A Dissertation on

"FACTORS NECESSITATING CONVERSION OF LAPAROSCOPIC CHOLECYSTECTOMY TO OPEN CHOLECYSTECTOMY"

submitted to

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY CHENNAI

with partial fulfillment of the regulations
for the award of the degree of

M.S., GENERAL SURGERY (BRANCH-I)
REG.NO:221711210

THANJAVUR MEDICAL COLLEGE, THANJAVUR.
THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY CHENNAI

May 2020

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This is to certify that the dissertation titled **"FACTORS NECESSITATING CONVERSION OF LAPAROSCOPIC CHOLECYSTECTOMY TO OPEN CHOLECYSTECTOMY"** submitted by **DR.K.RAMACHANDRAN,** Post Graduate student (2017-2020) in the Department of General Surgery, Thanjavur Medical College and Hospital, Thanjavur appearing for M.S. degree (General Surgery) Branch- I degree examination May 2020 is a bonafide record of work done by him, in partial fulfillment of the regulations of The Tamilnadu Dr.M.G.R. Medical University, Chennai. I forward this to the Tamilnadu Dr.M.G.R. Medical University, Chennai, Tamil Nadu, India.

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LIST OF ABBREVIATIONS USED

CHD - Common Hepatic Duct

CBD - Common Bile Duct

LC - Laparoscopic Cholecystectomy

CCK - Cholecystokinin

HDL - High Density Lipoproteins

TPN - Total Parenteral Nutrition

USG - Ultrasonography

YAG - Yttrium Aluminium Garnet

ECG - Electrocardiogram

COPD - Chronic Obstructive Pulmonary Disease

CDCA - Chenodeoxycholic acid

UDCA - Ursodeoxycholic acid

RHA - Right Hepatic Artery

CONTENTS

INTRODUCTION

Gallstone disease are a common gastrointestinal illness in the general population which frequently requires hospitalization . The prevalence is around 11% to 36% . The treatment of choice for patients with symptomatic cholelithiasis is Laparoscopic cholecystectomy. Previously Open cholecystectomy was frequently performed but that has given way to a laparoscopic approach.The advantages of laparoscopic cholecystectomy are the avoidance of large incision, shortened hospital stay and earlier recovery.

The patients condition, the surgeon is level of experience, and technical factors can play a major role in the decision for conversion. Inability to define the anatomy and difficult dissection are the leading cause for conversion followed by other complications like bleeding.

The conversion rate for elective laparoscopic cholecystectomy is around 5%, whereas the conversion rate in the setting of complications like acute cholecystitis is around 30%. The goal of this study was to determine the conversion rate and identify the factors responsible for conversion of laparoscopic cholecystectomy to open cholecystectomy.

Hence, these findings will allow us to :-

1. To identify a patients risk for conversion based on preoperative information leading to more meaningful and accurate preoperative counseling

2. Improved operating room scheduling and efficiency

3. Improve patient safety by minimizing time to conversion

AIMS AND OBJECTIVES

1. To identify the risk factors predictive of conversion of laparoscopic cholecystectomy to open surgery.

2. To determine the rate of conversion of laparoscopic cholecystectomy to open surgery.

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REVIEW OF LITERATURE

Historical Review

The first to describe calculi in human liverswas Alexander of Tralles (525-605), a physician of the Byzantine Empire.

The first clinical description of gallstone disease suggested by Gordon Taylor (1937)was recorded in the 4_{th} century BC. An accurate description of human gallstones was given by
Vesalius, concluding that they represented a disease process.

Joenisius was the first surgeon to successfully perform cholecystolithotomy in 1676, but the extracted gallstones was apparently extracted from a biliary fistula of the abdominal wall following spontaneous drainage of the abscess.

The first successful cholecystectomy was performed by Carl Langen bunch in 1882, a noted German surgeon and for more than 100 years it was the standard treatment for symptomatic gallbladder stones

Laparoscopic Cholecystectomy

The first laparoscopic cholecystectomy was performed in 1987 by Philippe Mouret.

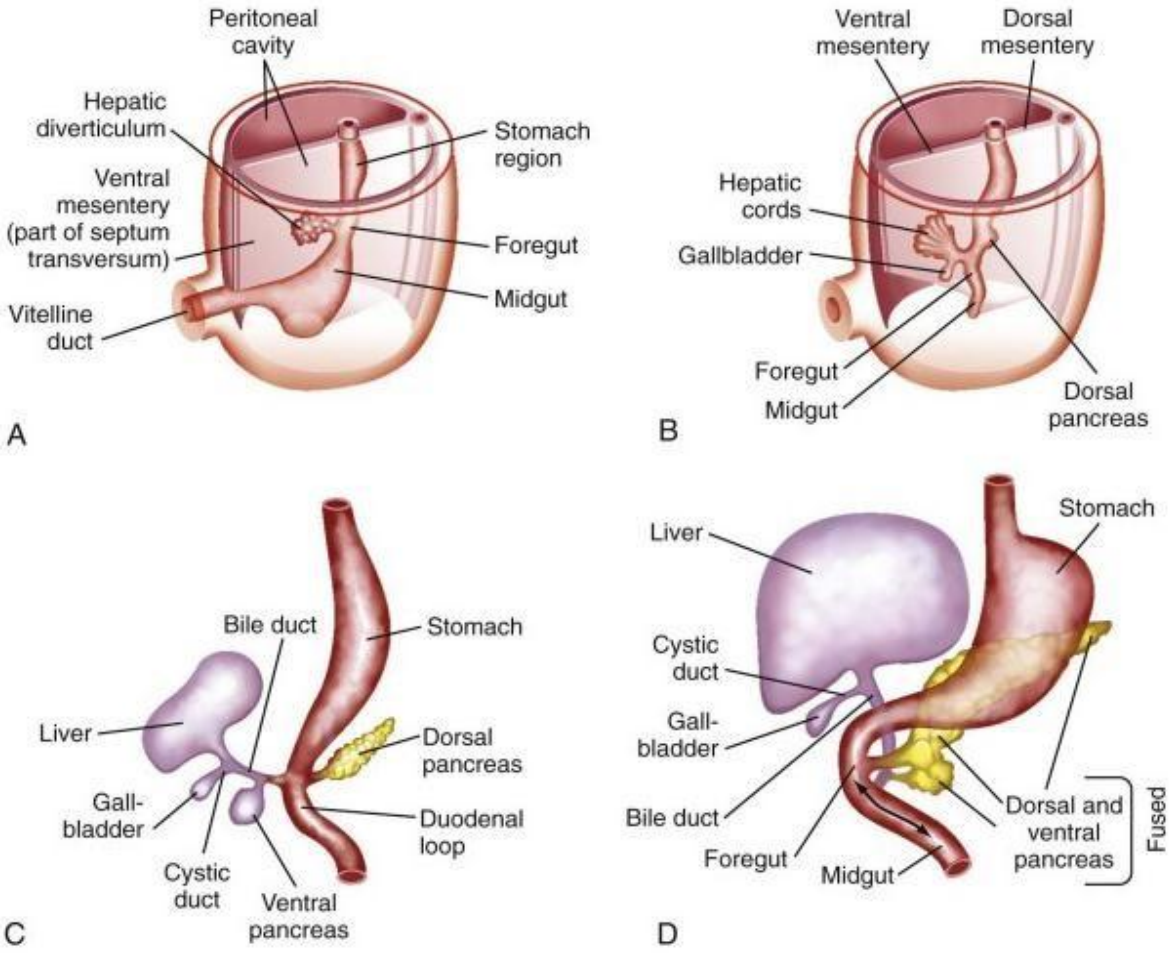
In 1988 McKernan and Saye also perfomed laparoscopic cholecystectomy in the United States.

In fact, in 1985, a German professor named Erich Muhe of Boblingen performed the first lap Cholecystectomy but his technique was not appreciated by his colleagues at the German surgical Society.Only in 1999 he was recognized by SAGES. In India the first laparoscopic cholocystectomywas performed in Mumbai, JJ Hospital 1990 .Within a span of few years laparoscopic Cholecystectomy became the procedure of choice for Gallbladder disease.

EMBRYOLOGY

The liver arises from the ventral surface of duodenal foregut as a diverticulum in the fourth week close to its midgut junction. The diverticulum is lined with endoderm, it grows vertically and cranially into

the septum transversum. Two solid hepatic buds diverges from the tip , the right and left lobes of liver .The buds develops into epithelial and branches and anastomoses to form a closed meshwork. Sinusoids arises from intervals of meshwork which are filled with blood. The bile duct arises from the original diverticulum and the cystic duct and gall bladder arises as an outgrowth from its distal part. It is solid at first but later it canalized.

