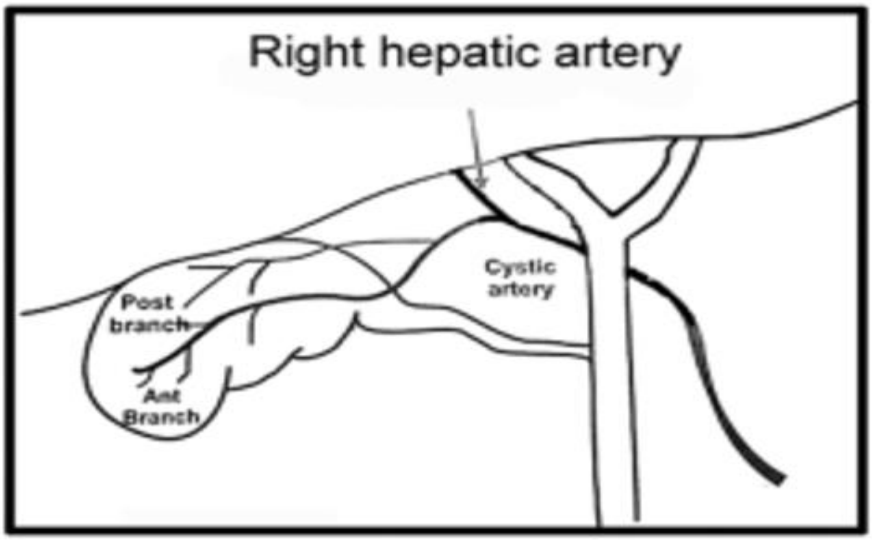

Figure 4: Anterior and posterior branches of the cystlic artery

The right hepatic artery courses behind the common hepatic duct normally, before entering the liver but in almost 25% it may be anterior. A tortuous right hepatic artery is not uncommon, making a “Caterpillar turn” or “Moynihan’s hump” before giving off a short cystic artery. This situation makes the right hepatic artery more prone to injury in cholecystectomy and should be suspected if an unusually large cystic artery is seen [Figure 5] ***(O’Rourke, 2018).***

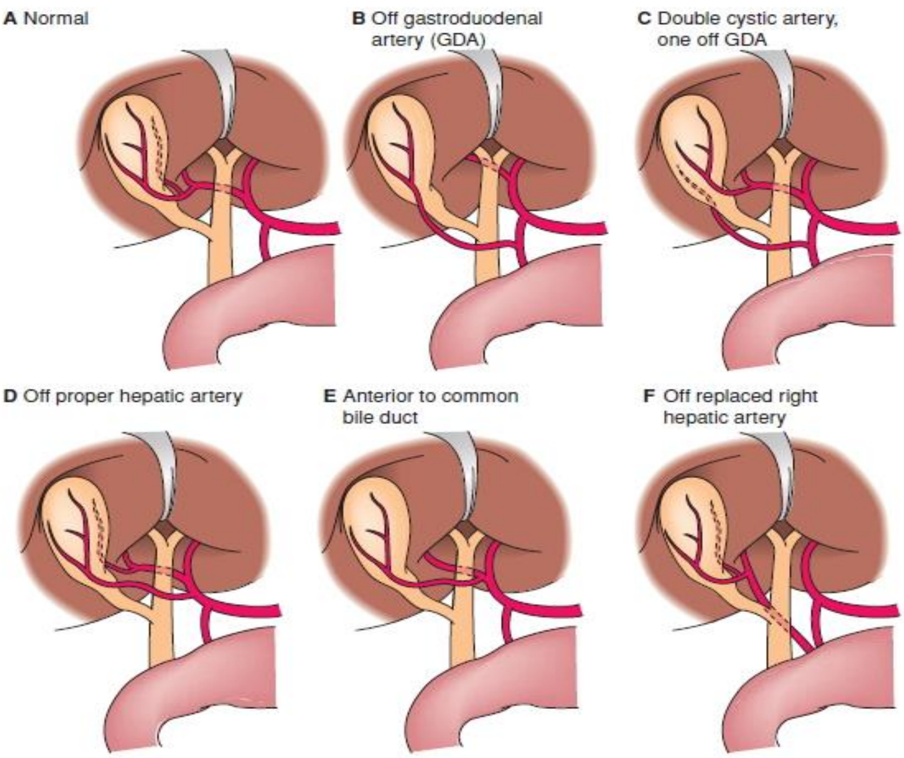

Figure 5: Variations of Cystic artery

However, a double cystic duct is extremely rare and poses a challenge for surgeons during an operation. Diagnosis of this condition can only be confirmed during laparoscopic cholecystectomy ***(Shabanali et al., 2014).***

3. <u>The Accessory and aberrant ducts</u>

There are a large number of accessory ducts [Fig. 6] described. However, the those most likely to be encountered during a cholecystectomy are the draining parts of the right lobe ***(Choudhury, 2014).***

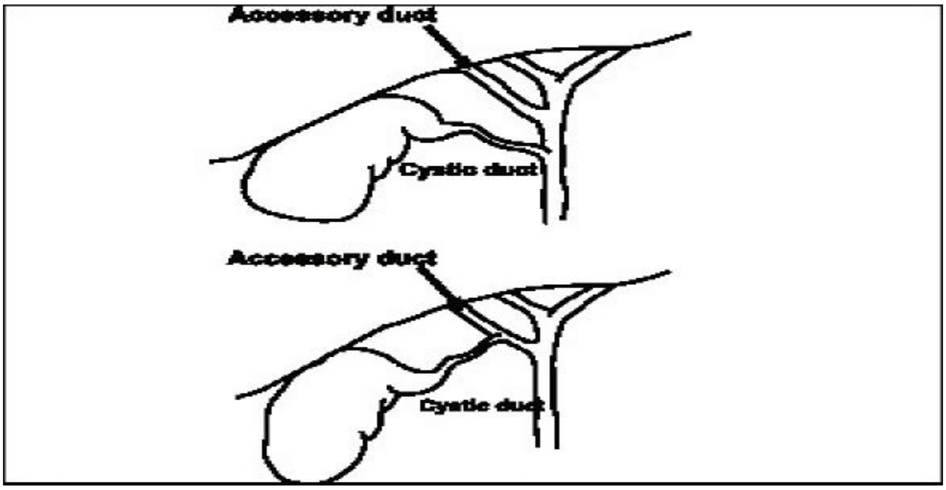

Figure 6: Accessory and aberrant ducts

Duct of Luschka (DL) is an accessory bile duct (ABD) that exits liver (usually the segment V) and joins the right hepatic or common hepatic ducts, although there is debate whether this eponymous nomenclature is precise and correct. There is also debate regarding the definition and the incidence of this variation, as it can range from 1% to 50%.

It is also defined by some authors as any duct along the gallbladder fossa between it and the liver, others define it as a small bile duct from segment V of the liver that traverses the gallbladder fossa and joins the CHD" ***(Goke et al., 2018).***

4. <u>Calot's triangle:</u>

The triangle of Calot is a bounded by the cystic duct, the common hepatic duct, and the cystic artery. It was described by Jean-Francois Calot in his 1890. "Calot's'" triangle has become ensconced in the surgical vernacular. However, the term is not anatomically precise as it is commonly used. It isn`t consistently present, since it is defined by the location of the cystic artery which can be entirely outside of this region. Though Hepatocystic triangle is preferred terminology considering this anatomical area ***(Asbun et al., 2020).***

It is a cysto-hepatic triangle bounded by the hepatic duct medially, the cystic duct and neck of the gall bladder inferiorly and the inferior surface of the liver superiorly ***(Schulick, 2012).***

In this triangle runs the cystic artery, often the right hepatic artery, rarely a bile duct and also contains the cystic lymph node. Hence this triangle has a greatly important area of dissection during cholecystectomy. The apex of the triangle is the most critical area (cysto-hepatic angle) as the cystic artery passes ***(Schulick, 2012).***