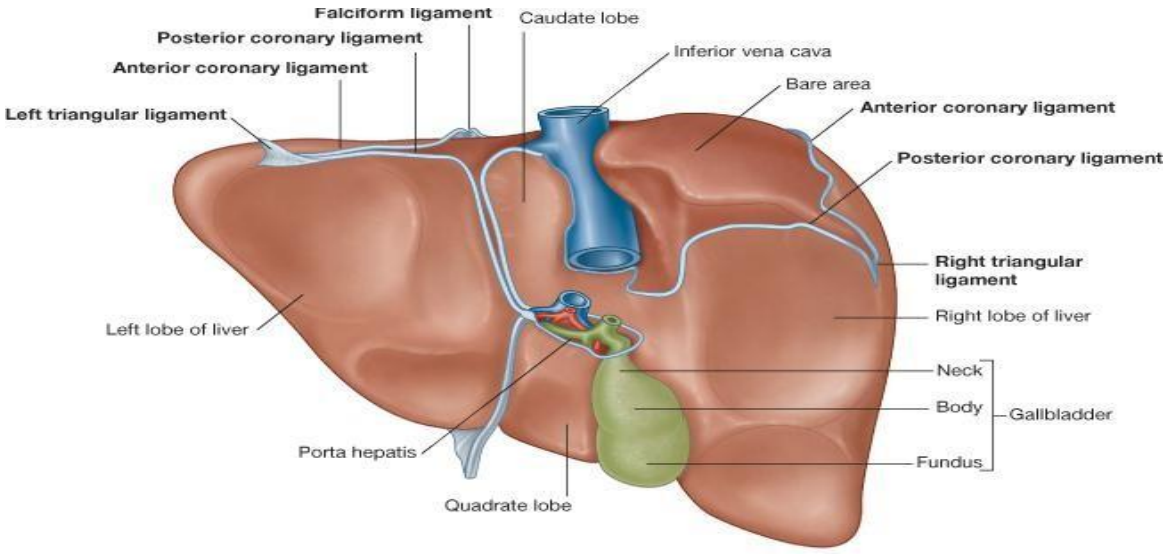


BILIARY EMBRYOLOGY

ANATOMY

The **gallbladder** is a pear-shaped sac lying on the visceral surface of the right lobe of the liver in a fossa between the right and quadrate lobes. It has:

- A rounded end (**fundus of gallbladder**), which may project from the inferior border of the liver,
- A major part in the fossa **(body of gallbladder**), which may be against the transverse colon and the superior part of the duodenum;
- A narrow part (**neck of gallbladder**) with mucosal folds forming the spiral fold.



ANATOMY OF THE GALL BLADDER

The gallbladder is around 7 to 10 cm in length and varies from 2.5 to 3.5 cm in width. It has a capacity of 50 to 60 ml of bile. The Hartmann's pouch is a peculiar bulge of the infundibulum that lies close to the gallbladder's neck. Here gallstone commonly lodges. The neck joins the cystic duct.

The gallbladder is made up of five layers.

1. The innermost layer is the epithelium,
2. The lamina propria,
3. The smooth muscle,
4. The perimuscular subserosal connective tissue, and
5. The serosa.

The gallbladder is devoid of muscularis mucosa or submucosa.

The lamina propria contains :-

- Nerve fibers,
- Vessels,
- Lymphatics,
- Elastic fibers,
- Loose connective tissue, and
- Occasional mast cells and macrophages.

The muscle layer is composed of loose arrangement of circular, longitudinal, and oblique fibers without well-developed layers.Rokitansky-Aschoff sinuses are invaginations of epithelium into the lamina propria, muscle, and subserosal connective tissue. The ducts of Luschka are tiny bile ducts found around the muscle layer on the hepatic side of the gallbladder.

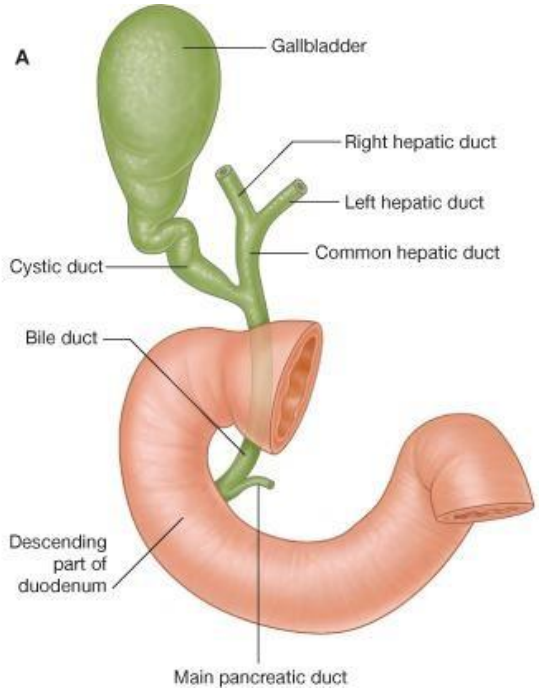
Anatomy of biliary tract

The right and left hepatic ducts unite outside the liver in the portahepatis to form thecommon hepatic duct (CHD). The cystic duct arises from the gallbladder and joins the CHD to form the common bile duct (CBD) . The length of the cystic duct is averages between 2 to 4 cm.

The cystic duct contains a number of mucosal folds, similar to those found in the neck of the GB. These spiral folds are referred to as valves of Heister and they do not have valvular functions.

The common bile duct also referred to as CBD runs in between the layers of the lesser omentum, It lies anterior to the portal vein and to the right side of the hepatic artery. It passes behind the1st part of the duodenum in a groove on the back of the head of the pancreas, it enters the

2nd part of the duodenum. The duct runs obliquely through the posterior-medial wall, and it usually joins the main pancreatic duct to form the Ampulla of Vater. The mucous membranes made to bulge inwards in the ampulla to form an eminence, the duodenal papilla. The bile and pancreatic ducts open into the duodenum separately in about 10-15% of subjects. The dimensions of the common bile duct is usually less than 11 mm and anything greater than 18 mm is considered pathological.



ANATOMY OF THE BILIARY TREE

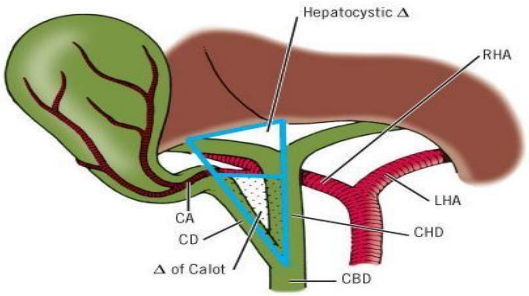
The duodenal portion of the CBD is surrounded by thickened longitudinal and circular muscle fibres. This is called the sphincter of oddi.

Calot’s Triangle

In 1891, Calot’s described what is now known as The Calot’s Triangle.It is a triangular anatomic region formed by the :-

- Common hepatic duct medially,
- Cystic duct laterally,
- Cystic artery superiorly.

The Calot's triangle at present is considered by most to comprise the triangular area with an upper boundary formed by the inferior margin of the right lobe of the liver, rather than the cystic artery. During cholecystectomy, clear visualization of the hepatocystic triangle is important for accurate identification of the structures within the triangle.

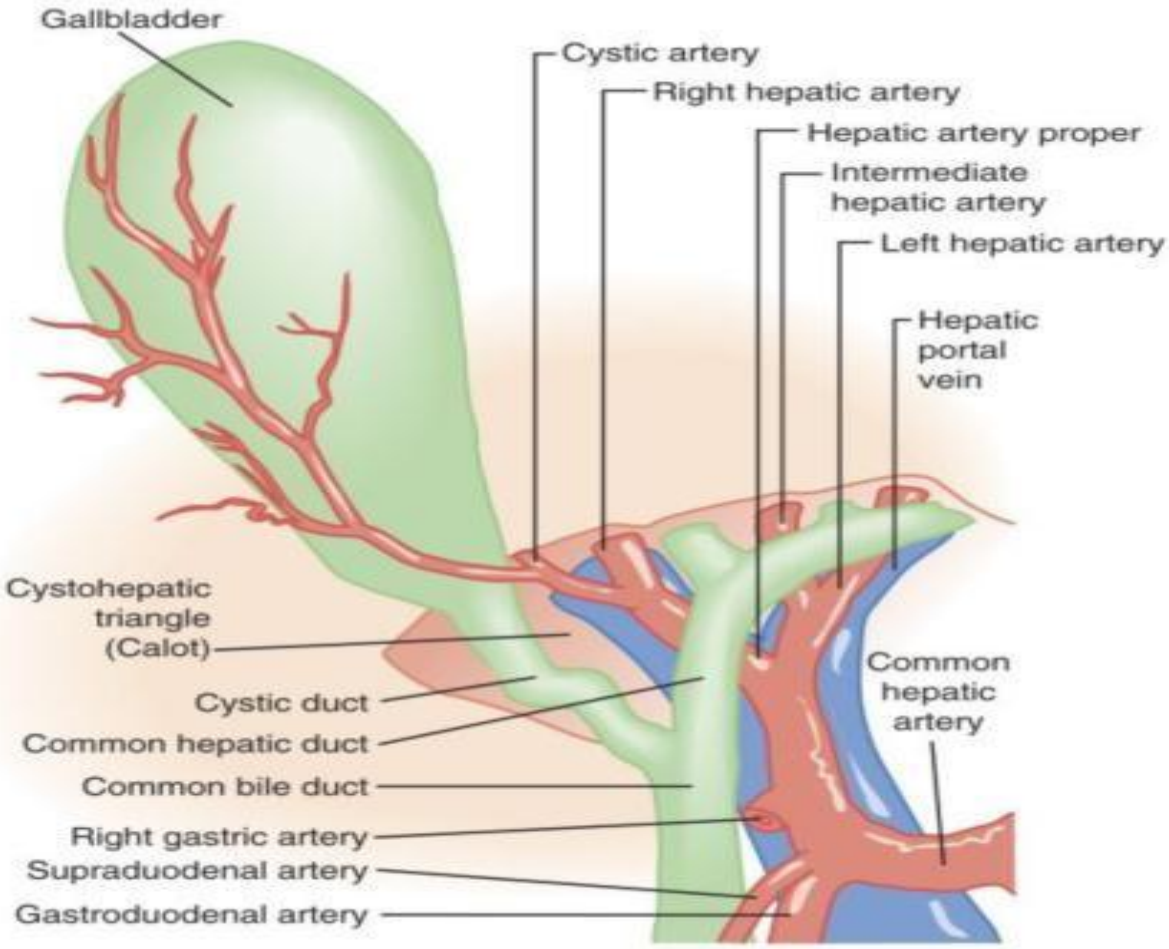


CALOT’S TRIANGLE

Blood supply

The cystic artery supplies the Gall Bladder .It is a branch of the Hepatic artery . It is large and tortuous and variable in its location. Smaller

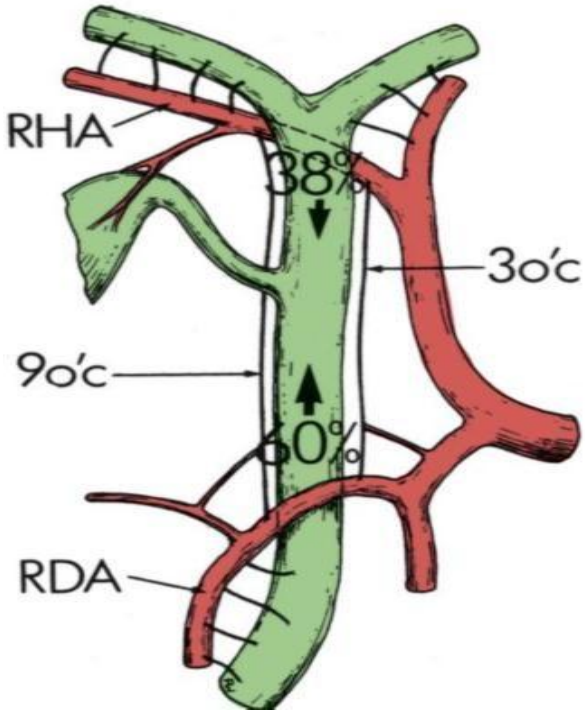
blood vessels enter from the liver through the GB fossa. The cystic vein drains into the portal venous system and constitutes its venous drainage.



ARTERIAL BLOOD SUPPLY OF THE GALL BLADDER.

The arterial blood supply to the supraduodenal part of bile duct is generally by 2 main(axial) vessels, which run along the bile duct in 3'0 clock and 9'0 clock position. These are supplied predominantly by the retroduodenal artery from below, and the right hepatic artery from above.

This pattern of arterial supply therefore would explain why vascular damage results in bile duct stricturing.



ARTERIAL BLOOD SUPPLY OF THE EXTRAHEPATIC BILIARY TREE

Lymphatics

There are quite a number of lymphatic vessels in the sub mucous and sub peritoneal layers. They drain through the cystic gland at the neck of the gallbladder to glands along the CBD, where they anastomose with lymphatic from the head of the pancreas.

Nerve supply

The gallbladder and bile ducts are innervated by both the parasympathetic and sympatheticsystem.

Laparoscopic anatomy

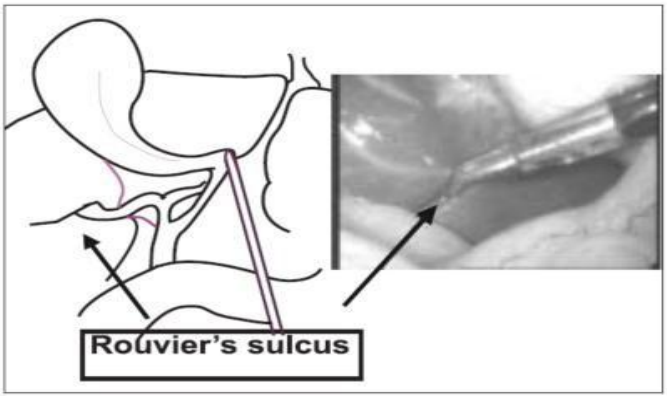
With the advent and popularity of LC, a new look and insights into the biliary anatomy began to emerge especially of the Calot's triangle area and the term "laparoscopic anatomy" has actually found a place even in anatomy texts.

The different anatomical laparoscopic view of the area during cholecystectomy and especially in the area around the Calot'striangle does contribute to misidentification of structures. During laparoscopic procedure due to different methods of retraction the Calot'striangle tend to be distorted by actually flattening it rather than opening it out. Also the reluctance to perform (due to difficulty) a fundus first cholecystectomy during the laparoscopic procedure as opposed to open procedure also contributes to the some lack of exposure of the Calot's triangle. Finally the most popular approach is the posterior orreverse dissection of the Calot's triangle, again gives a different view of the area and since gallbladder is

flipped over during this method it may lead to further anatomical distortion.

The Rouvier's sulcus is fissure on the liver between the right lobe and caudate process and is seen clearly during LC while doing a posterior dissection approach in majority of the patients. It is at the level of the porta hepatic where the right pedicle enters the liver. It has been emphasized that all dissection should be kept to a level above (or anterior) to the sulcus to prevent injury to the bile duct.

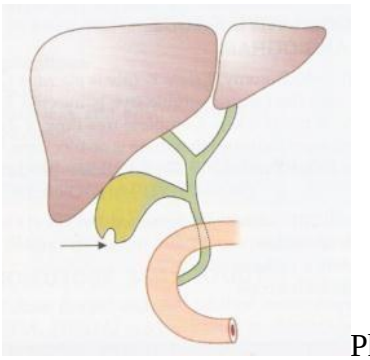
Also, very importantly this being an "extrabiliary" reference point it does not get affected by distortion due to pathology. Similarly, a clear view of the junction of cystic duct with the gallbladder along with the visualisation of a space between the gallbladder and the liver and clear of any structure other than the cystic artery is also recommended as a vital step to prevent bile duct injury.



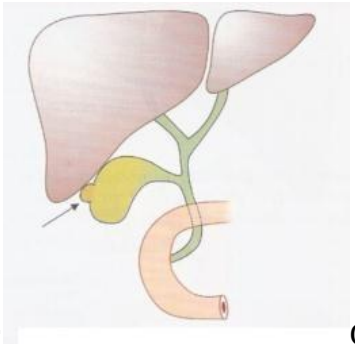
ANOMALIES OF GALLBLADDER

The Gallbladder may be :

1. Septate, transversely or longitudinally placed.
2. Double with a single cystic duct.
3. Double with separate ducts opening into hepatic or common or both ducts.
4. The serosa may be separate or common.
5. Small ducts may connect gallbladder with liver. Usually these become obliterated.
6. Phrygian cap deformity is the most common congenital abnormality.
7. It may have a mesentery; which can be found on the left of the falciform ligament or intrahepatic



Phrygian gall bladder



Gallbladder diverticulum

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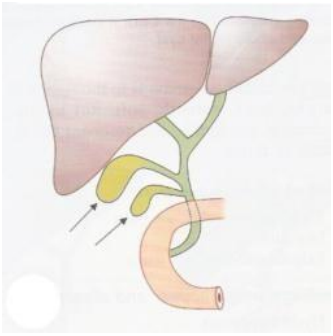
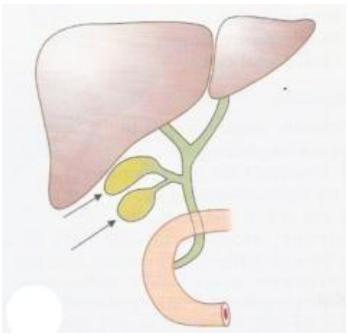


Double gallbladder with separate cystic ducts



Double gallbladder with common cystic duct

VARIATIONS OF 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.

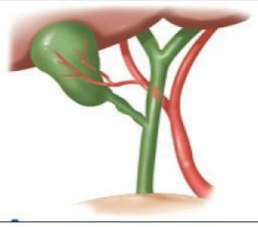
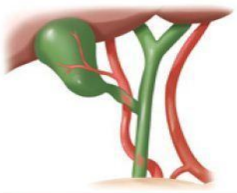
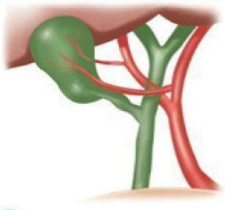
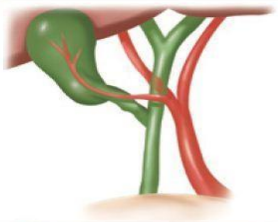
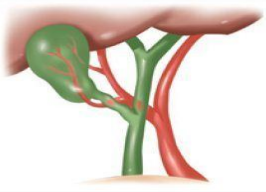
D. The cystic duct drains into right hepatic duct.

E. Long cystic duct that joins the common hepatic duct behind the duodenum.

F. Absence of the cystic duct.

G. The cystic duct crosses posterior to the common hepatic duct and joins it anteriorly.

H. The cystic duct courses anterior to the common hepatic duct and joins it posteriorly.

Cystic artery from right hepatic artery, about 80–90%	
Cystic artery from right hepatic artery (accessory or replaced) from superior mesenteric artery, about 10%.	
Two cystic arteries, one from the right hepatic, the other from the left hepatic artery, rare.	
The cystic artery branching from the right hepatic artery and running anterior to the common hepatic duct, rare.	
Two cystic arteries arising from the right hepatic artery, rare.	