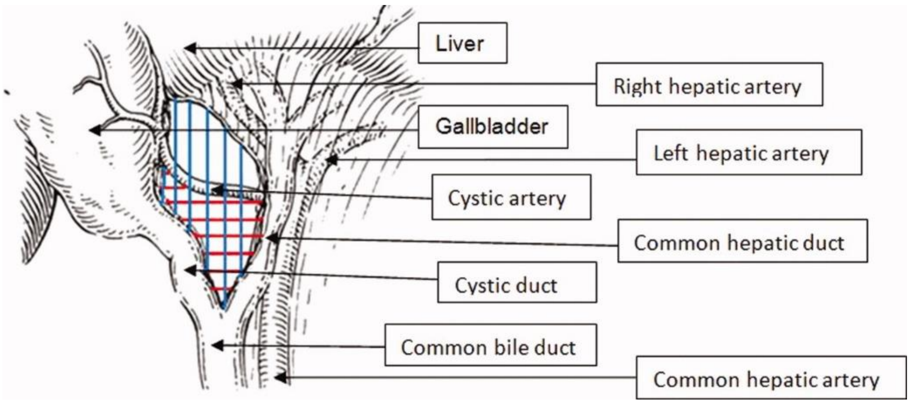

Figure 7: Calot's triangle ***(Abdalla et al., 2013).***

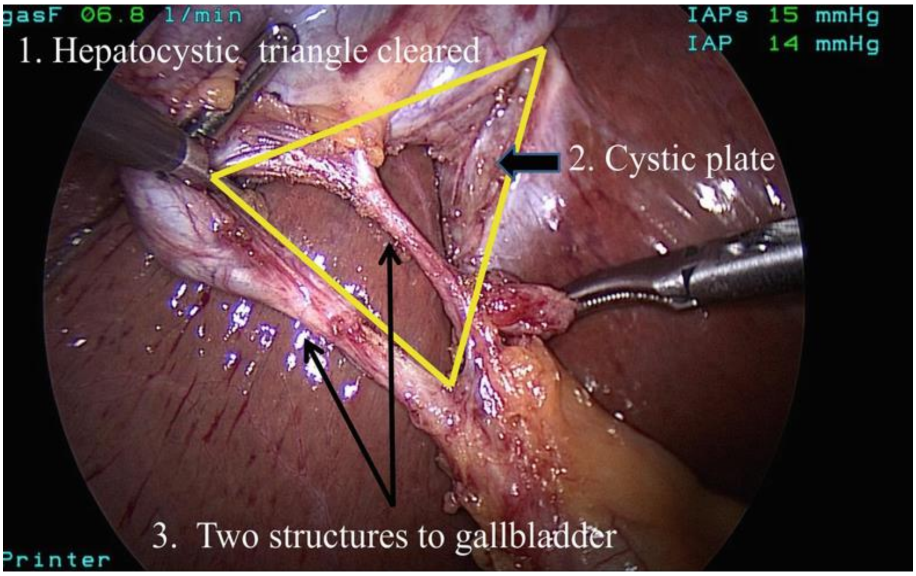

Figure 8: hepato-cystic triangle ***(Asbun et al., 2020).***

5. <u>Common Bile Duct:</u>

The cystic and common hepatic ducts join to form the common bile duct. The common bile duct is approximately 8 to 10 cm in length and 0.4 to 0.8 cm in diameter. The common bile duct can be divided into three anatomic segments: supraduodenal, retroduodenal, and intrapancreatic ***(Schulick, 2012).***

The supraduodenal segment resides in the hepatoduodenal ligament lateral to the hepatic artery and anterior to the portal vein; the course of the retroduodenal segment is posterior to the first portion of the duodenum, anterior to the inferior vena cava, and lateral to the portal vein. The pancreatic portion of the duct lies within a tunnel or groove on the posterior aspect of the pancreas. The common bile duct then enters the medial wall of the duodenum, courses tangentially through the submucosal layer for 1 to 2 cm, and terminates in the major papilla in the second portion of the duodenum. The distal portion of the duct is encircled by smooth muscle that forms the sphincter of Oddi ***(Schulick, 2012).***

The common bile duct usually joins the pancreatic duct to form a common channel before entering the duodenum at the ampulla of Vater. Some patients will have an accessory pancreatic duct emptying into the duodenum. The blood supply of the common bile duct is segmental in nature and consists of branches from the cystic, hepatic, and gastroduodenal arteries. These meet to form collateral vessels that run in the 3 and 9 o'clock positions. The venous drainage forms a plexus on the anterior surface of the common bile duct ***(Schulick, 2012).***

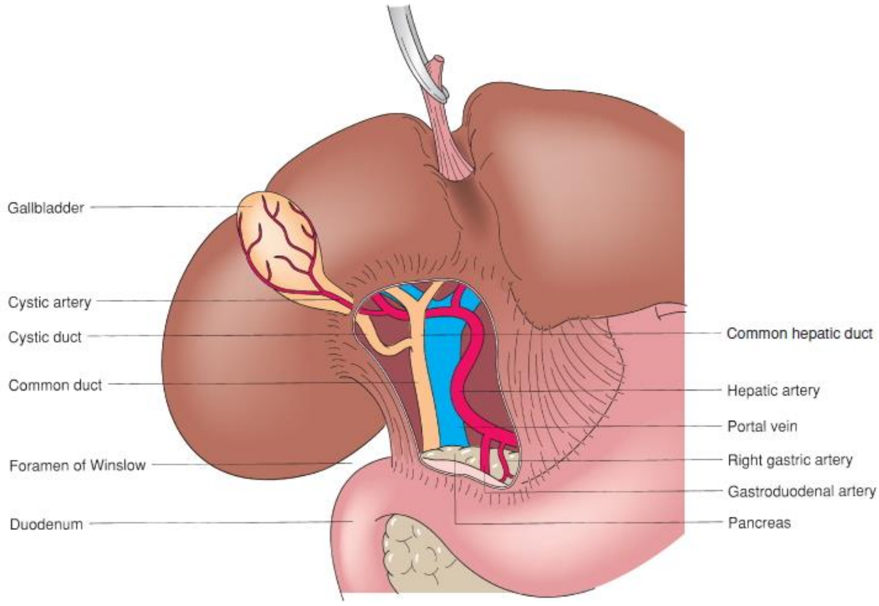

Figure 9: Relationship of structures within the hepatoduodenal ligament

Nerve supply of the biliary tract:

Parasympathetic fibers, mainly from the hepatic branch of the anterior vagal trunk, stimulate contraction of the gall bladder and relax the ampullary sphincter. Sympathetic fibres from the coeliac ganglia, which inhibit contraction. Afferent fibres including those subserving pain from the gall bladder may: run with right sided sympathetic fiber and reach spinal cord segments, (T7-9) and this explains radiation of the pain to the back in the infrascapular region or run into the right phrenic nerve (C3-5) and this explains the occasional referral of pain to the right shoulder region ***(McMinn, 2000).***

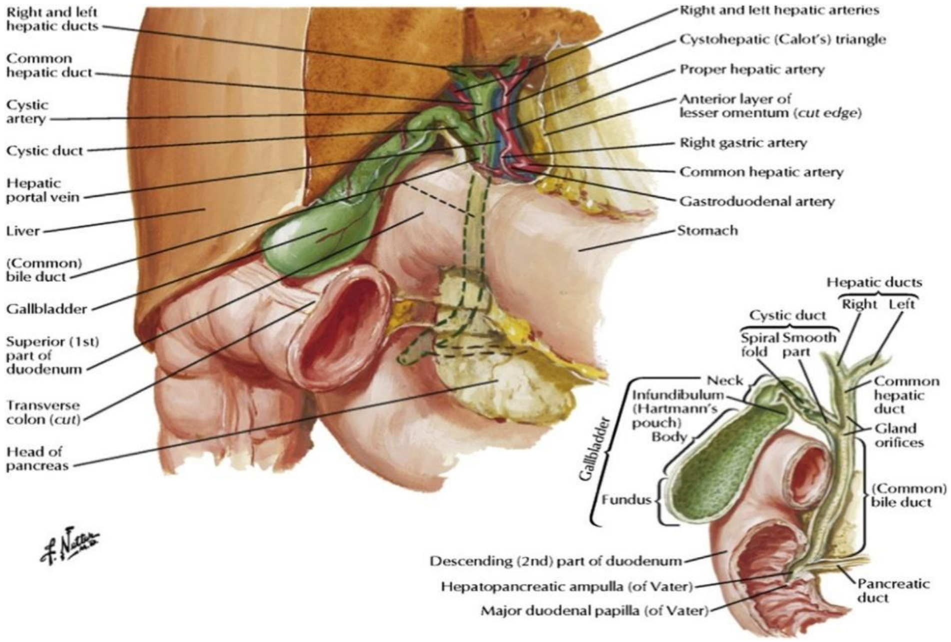

Figure 10: Classic view of extrahepatic biliary ducts

5. Anatomical Variations of the Biliary Tract

<u>Extrahepatic Biliary Atresia</u>

Congenital biliary atresia is the most serious malformation of the biliary tract. A short segment, an entire duct, or the whole system may be atretic; the atretic duct may be hypoplastic, stenosed, or reduced to a fibrous band that is easily overlooked by the surgeon.

Hepatic biliary duct atresias may be divided into three groups:

First group:

Patent proximal hepatic ducts and occluded distal ducts. Patency may occur in any portion of the right or left hepatic duct as it emerges from the liver. This atresia is called "correctable" ***(Francoeur et al., 2003).***

Second group:

Occluded proximal ducts. No portion of the emerging hepatic duct is patent. This atresia is called "noncorrectable" ***(Francoeur et al., 2003).***

Third group:

Includes the presence of intrahepatic atresia. In this form of atresia, the extrahepatic ducts may be present or absent. The mechanism of intrahepatic atresia remains obscure and the condition is as yet non correctable. It requires early liver transplantation ***(Francoeur et al., 2003).***

There are morphological variations and abnormalities in more than 33% of gall bladders such as duplication. Sites of potential malformations of the extrahepatic biliary tract and common bile duct ***(John et al., 2004).***

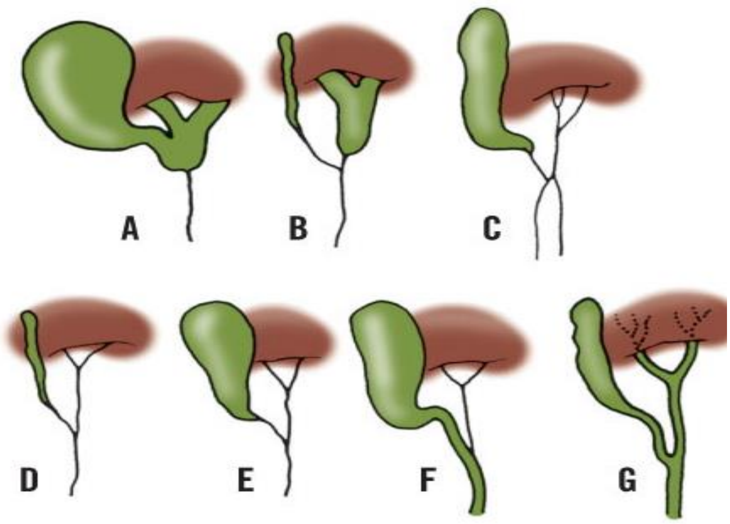

Figure 11: Different types of Biliary Atresia

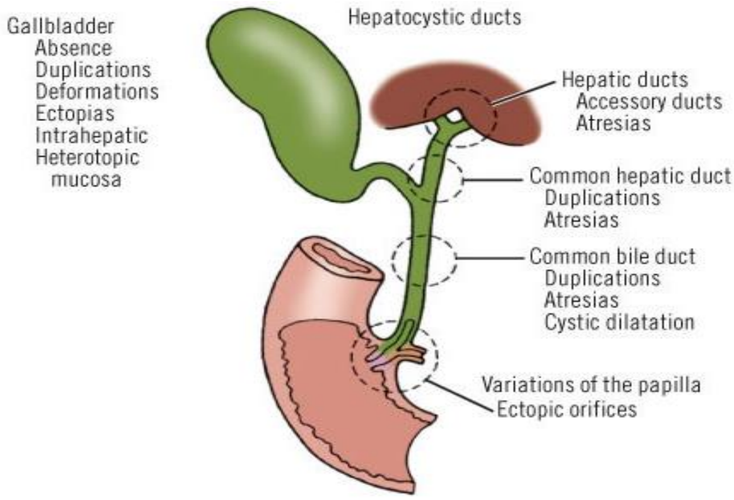

Figure 12: Sites of potential biliary tract malformations

Anomalies of Gall Bladder

1. Absence of Gall bladder

Occasionally the gallbladder (and usually the cystic duct as well) is absent or vestigial. The absence must be confirmed by ruling out an intrahepatic gallbladder or a left-sided Gall bladder ***(John et al., 2004).***

2. Multiple Gall bladder

The first human double Gall bladder was found by autopsy in 1674, the first such anomaly to be recorded from observation of a living patient was in 1911, multiple gall bladders form a continuous spectrum of malformations, from an externally normal organ with an internal longitudinal septum to the most widely separated accessory gallbladders. For practical purposes, the anomalies can be categorized into six basic types. Three types belong to the split primordium group and three belong to the accessory gallbladder group ***(John et al., 2004).***

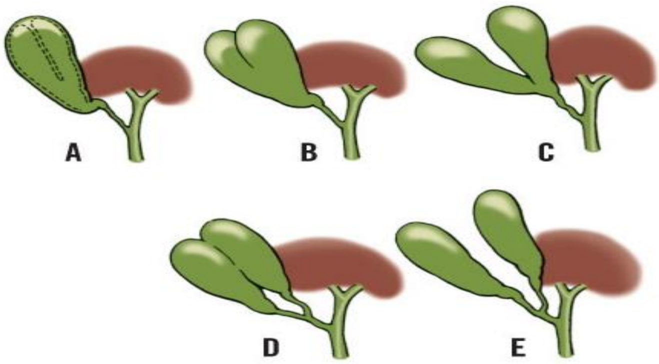

Figure 13: Different types of multiple Gall bladders

3. Left sided Gall bladder

Rarely, a Gall bladder is found on the inferior surface of the left lobe of the liver. In such cases, the cystic duct enters the common bile duct from the left. There is no associated functional disorder. Ultrasonography should detect this anomaly, but the radiologist must be alert ***(John et al., 2004).***

4. Intrahepatic Gall bladder

Intrahepatic Gall bladder is submerged in the liver and gives the appearance of absence of the gallbladder. CT scan or ultrasonography may provide its only evidence. A high percentage of occurrences of Gall bladder stones are associated with this anomaly ***(John et al., 2004).***

5. <u>Mobile Gall bladder</u>

Mobile Gall bladder is attached to the liver by a mesentery. Such a gallbladder is susceptible to torsion and strangulation. Otherwise, it causes no symptoms ***(John et al., 2004).***

Physiology of the Gallbladder

Gallbladder considered a part of the extrahepatic biliary system where the bile stored and concentrated. Bile originally formed in the liver. Then to the common hepatic duct through intrahepatic ducts. Then through the cystic duct to be stored in the gallbladder. When the food in the stomach & duodenum stimulates gallbladder to empty, it contracts and empties the concentrated bile back through the cystic duct, down the common bile duct, into the second portion of the duodenum through the ampulla Vater. Opening and closing of the sphincter of Oddi at the ampulla Vater controls the bile flow ***(Jones et al., 2020).***

Gallbladder epithelium plays role in concentrating bile, which contains channels transport sodium chloride actively. The typical capacity of the gallbladder is 30 mL but it can distend up to 300 mL of fluid. The wall of the gallbladder is composed of the visceral peritoneum (on areas not in direct contact with the liver), subserosa, muscularis mucosa, lamina propria, and columnar epithelium ***(Keplinger et al., 2014).***

Patient Positioning

In North American positioning, the patient is lying spine and the surgeon is positioned on the patient's left side In European positioning, the patient is in low stirrups and the surgeon is on the patient's left or between the patient's legs.

With North American positioning, the camera operator usually stands on the patient's left and to the left of the surgeon, while the assistant stands on the patient's right. The video monitor is positioned on the patient's right above the level of the costal margin. If a second monitor is available, it should be positioned on the patient's left, to the right of the surgeon, where the assistant can have an unobstructed and comfortable view. Exposure can be improved by tilting the patient in the reverse Trendelenburg position and rotating the table with the patient's right side up. Gravity pulls the duodenum, the colon, and the omentum away from the gallbladder, thereby increasing the working space available in the upper abdomen.

The OR table should allow easy access for a fluoroscopic C arm, to facilitate intraoperative cholangiography. The table cover should be radiolucent ***(Souba et al., 2005).***

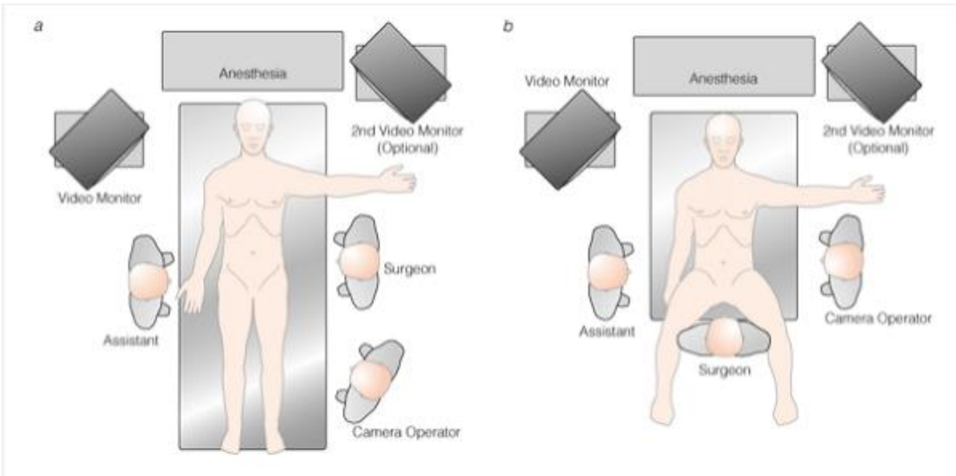

Figure 14: Setup for Laparoscopic Cholecystectomy

<u>Technique</u>

Patients undergoing laparoscopic cholecystectomy are prepared and draped in a similar fashion to open cholecystectomy. Conversion to an open operation is necessary in up to 3% of patients undergoing elective cholecystectomy and up to 25% of patients undergoing laparoscopic cholecystectomy for acute cholecystitis.

Either an open or closed technique can be used to establish a pneumoperitoneum. With the open technique, a small incision is made at the umbilicus, and a blunt cannula (Hasson cannula) is inserted into the peritoneal cavity and anchored to the fascia.