VARIATIONS IN THE ARTERIAL SUPPLY TO THE GALLBLADDER

PHYSIOLOGY

Bile Formation and Composition

The bile is continuously produce in the liver and excreted out into the bile canaliculi. The normal adult produces within the liver 500 to 1000 mL of bile a day. The bile secretion is controlled by neurogenic, hormonal, and chemical stimuli. Vagal stimulation increases bile secretion, whereas splanchnic nerve stimulation decreases bile flow. Hydrochloric acid, partly digest proteins, and fatty acids in the duodenum and that stimulate the release of secretin from the duodenum which in turn, increases bile production and bile flow. Bile flows from the liver to the hepatic ducts, to the common hepatic duct, through the common bile duct, and finally into the duodenum.

Bile is composition is that of water, electrolytes, bile salts, proteins, lipids, and bile pigments. Sodium, potassium, calcium, and chloride have the same concentration in bile as in plasma or extracellular fluid. The pH of hepatic bile is usually neutral or slightly alkaline, but varies with diet; an increase in protein shifts the bile to a more acidic pH.

The liver synthesizes primary bile salts, cholate and chenodeoxycholate from cholesterol. These are conjugated there with taurine and glycine, and act as anions within the bile (bile acids) that are balanced by sodium. Bile salts are excreted into the bile by the hepatocyte and aid in the digestion and absorption of fats in the intestines. About 80% of the conjugated bile acids in the intestines, are absorbed in the terminal ileum. The remainder is dehydroxylated (deconjugated) by gut bacteria which forms secondary bile acids deoxycholate and lithocholate. These are absorbed in the colon and transported to the liver, conjugated, and secreted in the bile.

Eventually, about 95% of the bile acid pool is reabsorbed and returned via the portal venous system to the liver, this is known as enterohepatic circulation. 5% is excreted in the stool, leaving the small amount of bile acids to have maximum effect.The principal lipids found in bile which are excreted by the liver are cholesterol and phospholipids. There synthesis is in part regulated by bile acids.

The bile colour is due to the presence of the pigment bilirubin diglucuronide, which is the metabolic product from the breakdown of hemoglobin, and its concentrations in bile is 100 times greater than in plasma.

Once in the intestine, bacteria convert the bile into urobilinogen, a small fraction of which is absorbed and secreted again into the bile.

Gallbladder Function

The gallbladder, the bile ducts, and the sphincter of Oddi act together to store and regulate bile flow. The gallbladders main function is to concentrate and store hepatic bile and to deliver it into the duodenum in response to a meal.

Absorption and Secretion

In fasting state, approximately 80% of the bile is stored in the gallbladder. This storage is made possible because of the absorptive capacity of the gallbladder, its mucosa has the greatest absorptive power per unit area of any structure in the body. It rapidly absorbs elecytrolytes like sodium, chloride, and water against a significant concentration gradients, the bile is concentrated upto 10-fold and leading to a marked change in the composition of bile.

This rapid absorption prevent a rise in biliary pressure within the biliary tree in normal circumstances. Gradual relaxation and emptying of the gallbladder during the fasting period also plays a role in maintaining a relatively low intraluminal biliary pressure.

GALLSTONES

INCIDENCE:

The most common biliary pathology are gallstones . The incidence of gallstone disease varies throughout the world. By the age of 75, about 35% women and 20% of men would have developed gallstones.

RISK FACTOR ASSOCIATED WITH GALLSTONE FORMATION

1.Cholesterol stones

i. Age>40 years

ii.Estrogens

a.Female sex(2-3 times the risk in men)

b.Pregnancy(risk increases with number of pregnancies)

c.Estrogen containing OCPs

iii.Genetic or ethnic variation

iv.High fat ,low fiber diet

v.Obesity

vi.Hyperlipidaemia

vii.Bile salt loss(Ileal disease or resection,Crohn's disease)

vii.Cystic fibrosis

ix.Anti –hyperlipidaemicdrugs(clofibrate)

x.Impaired gall bladder emptying

a.Truncalvagotomy

b.Type -1 diabetes

c.Octreotide

d.Total parenteral nutrition

e.Starvation or rapid voluntary weight loss

2.Pigment stones

i.Haemolytic disease

ii.Biliary stasis

iii.Biliary infection

CLASSIFICATION OF GALLSTONES:

	Cholesterol	Black	Brown
Location	Gallbladder, ducts	Gallbladder, ducts	Ducts
Major constituents	Cholesterol	Bilirubin pigment polymer	Calcium bilirubinate
Consistency	Crystalline with nucleus	Hard	Soft, friable
% Radio-opaque	15%	60%	0%
Associations			
Infection	**Rare**	**Rare**	**Usual**
Other diseases		Haemolysis, Cirrhosis	Chronic partial biliary obstruction

Classification of gallstones

PATHOGENESIS:

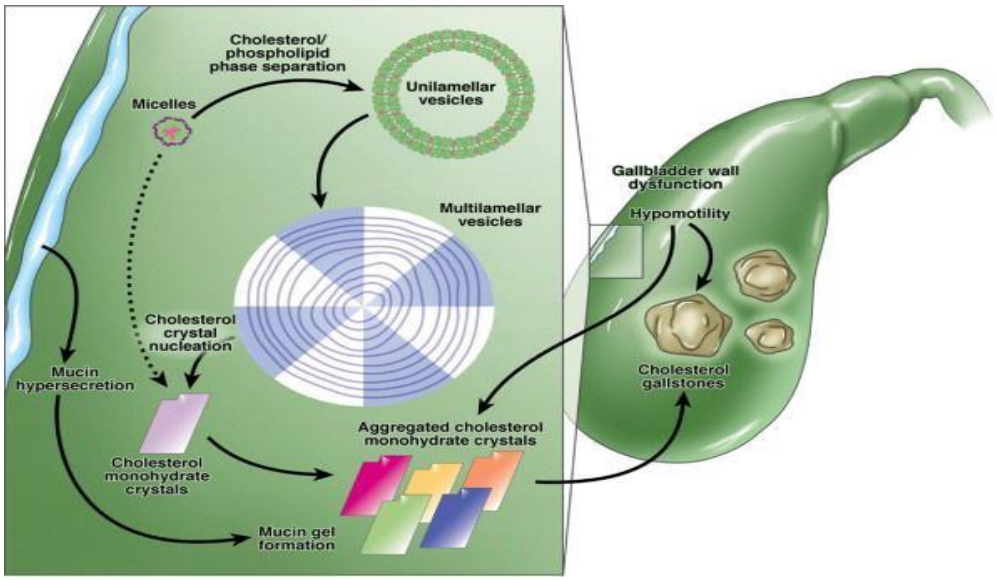
Gallstones are mainly composed of cholesterol, bilirubin, and calcium salts, with small amounts of protein and other materials. In Western countries cholesterol is the main constituent of more than three quarters of gallstones, and these stones many of them are more than 80 percent cholesterol. Non-cholesterol stones are categorized as black or brown pigment stones, consisting of calcium salts of bilirubin. About 15 percent of gallstones can be seen on a plain abdominal radiograph, and pigment stones constitutes two thirds of these . Calcification which is

visible only on the rim occurs usually in cholesterol stones. Cholesterol gallstones formation results when the cholesterol concentration in bile exceeds the ability of bile to hold it in solution i.e. reaches its saturation point, so that crystals form and grow as stones. The lithogenicity of bile are affected by various factors.

Cholesterol gallstones:

The three major factors that determine the formation of cholesterol gallstones are

1. Altered hepatic bile,
2. Nucleation of cholesterol monohydrate crystals and
3. Impaired function of gallbladder.



The physical-chemical processes involved in formation of cholesterol stones **Biliary sludge .**

Role of infection

Infection has little importance in cholesterol gallstone formation. The bile is usually sterile. Biliary infection can lead to brown-pigment stone formation. These stones may contain bacteria which is seen on electron microscopy.

Age

The prevalence of gallstone disease increases with advancing years, which maybe to increased cholesterol content in bile. Pigment and cholesterol type stones are reported in childhood.

Genetics

There is a familial predisposition to the incidence of gallstones in families with known history of gallstone disease irrespective of their age and weight.

Sex and oestrogens

Gallstones are two times as common in women as in men. There is higher incidence in multiparous than in nulliparous women. Incomplete emptying of the gallbladder in late pregnancy leads to retention of cholesterol crystals; this favours gallstone formation. Women younger than 30 years, gallbladder stones are commonly associated with pregnancy and

obesity. When women are placed on birth control pills the bile becomes more lithogenic. Women on long-term OCP'shave a twice the incidence of gallbladder disease over controls. Postmenopausal women on oestrogen containing drugs have 2.5 times increase in gallbladder disease.

Obesity

There is increased incidence of gallstone disease in obese individuals than in the general population and is particularly an important risk factor in women less than 50 years old (fat, fertile, female of forty). Obesity is associated with increased cholesterol synthesis and excretion.

It is found that 50% of markedly obese patients have gallstones at surgery.

Dietary factors

Dietary fibre deficiency is associated with increased incidence of gallstone disease. This is due to increase in secondary bile acids, and render it more lithogenic,carbohydrate in refined form increases saturation of biliary cholesterol. A moderateamount of alcohol has a protective action against gallstones. Vegetarians have fewer incidence of gallstones .