An 11-mm trocar is inserted through the supraumbilical incision once a pneumoperitoneum is established. A 30- degree laparoscope is then inserted through the umbilical port, and an examination of the peritoneal cavity is performed. An 11-mm operating port is placed subxiphoid, and two additional 5-mm trocars are positioned subcostally in the right upper quadrant in the midclavicular line and in right iliac region in anterior axillary line.

The two 5-mm ports are used for grasping the gallbladder and exposing the gallbladder and cystic duct. The infundibulum and retract it laterally to further expose the triangle of Calot. Traction on the fundus should be upward toward the patient's head, and traction on the Hartmann pouch laterally to the right.

This combination "dis-aligns" the common duct and cystic duct so that they appear as distinct structures. Incorrect traction aligns the ducts so that they appear as a continuous structure ***(Henry et al., 2011).***

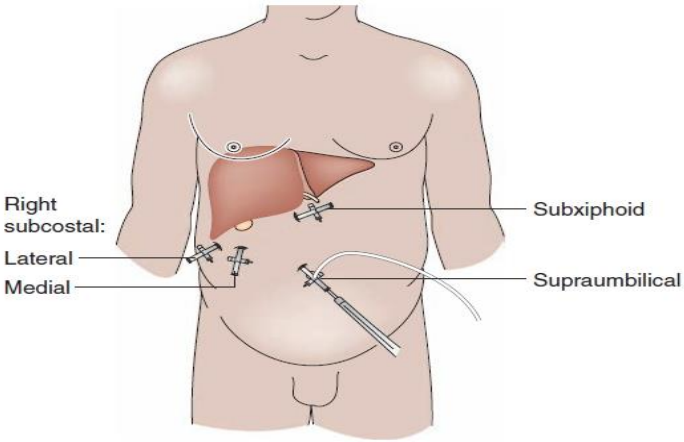

Figure 15: Port sites

Elective laparoscopic cholecystectomy can be safely performed as an outpatient procedure. Among patients selected for outpatient management, 77% to 97% of patients can be successfully discharged the same day. Factors contributing to overnight admission include uncontrolled pain, nausea and vomiting, operative duration greater than 60 minutes, and cases completed late in the day ***(Henry et al., 2011).***

Routine operative cholangiography has been advocated to avoid ductal injury. However, opinion on the subject is sharply divided. Biliary injuries occur less frequently in the hands of surgeons who perform operative cholangiography routinely. However, in about 50% of ductal injuries, a cholangiogram fails to prevent the injury although abnormal anatomy is present (i.e., cholangiograms are often incorrectly interpreted) ***(Henry et al., 2011).***

The indications for intraoperative cholangiography, when it is performed selectively, are known choledocholithiasis, a history of jaundice, a history of pancreatitis, a large cystic duct and small gallstones, any abnormality in preoperative liver function tests, and dilated biliary ducts on preoperative sonography. Provided these indications are carefully followed, selective cholangiography may be as effective in detecting clinically relevant stones as routine cholangiography.

Serious complications of laparoscopic cholecystectomy are rare, the mortality rate being less than 0.3%. As cholecystectomy rates have risen, however, the total number of deaths has not decreased ***(Henry et al., 2011).***

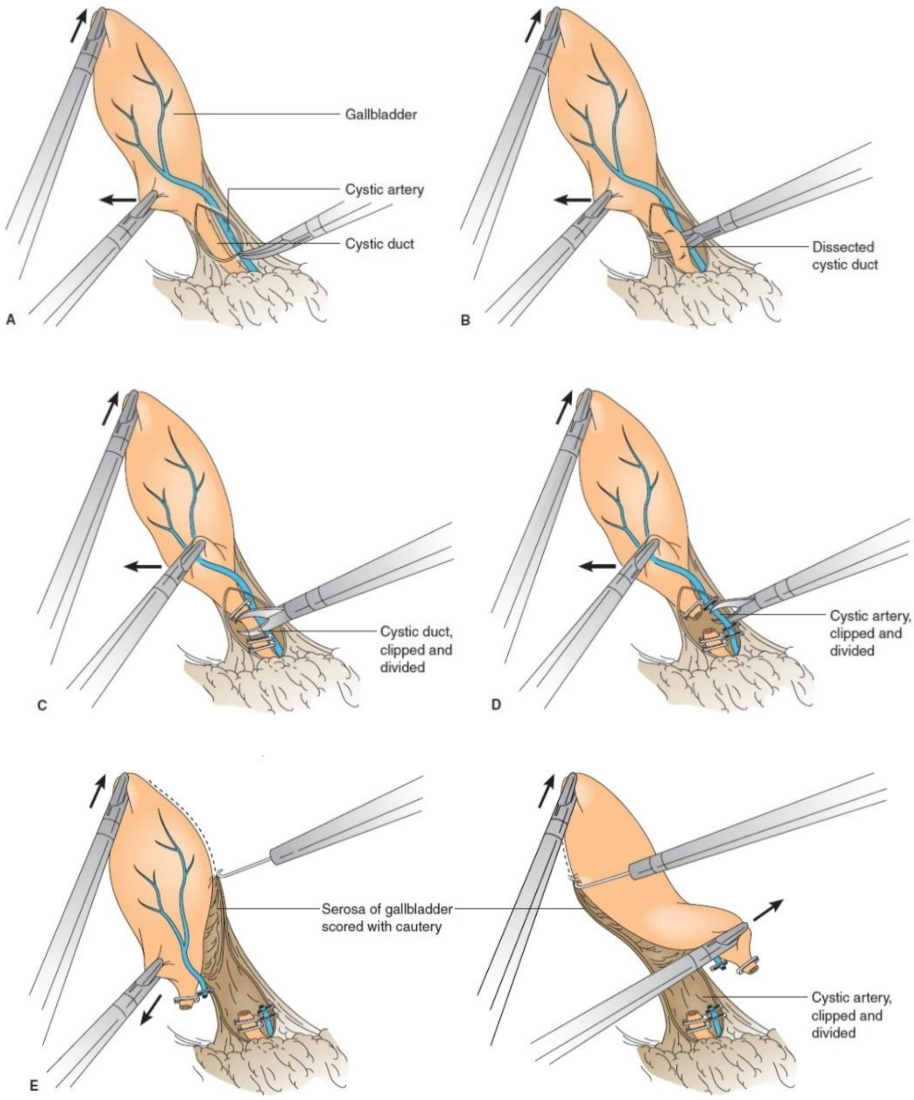

Figure 16: Operative steps

However its important to visualize the *critical view of safety* in order to try to prevent complications of biliary tree injury either CBD or Common Hepatic Ducts injury.

Critical View of Safety

Anatomy is important when performing laparoscopic cholecystectomy. The concept of the critical view of safety (CVS) was originated by Strasberg et al in 1995 ***(Hori et al., 2016).***

The triangle of Calot is cleared of fat and fibrous tissue. Only two structures are connected to the lower end of the Gall bladder once this is done, and the lowest part of the gall bladder attachment to the liver bed has been exposed The latter is an important step, equivalent in the open technique to taking the gallbladder off the liver bed. It is not necessary to expose the common bile duct. Once the critical view is attained, cystic structures may be occluded, as they have been conclusively identified. Failure to achieve the critical view is an indication for conversion or, possibly, cholangiography to define ductal anatomy. It is the author's opinion that there is considerable danger in relying simply on the appearance of the "cystic duct" — Gall bladder junction, as this may be deceiving, especially in the presence of severe inflammation ***(Strasberg et al., 2002).***

Surgeon should be positively identify cystic duct and cystic artery (CA) before cutting or clipping them. Calot's triangle must be dissected well. Gall bladder lower end should be dissected off the liver bed, and the bottom of the liver should be visible. It is not necessary to directly confirm the CHD and CBD. Hence, only two structures should be seen to enter the GB. Positive identification of the CD and CA as they join the GB infundibulum is required before these structures can be divided ***(Hori et al., 2016).***

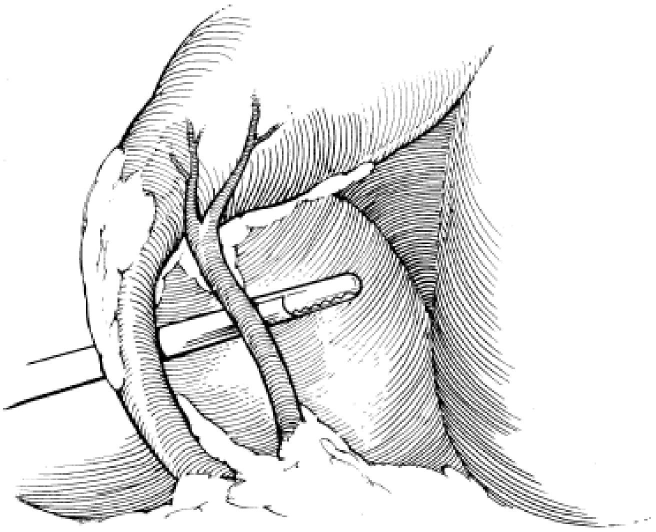

Figure 17: The Critical view of Safety

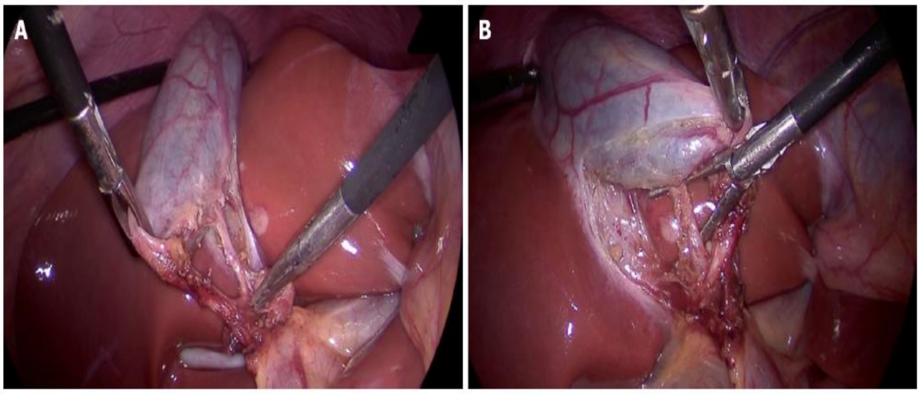

Figure 18: [A &B] *Critical view of safety with all three components:* **(1)** Fibrofatty tissue has been cleared from the hepatocystic triangle; **(2)** Lower part of the cystic plate has been clearly exposed; and **(3)** Only two tubular structures are seen entering the gallbladder. A: Anterior view; B: Posterior view (inverted hepatocystic triangle).

Complications of Laparoscopic Cholecystectomy

Laparoscopic cholecystectomy (LC) remains an extremely safe procedure with a mortality rate of (0.22-0.4%). Major morbidity occurs in approximately 5% of patients ***(Steiner et al., 2004).***

Complications include the following:

1. **Trocar/Veress needle injury:**

Intestinal injury may occur during establishment of abdominal access, adhesiolysis, or dissection of the gallbladder off of the duodenum or colon. An injury to the bowel should be repaired with careful 1- or 2-layer suture closure. The incidence of injury to viscera or vessels from a Hasson trocar or Veress needle is similar (in the range of 0.2%) ***(Ahmad et al., 2019).***

A recent systematic review showed that an open-entry technique is associated with a significant reduction in failed entry when compared to a closed-entry technique, with no difference in the incidence of visceral or vascular injury ***(Ahmad et al., 2019).***

Significant benefits were noted with the use of a direct-entry technique when compared to the Veress Needle. The use of the Veress Needle was associated with an increased incidence of failed entry, extraperitoneal insufflation and omental injury; direct-trocar entry is therefore a safer closed-entry technique ***(Ahmad et al., 2019).***

2. Haemorrhage:

Large-vessel vascular injury usually occurs at the time of initial abdominal access. These may be lethal complications. Development of a retroperitoneal hematoma or hypotension should be treated immediately by conversion to laparotomy.

The most obvious danger is that of hemorrhage from the many large blood vessels lying anterior to the biliary tree. Such vessels are inconstant in number and location. The posterior superior pancreaticoduodenal artery, anterior to the retroduodenal portion of the common bile duct, is the vessel most frequently encountered ***(Steiner et al., 2004).***

All the vessels listed in Table (1) are subject to possible injury.

Table 1: Segments of the Biliary tract and frequency of arteries lying anterior to them

Segment	Artery Anterior	Percent Frequency
Right and left hepatic ducts	Right hepatic artery	12-15
	Cystic artery	<5
Common hepatic duct	Cystic artery	15-24
	Right hepatic artery	11-19
	Common hepatic artery	<5
Supraduodenal common bile duct	Anterior artery to CBD	50
	Posterosuperior pancreaticoduodenal artery	12.5
	Gastroduodenal artery	5.7-20*
	Right gastric artery	<5
	Common hepatic artery	<5
	Cystic artery	<5
	Right hepatic artery	<5
Retroduodenal common bile duct	Posterosuperior pancreaticoduodenal artery	76-87.5
	Supraduodenal artery	11.4

(John et al., 2004)

The following list of variations in the cystic artery may help one avoid common pitfalls:

- The cystic artery usually arises from the right hepatic artery (A).
- Dual cystic arteries, one arising from each of the hepatic arteries (B)
- Cystic artery arising from the common hepatic artery (C)
- Cystic artery arising from the gastroduodenal artery (D)
- Cystic artery arising from an anterior right hepatic artery (E)
- A single cystic artery arising from the left hepatic artery (F).

(Strasberg, 2011)

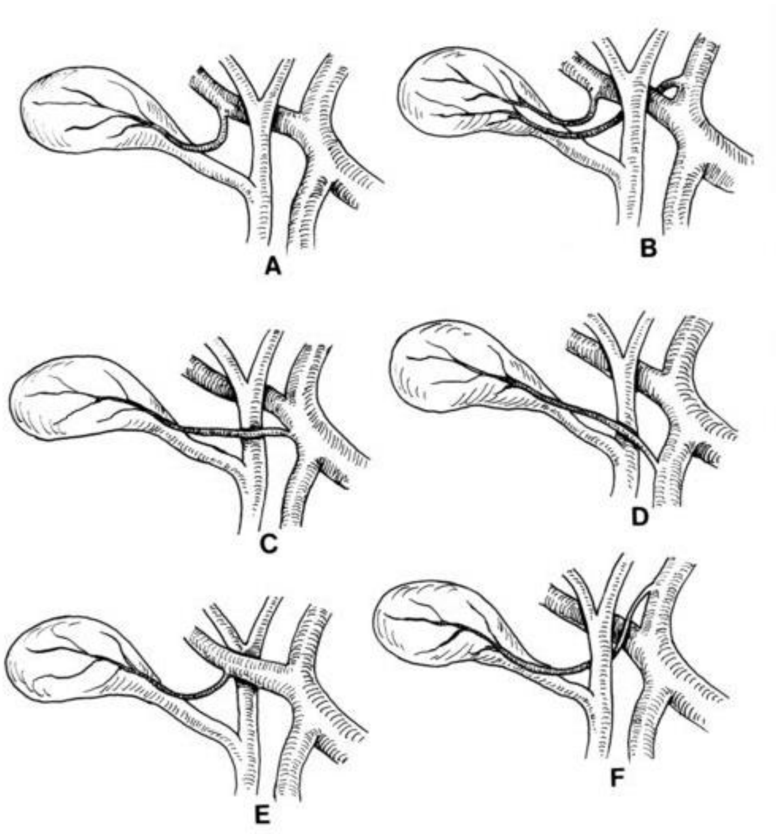

Figure 19: Anatomic variations of the blood supply for the Gall bladder

Injury to the portal vein or the inferior vena cava is a serious complication. These vessels must, of course, be repaired at once ***(Tchirkow et al., 2002).***

Excessive bleeding in the region of the triangle of Calot should not be treated laparoscopically. Attempts at blind clipping or cauterizing significant bleeding usually leads to worsening haemorrhage or hepatic artery injury. If, and only if, a bleeding site can be definitely identified and the locations of both the hepatic artery and common bile duct (CBD) are known, bleeding may be controlled with electrocautery or clips ***(Tchirkow et al., 2002).***

Management of Haemorrhage:

Prevention of arterial bleeding begins by dissecting the artery carefully and completely before clipping and by inspecting the clips to ensure that they are placed completely across the artery without incorporating additional tissue (e.g., a posterior cystic artery or right hepatic artery). When arterial bleeding is encountered, it is essential to maintain adequate exposure and to avoid blind application of hemostatic clips or cauterization. The laparoscope should be withdrawn slightly so that the lens is not spattered with blood. The surgeon should then pass an atraumatic grasping forceps through a port other than the operating port and attempt to grasp the bleeding vessel. An additional trocar may have to be inserted for simultaneous suction-irrigation. Once proximal control is obtained, the operative field should be suctioned and irrigated to improve exposure. Hemostatic clips are then applied under direct vision; in addition, a sponge may be introduced to apply pressure to the bleeding vessel. Conversion to open cholecystectomy is indicated whenever bleeding cannot be promptly controlled laparoscopically ***(Strasberg, 2011).***

Bleeding from veins of the Gall bladder bed or from veins of the common bile duct is a minor complication which can usually be controlled by fulguration of the bleeding site using a spatulated electrocautery wand for this purpose ***(Strasberg, 2011).***

If a larger intrahepatic sinus has been entered, hemostatic agents (eg, microfibrillar collagen) can be placed laparoscopically in the liver bed, and pressure can be held with a clamp.. The argon plasma coagulator (APC) can be an excellent tool for severe Gall bladder fossa oozing that is not responsive to simple electro-cautery ***(Strasberg, 2011).***

A second vascular complication of biliary surgery is ischemia to the liver from unintended ligation of the right hepatic artery or an accessory or replacing aberrant right hepatic artery. Interference with the blood supply of the common bile duct may result in ischemia and stricture. Other surgeons feel that the blood supply is good and that collateral circulation will prevent local ischemia ***(Strasberg, 2011).***

3. Post cholecystectomy syndrome:

This refers to a set of abdominal symptoms that occur with a frequency of up to 40% after cholecystectomy. Symptoms are often vague and include dyspepsia, flatulence, bloating, right upper quadrant pain, and epigastric pain.