Serum factors

Low HDL levels and high triglyceride levels have the highest risk of gallstones (both cholesterol and pigment) .

Pigment gallstones:

This term is refers to stones containing less than 25% cholesterol. They may be irregular or crystalline or smooth and amorphous on cross-section. They represent 25% of gallstones removed at cholecystectomy.

There are two types of pigmented stones: black and brown.

Black pigment stones are largely composed of an insoluble black pigment polymer mixed with calcium phosphate and carbonate. They are usually seen inside the gallbladder. They are associated with chronic hemolysis, like hereditary spherocytosis or sickle cell disease, and mechanical prostheses in the circulation.

Brown pigment stones have calcium bilirubinate and are also composed of calcium palmitate and cholesterol as their other major constituents. They are usually radiolucent. They are usually found in the gallbladder, intra-hepatic and extra-hepatic bile ducts. They have a 10% association with stricture, sclerosing cholangitis and Caroli's syndrome. Recurrent bile duct stones are usually brown pigment stones. In Oriental countries,

parasitic infestations of the biliary tract by Clonorchis sinensis or Ascaris Lumbricoides are associated with these stones.

Clinical Presentation of Gallstones:

1. Asymptomatic.
2. Biliary colic.
   i. Right subcostal or epigastric pain radiating to back or lower pole of scapula lasting for 20 minutes to 6 hours.
   ii. Associated with vomiting, brought on by (any) food.
   iii. May disturb sleep.
3. Flatulent dyspepsia.
4. Acute Cholecystitis - Calculous (as opposed to Acalculous)/ Empyema gallbladder/ Gangrenous Gallbladder.
   i. Severe pain and tenderness in right subcostal region - Murphy sign - pain on palpation of the right upper quadrant when the patient inhales.
   ii. Fever and leucocytosis.
5. Chronic calculous Cholecystitis - repeated episodes of right hypochondrial pain with/without fever and vomiting.
6. Cholangitis - Fever with chills/rigors, transient jaundice, upper abdominal pain, vomiting - Charcot triad (right upper quadrant pain, fever, and jaundice)
7. Mucocele - Heaviness in upper abdomen; palpable lump.
8. Choledocholithiasis with extra-hepatic cholestasis.
9. Biliary pancreatitis.
10. Gallstone ileus.
11. Gallbladder perforation.
12. Gallbladder carcinoma.

The percentages indicate the approximate frequencies of complications that occur in untreated patients, based on natural history data. The most frequent outcome is for the patient with a stone to remain asymptomatic(75%) throughout life .Biliary pain(20%),acute cholecystitis(10%) , cholangitis , and pancreatitis (5%) are the most common complications. Mirizzi's syndrome (0.5%), cholecystoentericfistula(0.1%), Bouveret's syndrome and gallbladder cancer (<0.1%) are relatively rare.

SYMPTOMATIC GALLSTONES:

Chronic Calculous Cholecystitis

Chronic cholecystitis is referred to as an ongoing inflammation with recurrent episodes of biliary colic due to cystic duct obstruction. Histologically, increase in subepithelial and subserosal fibrosis and a mononuclear cell infiltrate is characteristic of chronic cholecystitis.

The main symptom of chronic symptomatic cholecystitis is pain, usually referred to as biliary colic. It is constant pain and lasts 1 to 5 hours which may be accompanied by nausea, vomiting, bloating and belching which are present in 50% of cases. Rarely fever and jaundice is seen in

simple biliary colic.During a biliary colic episode the patient might have mild right upper quadrant tenderness.

The standard diagnostic exam for gallstones is an abdominal ultrasound. Cholecystectomy is indicated if there is recurrent attacks of biliary colic and on ultrasound sludge is detected on two or more occasions. Other causes for typical biliary attack are cholesterolosis and adenomyomatosis of the gallbladder. Cholesterolosis is caused by the accumulation of cholesterol in macrophages in the gallbladder mucosa, either locally or as polyps. It is also known as "strawberry gallbladder."

Elective laparoscopic cholecystectomy is the standard treatment for patients with symptomatic cholelithiasis. Patients are advised to avoid dietary fats and heavy meals while awaiting surgery. Diabetic patients have a higher risk for acute cholecystitis or even gangrenous cholecystitis therefore prompt cholecystectomy is advised for these patients.

Acute Calculous Cholecystitis:

Gallstone obstruction of the cystic duct causing biliary colic is the initial event in acute cholecystitis in 90%-95% of cases. Obstruction of the cystic duct causes the gallbladder to be distended, and the gallbladder wall

then becomes inflamed and edematous. In the most cases, the gallstone dislodges, and the inflammation resolves by itself.

The most common symptom of acute cholecystitis is right upper quadrant pain, similar in severity but has a much longer duration than pain from previous biliary colic episodes. Other common symptoms are fever, nausea, and vomiting. On physical exam, right hypochondrium tenderness and guarding inferior to the right costal margin are usually elicited, distinguishing the episode from simple biliary colic.

The most useful radiographic test for diagnosis is ultrasonogram. It has good sensitivity for identifying gallstones. Radionuclide scanning is used less frequently and mostly in atypical cases. Lack of filling of the radiotracer (99mTc-HIDA) in the gallbladder after 4 hours indicates obstruction in cystic duct.

After the diagnosis is confirmed treatment includes, IV fluids, antibiotics, and analgesia. Antibiotics should cover gram-negative aerobes and anaerobes.Laparoscopic cholecystectomy is the gold standard treatment for patients with acute cholecystitis. Early cholecystectomy within 2 to 3 days of presentation is preferred over interval or delayed

cholecystectomy which is performed 6 to 10 weeks after initialization of medical therapy.

Choledocholithiasis

Common bile duct stones are classified into primary and secondary depending on their point of origin. Primary stones are those that are formed in the CBD itself and secondary stones are those that have been formed in the gallbladder and have migrated in to the CBD, 6% to 12% of patients with stones in the gallbladder. The secondary stones are of the brown pigment type. The primary stones are associated with biliary stasis and infection .They are commonly seen in Asian populations. Common duct stones are also defined as retained stones if they are found within 2 years of cholecystectomy, recurrent if they have detected more than 2 years after cholecystectomy.

Common bile duct stones are usually silent and are often incidentally discovered. Biliary obstruction in these patients are transient, and laboratory tests are usually normal. Clinical features of CBD obstruction include biliary colic associated with progressive jaundice, clay colour stools, and darkening of the urine. Fever and chills may be present in

patients cholangitis and constitute charcots triad. Ultrasonography, is the first test to be done. It can detect stones in the gallbladder and measure the diameter of the common bile duct. A dilated bile duct (>8 mm in diameter) in a patient with gallstones presenting with jaundice and biliary pain is highly suggestive of choledocholithiasis. MRCP is a uselful imaging modality and it provides excellent anatomic detail with sensitivity of 95% and specificity of 98%. ERCP is the diagnostic and also therapeutic test of choice in patients with distal common bile duct stones. Endoscopic cholangiography helps in confirmation of diagnosis in patients with suspected common bile duct stones and also provides ductal clearance of the stones and sphincterotomy before laparoscopic cholecystectomy. We should consider prompt cholecystectomy after endoscopic clearance of the common bile duct during the hospital admission if the patient is fit for surgery.

A single sitting procedure can be performed where laparoscopic common bile duct exploration through the cystic duct after cholecystectomy or with formal choledochotomy and insertion of T tube which allows retrieval of stone during the same procedure. The purpose of the T tube is to aid in postoperative radiologic stone extraction as it allows easy access to the biliary system.

Gallstone Pancreatitis

Another common complication of CBD stones is the obstruction of the main pancreatic duct by an impacted stone or temporary obstruction of the stone passing through the ampulla leading to gallstone pancreatitis. Treatment in acute cases includes ERCP with sphincterotomy and stone extraction. Once the pancreatitis has subsided, cholecystectomy is advised during the same admission.

Investigations:

There are many different array of investigations available for the diagnosis of gallstones:

1.Bloodinvstigations

2Plain x ray abdomen

3.Ultrasonography

4.CT abdomen

5.MRCP

6.ERCP.

Blood investigations:

Serum transaminases will be elevated in nearly 50% of patients with symptomatic gallstones.

White blood cell count can be elevated in acute cases. Serum lipase and amylase are useful in patients with suspected gallstone pancreatitis. In patients with liver dysfunction due to severe jauncie, prothrombin time (PT) and activated partial thromboplastin time (aPTT) might be abnormal.

Plain X-ray abdomen:

X-ray abdomen is considered a preliminary test. Only 10% of gallstones are radio opaque.A porcelain gallbladder due to its extensive wall classification can be seen on a plain x-ray film.It is an indication of urgent cholecystectomy due to its pre malignant potential.

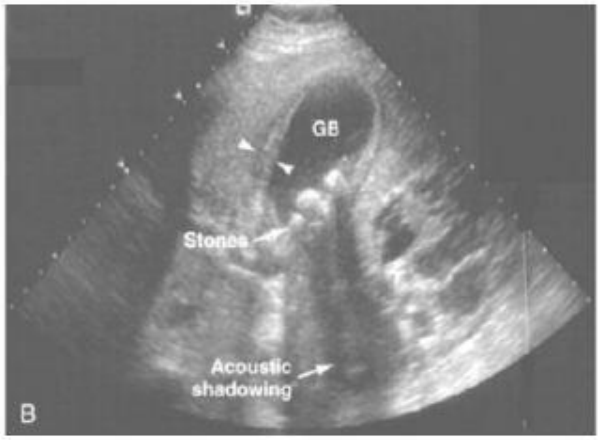
Ultrasonography:

It is the initial investigation in a suspected case of any disease involving the biliary tree. Its advantage lies in the fact that it is non-invasive, no radiation exposure and it can be done on critically ill patients [25]. It can detect stones larger than 1mm in diameter. It can also rule out other causes of right hypochondrium pain like abscess and malignancy. It can also detect dilatation in CBD diameter in cholidocholithiasis .

In ultrasound gallstones are seen as moveable echogenic spot that produces a shadow. They are acoustically dense and produce an acoustic shadow. Ultrasound can also detect gallbladder sludge which does not

produce shadows but have tiny echogenic spots. The only disadvantage is that it is operator-dependent.

Typical ultrasonographic appearance of gallstones casting an acoustic shadow

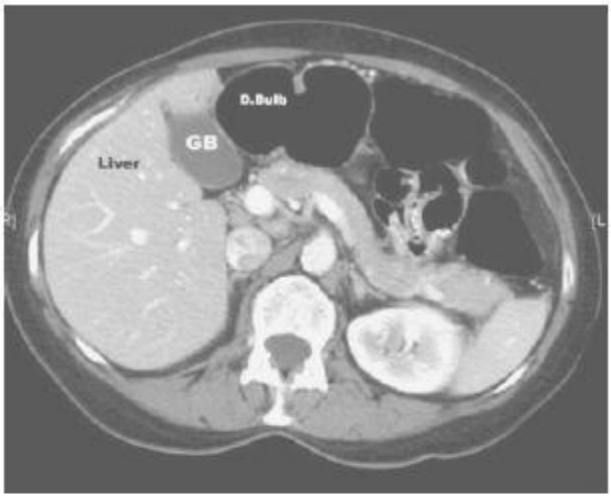


Cholelithiasis in the setting of acute cholecystitis.

. Multiple gallstones can be seen within the gallbladder lumen with associate gallbladder wall thickened (arrowheads).

Computed Tomography

It is not the first-line test. Gallstones are frequently missed by routine CT. It has low sensitivity but it does provide important information regarding the nature, extent, and anatomy of the biliary tree and the associated surrounding structures. In general, this test provides more useful information than ultrasound in the setting of extra hepatic obstruction which may be due to causes other than cholidocholithiasis. Disadvantage for CT scanning include ionizing radiation exposure and cost.



Normal CT Scan of gall bladder

CT image demonstrates a large gallstone (arrow) in the gallbladder.

CT IMAGE OF GALL BLADDER STONE

Magnetic Resonance CholangioPancreatography (MRCP)

Recently,(MRCP) Magnetic Resonance cholangio-pancreatography is another alternative to (ERCP) endoscopic retrograde cholangiography .It is non- invasive and non-ionizing but lacks therapeutic capability. In MRCP

native high signal intensity of fluid on T2-weighted images permits imaging of the biliary tree. Sensitivity of MRI cholangiography for detecting gallstones and CBD stones are over 90 %

Endoscopic Retrograde CholangioPancreatography (ERCP):

Here a side-viewing endoscope is used, by fluoroscopy the common bile duct can be cannulated and a cholangiogram perform. The procedure is done under I.V sedation for the patient. The advantages of ERCP is that you can directly view the ampullary region and have direct access to the CBD. It also has a therapeutic role. It is particularly useful for distal CBD stones specially when it is associated with cholangitis or obstructive jaundice or gallstone pancreatitis. Over here it is the procedure of choice. Once the distal CBD stone is visualized, sphinterotomy is done and extraction of the stone with dormia basket is done.

MANAGEMENT OF GALLSTONE DISEASES

Cases have been reported that contact dissolution of gallstones have been used using solvents and percutaneous cholecystolithotomy technique but it has been observed that these modalities are not superior to oral dissolution , laparoscopic cholecystectomy technique or shock wave

lithotripsy. Thus they were abandoned. Now the mainstay medical treatment for gallstones is oral dissolution using ursodeoxycholicacid , which may or may not be used with shock wave lithotripsy.

1. <u>Dissolution Therapy</u>

Here the rationale is reversing the supersaturation of bile with cholesterol. The main mechanism is making the cholesterol stones more soluble by addition of certain agents . The two most commonly used agents are chenodeoxycholic acid and ursodeoxycholicacid whichdissolve gallstones by desaturating bile and decreasing biliary cholesterol secretion. These agents via micellar solubilization encourage the removal of cholesterol from stones or encourage the formation of a liquid crystalline phase, or both.

The first bile acid used for gallstone dissolution was Chenodeoxycholic acid but because of its side effects like diarrhea and altered liver function it has been abandoned. Ursodeoxycholic acid is more commonly used now and is well tolerated. Patients with uncomplicated cholilithiasis should be considered for oral dissolution therapy. It is also important that the gallbladder function should be normal and the cystic duct is patent to allow unobstructed passage of unsaturated bile and stones

to pass out from the gallbladder. Oral dissolution therapy is used only on cholesterol stones.

The preferred drug for oral dissolution therapy is Ursodeoxycholic acid (ursodiol) . Dosage is 10 to 15 mg/kg of body weight per day. Night time dosing is preferred. Treatment should continue until documentation of stone dissolution by two consecutive negative ultrasonograms one month apart is done.

OPERATIVE MANAGEMENT

Cholecystectomy can done by 1.Open and 2. Laparoscopic methods

The indications are the same for both techniques.[31] These are:-

1. Symptomatic gallstones causing

- Mucocele of the gallbladder
- Repeated episodes of biliary pain
- Biliary pancreatitis
- Choledocholithiasis with extra-hepatic cholestasis
- Gallstone ileus.

2. Cholecystitis and its complications like:- □Acute acalculous cholecystitis

- Acute calculous cholecystitis
- Chronic cholecystitis
- Gangrenous cholecystitis
- Gallbladder perforation □Empyema gallbladder.

3. Asymptomatic cholelithiasis : only for selective indications, like :

- Diabetics.
- Patients undergoing bariatric surgery.
- Children.
- Renal transplantation
- Those with hemolytic diseases.

4. Gallstone dyspepsia

5. Gallbladder polyps.

OPEN CHOLECYSTECTOMY

Although laparoscopic techniques have largely superseded open cholecystectomy, there is still a role for open cholecystectomy in complicated cases of gallstone disease.

There are a number of clinical situations where if present difficulty might be encountered in laparoscopic approach and open cholecystectomy should be considered. Clinical conditions like for example morbid obesity, cirrhosis, previous surgery, portal hypertension, severe obstructive lung disease and pregnancy are factors for which laparoscopic cholecystectomy might be difficult and associated, with increased risk.

In addition, open cholecystectomy should preferred in patients with severe cholecystitis, acute cholangitis, gallbladder perforation, empyema of gallbladder or in suspected gallbladder neoplasm. Open cholecystectomy continues to be a perfectly acceptable method for cholecystectomy if circumstances like unavailability of facilities for laparoscopic surgery arises or if the surgeon is not adequately trained.

Operative technique:

Incision: Four incisions can be used for cholecystectomy:

1. A right subcostal incision gives the best exposure of the biliary tract.
2. A transverse incision gives a better cosmetic result at the expense of exposure.
3. A midline incision is useful when the diagnosis is not definite.
4. A right paramedian incision.

A mini-cholecystectomy is performed through a very short subcostal incision. Choice of incision depends partly on surgeons preference as well as patient factor like patients built and expected pathological condition.

Dissecting Calot's triangle

The operative field is properly exposed by retraction of the liver upwards using an appropriate retractor, the neck of the gallbladder is retracted anteriorly using a suitable forcep while the assistant retracts the colon and the duodenum inferiorly using a damp pack. Usingsharp dissection the

peritoneum over the neck of the gallbladder is incised and the contents of Calot's triangle displayed by a combination of blunt and sharp dissection.

The operation may be made easier by aspiration of the gallbladder contents if the gallbladder is tense and difficult to grasp. Positive identification of the cystic duct by meticulous dissection at its junction with the CBD and the cystic artery are absolutely crucial and reduces incidence of bile duct injuries significantly.

After identification of the cystic duct and the artery, these structures are ligated in continuity and divided . Adequate length of the cystic duct is left for easy cannulation if operative cholangiography is planned. Any stones present in the cystic duct are milked back into the gallbladder .The cystic duct is then ligated close to the gallbladder. Cholangiography if planned is to be performed at this stage.

Gallbladder dissection can begin from the fundus or in the cystic duct region. We should try our best to dissect as closely to the gallbladder wall as possible and proper use of diathermy to achieve adequate hemostasis. A drain can be placed at the gallbladder bed if required.

Complications:

1. Arterial hemorrhage during cholecystectomy from a torn cystic artery.
2. Pulmonary complications (most common).
3. Wound infections
4. Deep-vein thrombosis,
5. Cardiovascular problems

The mortality of open cholecystectomy is 1% and the morbidity about 5%.