The most common causes of this syndrome are dietary indiscretion, retained CBD stones, inflammation of the cystic duct remnant, and sphincter of Oddi dysfunction ***(Zhou et al., 2003).***

4. Bile ducts injury or stricture:

The most dreaded complication of LC is injury to the common bile or common hepatic duct. The estimated incidence of bile duct injury in cholecystectomies performed laparoscopically varies from 0.3-2.7%***),*** In contrast; biliary tract injuries were noted to occur in 0.25-0.5% of open cholecystectomies ***(McMahon et al., 2004).***

A major risk factor for bile duct injury is the experience of the surgeo*n,* other risk factors are the presence of aberrant biliary tree anatomy and the presence of local acute or chronic inflammatory ***(Lien et al., 2007).***

Data suggest that the incidence of bile duct injury during open cholecystectomy is 1 in 500 to 1,000 cases***),*** The incidence of bile duct injury during laparoscopic cholecystectomy is clearly higher. Although a wide range in the incidence of injury can be found in reported series, the most accurate data most likely come from surveys encompassing thousands of patients. These reports reflect the results from a large number of surgeons in both community and teaching hospitals. The results of such series suggest an incidence of bile duct ***(Bertrand et al., 2003).***

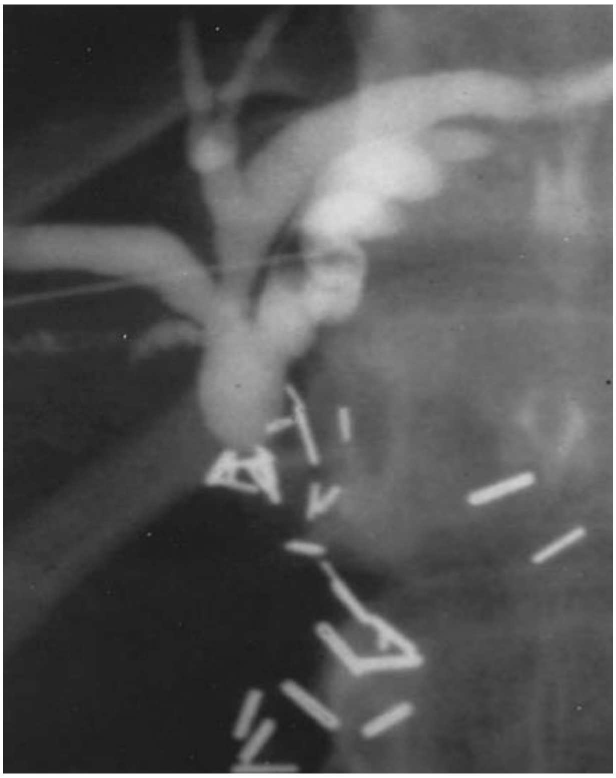

Figure 20: Percutaneous transhepatic cholangiogram in a patient with a bile duct stricture secondary to iatrogenic injury during cholecystectomy

Patients and Methods

This study was done to compare whether patients with intraabdominal drain following uncomplicated laparoscopic cholecystectomy are associated with more complications and hospital stay than those without intraabdominal drain.

Patients' population:

This study is a case series of 100 patients who underwent laparoscopic cholecystectomy.

We didn’t include patients who had:

1. Been operated for laparoscopic cholecystectomy other than cholelithiasis.
2. All patient contraindicated to laparoscopic surgery.
3. Emergency operations were excluded.
4. Acute cholecystitis, empyema GB, mucocele of GB.
5. Patient with bleeding tendency (preoperative increase in INR or thrombocytopenia.
6. Patient with chronic liver or kidney diseases.
7. Intraoperative bleeding OR inadequate hemeostasis.
8. Patients can be excluded based on operator`s judgement.

The included patients presented to the General Surgery Department at Rafidia Surgical Hospital .

Clinically all the patients were presented to undergo laparoscopic cholecystectomy operation and post-operative follow up for incidence of drain site pain, drain site infection, postoperative collection & hospital stay, Laboratory and radiological investigations were carried out in order to detect any intra-abdominal collection.

Type of Patients:

This was a prospective study that included 100 patients with cholelithiasis who were twenty to sixty five years old and from both sexes attending to the hospital. The patients were randomly allocated into two groups each included 50 patients, first group (Group A) underwent laparoscopic cholecystectomy and we put intra-abdominal drain, the second group (Group B) underwent laparoscopic cholecystectomy without intra-abdominal drain.

Study procedure:

All patients were subjected to preoperative, operative, and postoperative assessment:

1. **Preoperative:** the preoperative assessment included full history taking, clinical examination, which included general examination of the chest, heart, and abdomen.

   Patients were prepared for surgery, by explaining to them what is the procedure, its risks and benefits.

2. **Operative:** the operations were performed on the patients under general anesthesia and in supine position.

3. **Postoperative:** patients were followed up weekly for 2 to 3 weeks. Early postoperative follow-up included evaluation of postoperative pain, hospital stay and port site infection.

Patients' evaluation:

Clinical examination:

- Complete history taking.

- Detailed general and local physical examination.
- Operative details were all reviewed.

Laboratory investigations:

1- Full blood count.

2- Coagulation profile.

3- AST.

4- ALT.

5- Alkaline phosphatase.

6- Direct bilirubin.

7- Total bilirubin.

Statistical Analysis

Data were collected, revised, coded and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The quantitative data were presented as mean, standard deviations and ranges when their distribution found parametric. Also qualitative variables were presented as numbers and percentages.

The comparison between groups regarding qualitative data was done by using ***Chi-square test.***

The comparison between two independent groups with quantitative data and parametric distribution were done by using ***Independent t-test***

The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:

P-value > 0.05: Non significant (NS)

P-value < 0.05: Significant (S)

P-value < 0.01: Highly significant (HS)

Results

Among the 100 patients with chronic calcular cholecystitis included in this study 70 were females (70%) and 30 were males (30%).

The 100 patients were randomly distributed into two equal groups (50 patients each): *Group A* underwent laparoscopic cholecystectomy and we put intra-abdominal drain and, while *Group B* underwent laparoscopic cholecystectomy but we didn`t insert intra-abdominal drain.

Patients' age ranged from 20 to 65.

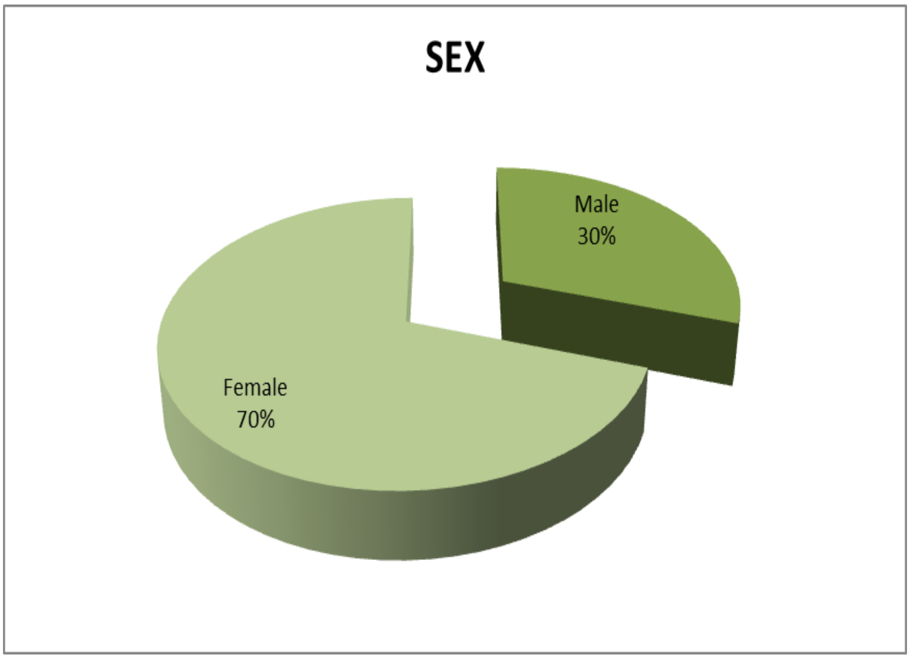

Figure 21: Sex distribution

- ***<u>Analysis of postoperative pain at drain/port site:</u>***

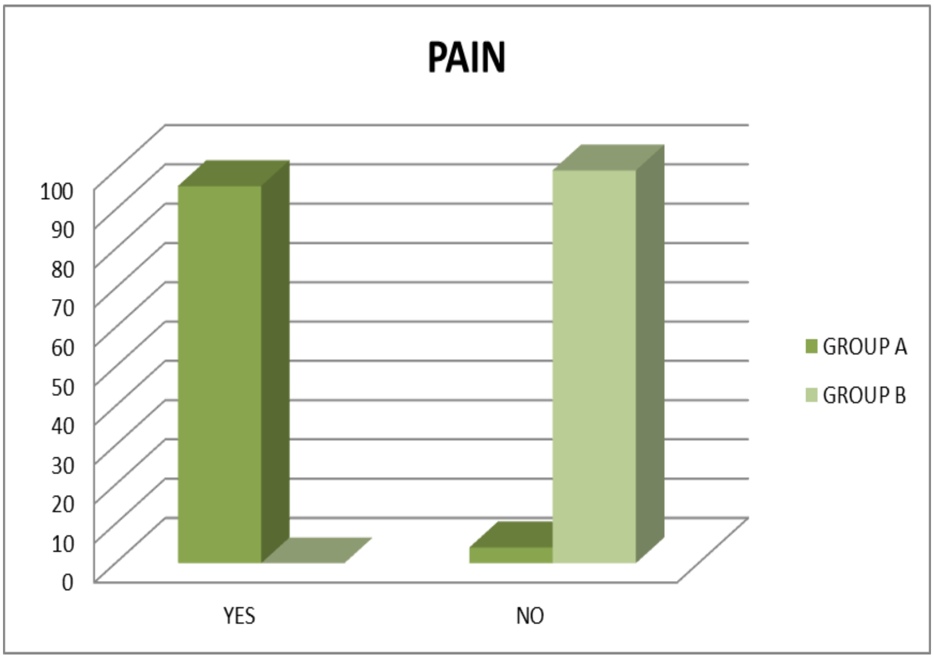

Figure 22: Analysis of postoperative pain at drain/port site

The incidence of postoperative pain at port site where drain was inserted was more in patients in group A (96%), while patients without drain (group B) experienced no or minimal postoprative pain (0% approximately). (P value 0.000 which is highly significant).

➢ ***<u>Analysis of postoperative infection at port/drain site:</u>***

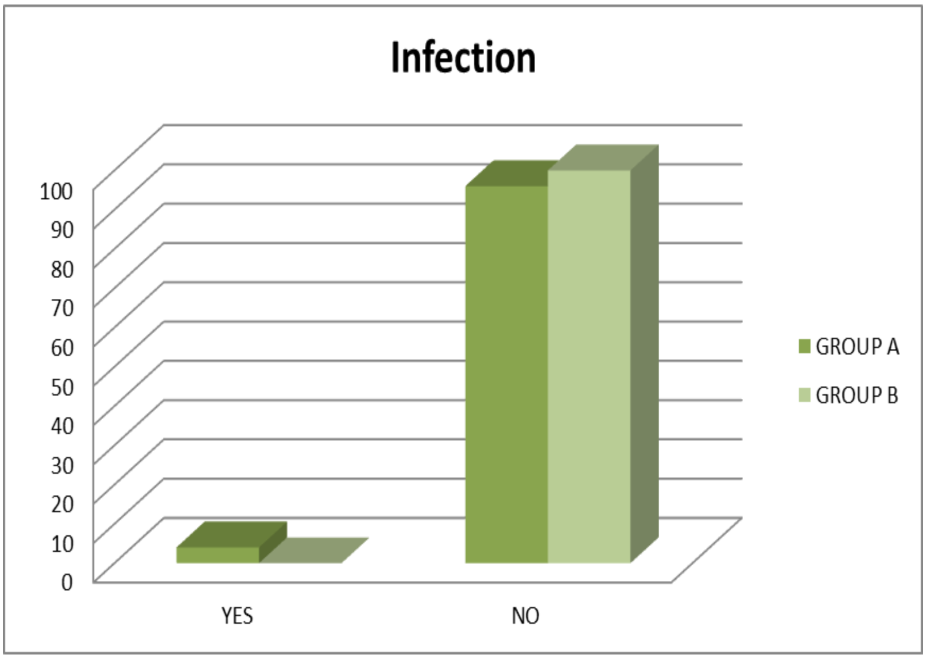

Figure 23: Analysis of postoperative infection at port/drain site

Also the incidence of postoperative drain site infection is higher in patients in Group A (drain from the port site) 4%, (P value 0.000). While in group B (patients with no drain) almost no patient experienced port site infection.

➢ ***<u>Analysis of post operative hospital stay:</u>***

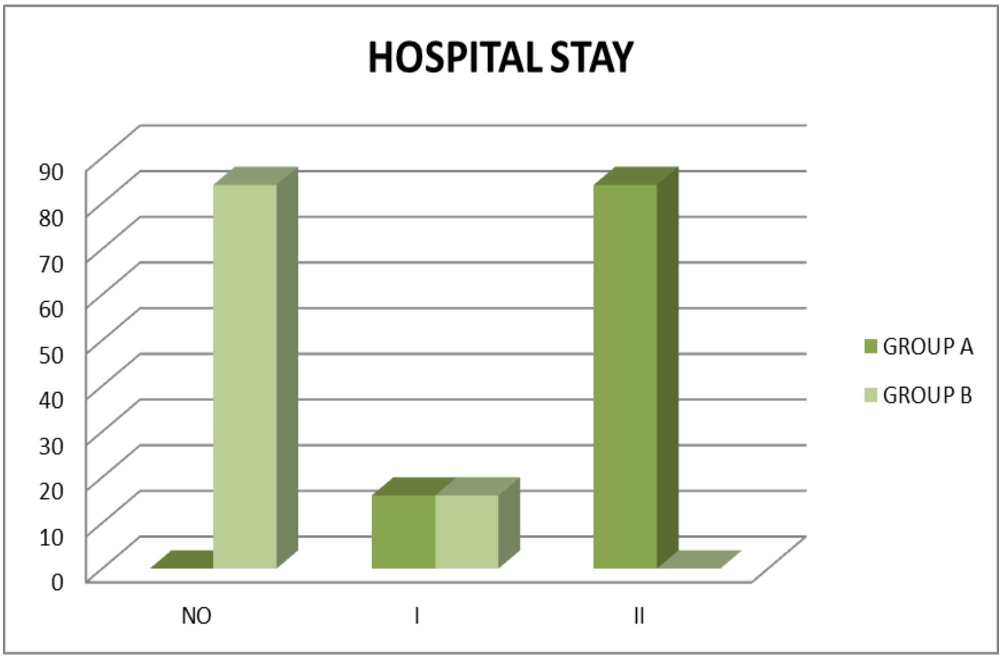

Figure 24: Analysis of post operative hospital stay

Regarding hospital stay, majority of patients with drain (group A) required hospital stay for almost 2 days (16% of patients discharged in day 1 postoperatively while 84% of patients discharged on day 2 post-operative), while those without drain (group B) 84% of patients discharged at the same day, while 16% discharged day 1 postoperative).

➢ ***Analysis of postoperative collection:***

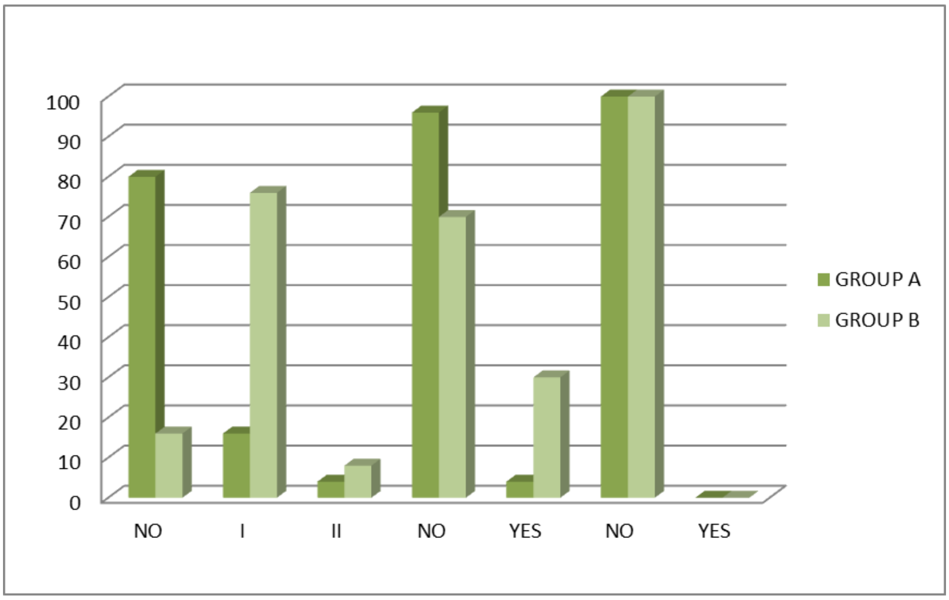

Figure 25: Analysis of postoperative collection

Regarding post-operative intrabdominal collection, we followed up patients using ultrasound on day 1, day 2 and day 3 postoperative (POD1, POD2, POD3), *(**No** collection, **I** collection < 50 ml, **II** collection 50-100 ml).*

This revealed intra-abdominal fluid collection POD1 was lower in drain group (Group A) than in non-drain group (Group B).