OTHER PROCEDURES:

Fundus first cholecystectomy:

A fundus-first or retrogradecholecystectomy is performed when in doubt about the anatomy. Dissecting gall bladder wall down in this manner to the cystic duct can be helpful. As we proceed retrogradely and keeping close to the gallbladder wall, the cystic artery and cystic duct are eventually exposed making ligation of these structures much easier. Operative cholangiography is performed towards the end of the surgery.

Bleeding from the gallbladder bed can at times obscure the view of the Calot'striangle.

Mini cholecystectomy:

This procedure is performed via a subcostal incision not more than 5 cm over the right hypochondrium just above the gallbladder. The fundus is dissected out first. There is minimal postoperative pain and patients can be discharged early. Controlled trial have shown that the results of mini cholecystectomy are comparable to those of the laparoscopic operation.

Cholecystostomy:

For patients who develop complications of acute cholecystitis drainage procedure is required. Ultrasound guided percutaneous drainage using a pigtail catheter is the procedure of choice. This allows the inflammation to settle down and laparoscopic cholecystectomy is planned for a later date.

Partial cholecystectomy:

Sometimes a partial cholecystectomy is required if it becomes obvious that it is too dangerous to remove the entire gallbladder. It is then wiser to excise a part or as much of the gallbladder as possible and to remove any remaining stones in the lumen. The gallbladder lumen is then

closed with a suture and a drain is left in place. If necessary a further operation may be planned later to remove the residual gallbladder, usually with some difficulty when the acute inflammation has subsided.

LAPAROSCOPIC CHOLECYCTECTOMY

Indications:

The indications for laparoscopic cholecystectomy is the same as for open procedure.

Contra-indications:

1. Patients unfit for general anesthesia.

2. Uncorrectable coagulopathy.

3. Significant portal hypertension.

4.. Surgeon inexperienced in laparoscopic surgery.

5. Patients with proven or suspected gallbladder malignancy.

Patients likely to require conversion:

It is better to identify conditions in which the surgeon should expect a difficult laparoscopic procedure and therefore should have a low threshold for conversion to open surgery. It is very important that the surgeon should realize when he or she has reached their limit of expertise and recognize early on the proper time to convert from laparoscopic cholecystectomy to an open cholecystectomy.

1. Acute severe cholecystitis- difficult dissection due to inflammation and adhesion.
2. Multiple prior operations- difficulty in safe access to peritoneal cavity.
3. Abnormal anatomy - higher likelihood of biliary/ vascular injury.
4. Acute pancreatitis - difficult visualisation due to edematous pancreatic head
5. Third trimester pregnancy - higher chance of uterine injury during access.
6. Cirrhotic liver - higher likelihood of liver injury and hemorrhage.
7. Evidence of generalized peritonitis.

8. Morbid obesity - Difficulty in access and dissection.

9. Septic shock from cholangitis.

Pre-operative Work-up:

1. Routine blood investigations, including liver function tests.

2. Ultrasonography / CT scan of the abdomen.

3. Upper GI endoscopy - to rule out acid peptic disease or hiatus hernia.

4. DVT prophylaxis in patients with high risk.

Disadvantage of laparoscopic cholecystectomy:

1. The incidence of bile duct injuries is higher as compared to open procedure.

2. The operating time is increased as compared to open method.

Advantages:

1. Postoperative pain is less.

2. Hospital stay is shorter.

3. Post-operative pulmonary function was less impaired after laparoscopic procedure than after open procedure.
4. Laparoscopic cholecystectomy has a lower risk of surgical site infection than open procedure

Anaesthesia

General anesthesia is the anaesthetic method of choice for patients undergoing laparoscopic surgical procedures. Two advantages of general anesthesia are:-

1. There is complete control of the patient'sventilation, which due to increased diaphragmatic pressure from the pneumoperitoneumand systemic absorption of CO2 and can be compromised

2. It also enables complete abdominal wall relaxation necessary for maintaining adequate pneumoperitoneum.

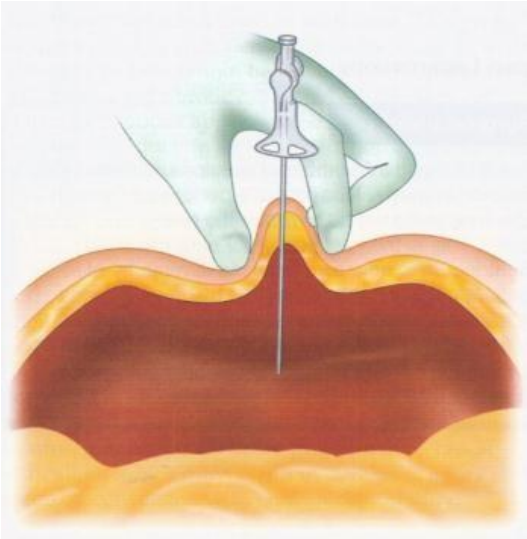
Technique:

1. Pneumoperitoneum and port placement:

In the absence of operative scar, periumbilical site which is thinnest site is the most preferred site for insertion of Veress needle. Using a number 15 or 11 knife either a transverse or vertical stab is made. Using the right hand the shaft of the Veress needle is held tightly, keeping

adequate length of the distal needle tip just adequate to traverse the entire thickness of the abdominal wall.

Using the left hand the abdominal wall is lifted midway between the pubic symphysis and umbilicus. TheVeress needle is inserted through the abdominal wall either at a 45 degree caudal angle to the abdominal wall (in minimally obese patient) or perpendicular to the abdominal wall (in markedly obese patients).



Veress needle insertion

Several maneuvers should be performed to confirm the intra-peritoneal position of the needle. First, to demonstrate the absence of return of blood or bowel contents the needle is aspirated and irrigated. Second, a saline drop test is performed to demonstrate to free flow of the liquid by gravity into the peritoneal cavity . Here the needle is filled with saline and

the negative pressure generated by lifting the abdominal wall causes the saline to flow down freely.

Finally, the needle is moved back and forth, to indicate that its tip moves freely within the peritoneal cavity. The insufflators is connected to the needle and the CO2 is instilled at a rate of 1 L/min and its initial pressure recorded on the insufflator should be less than 10 mmHg. If the initial pressure is 10 mmHg or higher it indicates that needle may be placed in the preperitoneal or other closed space. After insufflating approx 1L of CO2,there should be increased tympany in all the four quadrants of the abdomen and it should be confirmed. The maximum flow rate through a small caliber Veress needle is around 2.5 L/min. Once the intra-abdominal pressure of 15mmHg has been achieved,we remove the Veress needle , and insert the trocar through the same site.

The trocar is firmly held in the palm of the dominant hand and inserted using gentle but firm pressure while elevating the abdominal wall with the other hand. Once the port is inserted, the inner trocar can be removed, leaving the outer cannula and sheath in place. The stopcock or flapper valve on the port is opened to allow passage of the CO2 after connecting the insufflation line to the sheath. We then insert the video telescope and a general inspection of the peritoneal cavity is done,

including underlying visceral organs and retroperitoneum, to assess for visceral injury.

Under direct vision the remaining three trocars are inserted. The 10mm epigastric port is inserted in the midline just below the costal margin or the liver edge. The trocar is thrust in a rotatory movement this enables it to pierce the fascia and reaches the pre-peritoneal space. Then, we turn the trocar right so that it enters the peritoneum just at the base of the falciform ligament.

Two purposes are serve by this maneuver:

1. The trocar avoids vessel injury which sometimes may run in the free edge of the falciform ligament.
2. The instruments through this port does not suffer interference from the falciform ligament hanging in front of them.

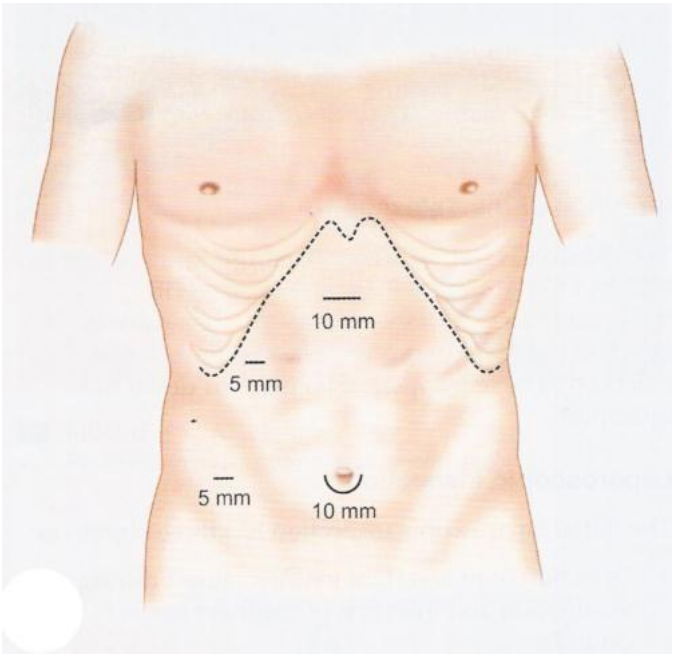
The 5mm mid-clavicular port is introduced at the same level right over the fundus of the gallbladder.

The lateral most 5mm port is also introduced at the same level as the previous port just anterior to the lateral peritoneal attachment of ascending colon or right iliac fossa.

Additional ports may be placed if required and they are as follows:

1. Left lumbar 5 or 10 mm port for three prong or flat blade retractor. This enables downward traction of the colon, omentum and duodenum and gives wide exposure of the hilum.