POD 1 the collection was lower in group A, 80% of patients developed no collection, while 16% of patients developed collection < 50 ml, while 4% of patients developed collection from 50-100ml, while those in group B, 16% of patients developed no collection, while 76% developed collection <50 ml, while 8% of patients developed collection 50-100 ml.

POD2 only 4% of patients those in group A (with drain) developed minimal collection that disappeared on next day. Group B (without drain)30% of patients developed minimal collection that disappeared on next day.

Table 2: Comparison between two groups regarding age, sex, pain, infection, hospital stay and collection postoperative day 1, 2, 3

		Group A	Group B	Test value	P- value	Sig.
		No.= 50	**No.= 50**			
Age	Mean±SD	37.80 ± 10.32	34.28 ± 9.33	1.266•	0.212	NS
	Range	22 – 63	20 – 53			
Sex	Males	12 (24.0%)	18 (36.0%)	0.000*	1.000	NS
	Females	38 (76.0%)	32 (64.0%)			
Pain	No	2 (4.0%)	50 (100.0%)	46.154*	0.000	HS
	Yes	48 (96.0%)	0 (0.0%)			
Infection	No	48 (96.0%)	50 (100.0%)	46.154*	0.000	HS
	Yes	2 (4.0%)	0 (0.0%)			
Hospital stay	No	0 (0.0%)	21 (84.0%)	42.000*	0.000	HS
	I	4 (16.0%)	4 (16.0%)			
	II	21 (84.0%)	0 (0.0%)			
POD1	No	40 (80.0%)	8 (16.0%)	38.789*	0.000	HS

	I	8 (16.0%)	38 (76.0%)			
	II	2 (4.0%)	4 (8.0%)			
POD2	No	48 (96.0%)	35 (70.0%)	2.083*	0.149	NS
	Yes	2 (4.0%)	15 (30.0%)			
POD3	No	50 (100.0%)	50 (100.0%)	-	-	-
	Yes	0 (0.0%)	0 (0.0%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)

*:Chi-square test; •: Independent t-test

Laparoscopic cholecystectomy has largely replaced open cholecystectomy because of shorter hospital stay, faster recovery, and lower overall morbidity. However, the morbidity due to bile duct injury has increased with the advent of the laparoscopic approach ***(Henry et al., 2011)***.

Prevention of intra-abdominal collections after laparoscopic cholecystectomy is our main concern. Post cholecystectomy collection in the sub-hepatic space is usually absorbed whether a drain is used or not.

Intraperitoneal collection of blood may cause postoperative pyrexia, prolong the hospital stay, and increase the incidence of wound infection, while the presence of bile in the peritoneal cavity produces peritoneal irritation.

Only some clinically significant abdominal collections may need intervention. The drain may also give false sense of security as it may get blocked and later patients present with complications.

Our study revealed that less post-operative port site pain, infection and hospital stay in group B (without drain) in comparison with group A (with drain) and those results were statistically significant (P-value< 0.01).

Regarding post cholecystectomy free inta-abdominal collection, it was less evident by ultrasound in group A (with drain) rather than group B (without drain) in first 24 hours. Although the results were statistically significant in the first 24 hours, the difference became insignificant on subsequent ultrasound after 72hrs. (p-value < 0.01 in day 1 postoperative, P-value >0.05 in day 2 postoperative).

Our results are similar to the result conducted by El-Labban et al. regarding postoperative hospital stay and abdominal collection, while his results were opposite to our study regarding port site infection, pain were there no statistical difference ***(EL-Labban et al., 2012).***

Opposite results were optained by Ishikawa et al in their randomized study which include 295 patients where Group A (with drain) include 145 patients and Group B (without drain) include 150 patient, where he stated that no significant difference between the two groups with respect to postoperative complication rate, while regarding postoperative hospital stay the results were similar to our study ***(Ishikawa et al., 2011).***

This is in support with results by Georgiou C as he included 116 patients, where 63 patient in drained group (YD) and 53 in non-drained group (ND) in regard postoperative pain, hospital stay as he stated that the proportion of patients staying in hospital for >2 days was higher in the YD group: 28.6% of the patients versus 13.2% in the ND group ($P = .05$).

As for Subhepatic fluid was more often observed in the YD group (47% versus 34% in the ND), but the difference was not statistically significant ***(Georgiou et al., 2011).***

Our results were also consistent with those reported by Yang et al, who reported that the abdominal drain group displayed significantly higher pain scores (MD: 1.07; 95% CI: 0.69–1.46; $P <. 001$), abdominal drain prolonged the duration of postoperative hospital stay (MD: 0.47 day; 95% CI: 0.14–0.80; $P =. 005$). Wound infection was found to be associated with the use of abdominal drains (RR: 1.97; 95% CI: 1.11–3.47; $P =. 02$) ***(Yang et al., 2020).***

Similarly, our result is supported by results of the study by Sharma et al who found that postoperative pain was higher in the group A (with drain) than in Group B (without drain), also the proportion of the patients staying in the hospital for more than two days was higher in group A (with drain), 14 (46.66%) and 8 (26.66%) in group B (without drain) ($p < 0.05$) while there was no statistical difference in the rate of wound infections ***(Sharma et al., 2016).***

Summary

Laparoscopic cholecystectomy provides a safe and effective treatment for patients with gallstones as it reduces post-operative pain with almost negligible scar, short hospital stay and earlier return to work.

Prophylactic drains in abdominal surgery are widely used either to detect complications early, such as postoperative hemorrhage or bile leakage, or to drain collections which may be toxic, as bile. However, evidence-based data do not support the use of prophylactic drainage in the majority of abdominal procedures.

Gallstones are still one of the most common conditions in surgical outpatient department. Laparoscopic cholecystectomy, after its advent in 1987, rapidly established itself as the gold standard treatment of gallstones. In 1913 cholecystectomy without drainage was described, and since then surgeons were divided whether to use it or not in uncomplicated cases. Most surgeons continue to use routine drain for the fear of bile leakage or bleeding. Such complications invariably occurred in spite of sub hepatic drainage. So, there arises a need for study, whether to put drain or not, and its consequences.

Among the 100 patients included in this study, 70 were females (70%) and 30 were males (30%), with female to male ratio 3.1: 1 approximately. The 100 were randomly distributed into two groups: Group A patients underwent laparoscopic cholecystectomy with drain insertion and this group composed of 50 patients 12 were males (24%) and 38 were females (76%). While Group B also underwent laparoscopic cholecystectomy but without drain insertion and this group composed of 50 patients, 18 males (36%) and 32 females (64%)

In our study we include patients with chronic calcular cholecystitis which is indicated for elective laparoscopic cholecystectomy.

Regarding the Postoperative Pain:

It was higher in patients in Group A (with drain) than in Group B (without drain), and that was statistically significant (P value less than 0.05).

Regarding Port Site Infection:

All patients included in this study were followed post-operative for port site infection (till day 7 time of stitch removal) and we found the incidence of port site infection was higher in Group A (with drain) at site where the drain was inserted, and that was statistically significant (P value less than 0.05).

Regarding postoperative hospital stay:

Hospital stay was much less in patients without drain (Group B) as 42 patient (84%) were discharged at the same day of operation which is statistically significant (P value less than 0.05).

Regarding postoperative collection:

We followed up postoperative collection in the two groups in day1, 2 and 3 and revealed that, POD 1 the collection was lower in Group A (with drain), 80% of patients developed no collection, while 16% of patients developed collection < 50 ml, while 4% developed collection 50-100 ml, while those in Group B (without drain) 8% of patient developed no collection, while 76% of patients developed < 50 ml, while 8% of patients developed 50-100 ml.

And that was statistically significant in day1 postoperative (P value less than 0.05), while it was non-significant in the following 72 hours.

Conclusion

Uncomplicated gall stone diseases can be treated by laparoscopic cholecystectomy without need for drain with reasonable safety by an experienced surgeon. With no usage of drain, it is significantly advantageous in terms of post-operative pain, use of analgesics, infection and hospital stay.

In our study we compare drain insertion post laparoscopic cholecystectomy in matter of post-operative pain, port site infection, hospital stay and post-operative collection.

It revealed that there is significant reduction in postoperative pain in patients without drain than in those with drain.

Moreover regarding postoperative wound infection it was also lower in patient with no drain.

There were also statistically significant reduction in postoperative hospital stay in patients without drain.

Furthermore, postoperative intrabdominal collection is significantly lower in patients with drain in first 24 hours, while after that there were no significant difference regarding intrabdominal collection.

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