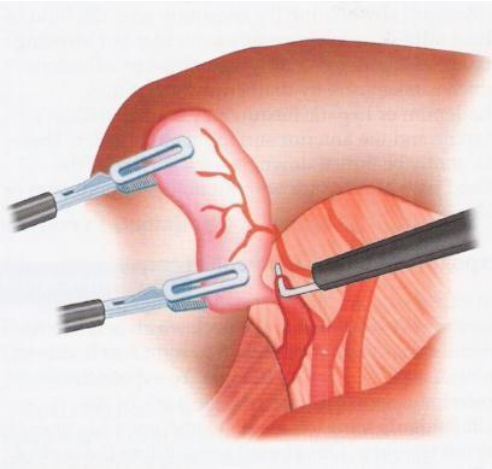
2. 5 mm port midway between right mid-clavicular and epigastric ports for lifting the quadrate lobe of the liver using a blunt tipped retractor, in cases like left lobe gallbladder, cirrhosis of the liver.



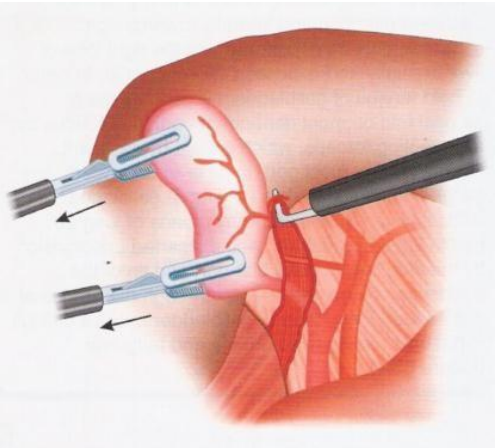
Port position for laparoscopic cholecystectomy

2. Initial dissection:

The fundus of the gallbladder is held upwards with a ratcheted grasper and retracted cranially by an assistant. This exposes the Calot's triangle and and hilum of the liver by lifting the right lobe of the liver. Adhesions between liver and gallbladder are released carefully beginning near the hilus and proceeding downwards to the neck. Adhesions must be dissected with care as they may contain omentum or other visceral organ like colon, stomach, and duodenum.



Dissection of cystic duct

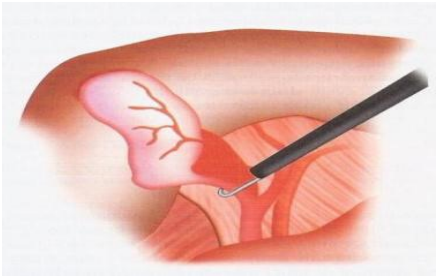


Dissection of cystic artery

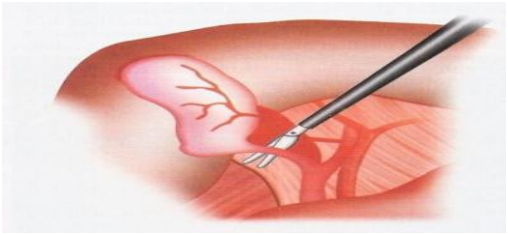
3. Dissection of The Calot's Triangle (cholecystohepatic triangle):

A dolphin-nosed atraumatic non-locking grasper is introduced through the left hand working port. We then hold the infundibulum of the gallbladder and retract it downwards and to the right. This maneuver enables the hepatocystic triangle to be widened and opened up allowing visualization of the structures within it. The anterior aspect of the Calot's triangle is exposed by retracting the infundibular grasper laterally. The posterior aspect of the Calot's triangle is exposed by retracting the infundibular grasper anteromedially.

The dissection starts at the infundibulum of the gallbladder and using a Maryland'sforceps introduced through the epigastric port we proceed towards the calot's triangle , dissecting free the peritoneum on the anterior and posterior surface of the gallbladder and calot's triangle by a combination of cautery and blunt dissection (Flag technique). The Calot's triangle is thus exposed.



Dissection of cystic pedicle



Dissection of cystic duct by blunt dissection

4. Identification of the cystic duct and artery:

This is the most critical step of the operation - identifying the cystic duct and artery. Two methods have been described for ductal identification in laparoscopic cholecystectomy.

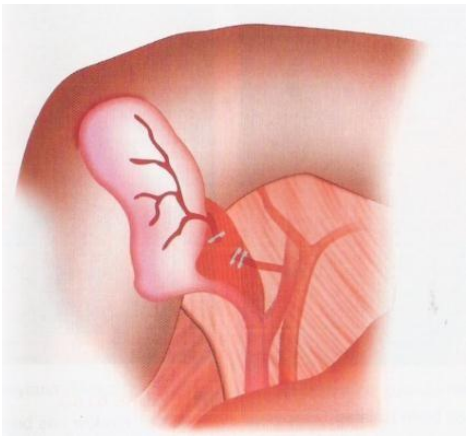
The first method is known as the "infundibular" or "infundibular cystic" technique. Here the cystic duct is isolated by dissecting the front and back of the triangle and once isolated it is traced on to the gallbladder. The infundibular method is the standard technique found in texts describing laparoscopic cholecystectomy. The second method is the "critical view of safety" technique described in 1995.

This method requires complete dissection of the calot's triangle and also separation of the base of the gallbladder infundibulum from the liver bed. Except for cystic duct and artery the calot's triangle is dissected free of all tissue. The base of the liver bed is left exposed. When this view is achieved, only two structures are seen entering the gallbladder and that can only be the cystic duct and artery. It is not necessarily required to see the common bile duct.

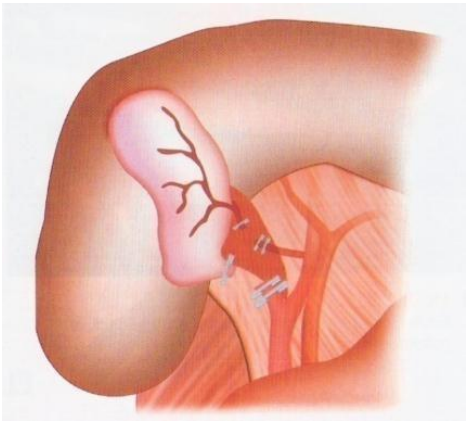
The cystic duct is identified at the safety zone i.e the junction of the cystic duct with the gallbladder. The danger zone is the cystic-common duct junction which is not always necessary to identify.

Using curved dissector within the cystic triangle and avoiding any potential avulsion of the cystic artery, it is identified along with its anterior and posterior branches by blunt dissection. The cystic node of Lund can sometime be found overlying the cystic artery. Cautious attention must be made to identify any vascular or biliary tree anomalies. We then ligate and divide the main trunk of the cystic artery. Widely placed anterior and posterior branches are clipped individually and divided. We should avoid blind application of clips within the Calot's triangle .

The cystic duct and the cystic artery are both clipped, two clips are placed on the cystic duct side and one clip placed on the gallbladder side. In a few situations the duct needs to be divided first to expose cystic artery, even though it is more desirable to divide the artery before the duct. Excessive traction to the cystic artery should be avoided till the cystic artery is clipped and divided.



Clipping of cystic artery



Clipping of cystic duct

5. Detachment of the gallbladder from the liver:

Care should be taken while dissecting the gallbladder from the liver bed to stay away from the porta hepatis and to avoid perforating the gallbladder. The gallbladder is elevated with the help of the infundibular grasper and is twisted alternately to the right and left. A hook cautery can be very useful for this stage of the operation. Depending on the surgeons experience a variety of instruments can be used to detach the gallbladder from the liver bed. Prior to complete gallbladder detachment, the liver bed should be inspected for adequate hemostasis or bile leak.

Dissection of gallbladder from its bed

6. Extraction of the gallbladder:

The extraction of the gallbladder can be done through the epigastric port or the umbilical port. The neck of the gallbladder can be grasped using a

claw shaped gallbladder extraction forceps and extracted through the skin opening. If the gallbladder is too distended, the neck can be opened and gall bladder contents suctioned out. Using a sponge holder the stones are debulked through fragmentation. If the gallbladder is too thick preventing its extraction , the fascial incision is extended to facilitate its removal.

7. **Final inspection and irrigation:**

After the extraction of the gallbladder, the epigastric port is replaced and the peritoneal cavity is inspected for bleeding. A thorough wash of the gallbladder bed is given. Morrison'spouch, peri hepatic areas and paracolic gutter are washed with saline which is meticulously suctioned out.

8. **Drainage and Closure:**

A drain is placed if it is needed through the lateral-most port. A size 14F Romovac tube is usually sufficient. If a larger drain is needed, it should be placed through the epigastric port inside the peritoneal cavity and brought out through the lateral-most port in a reverse fashion by a grasper.

Trocars are removed under direct vision to see if there is any bleeding from the trocar sites. Pneumoperitoneum is evacuated. The fascia

or rectus of the 10 mm ports is closed with either vicryl sutures or prolene using port closure needle. Skin closure is enough for the 5mm ports .

COMPLICATIONS:

Trocar injuries:

It is frequently associated with creation of initial pneumoperitoneum. These include pneumoomentum, pneumothorox , subcutaneous emphysema, bleeding from abdominal wall or omentum, , solid visceral injury (Spleen or liver) , gastrointestinal tract perforation and cardiac arrhythmias.

Bleeding:

Injury to a major vessel during trocar insertion like hepatic artery are the main causes of severe hemorrhage . Another cause of substantial bleeding is avulsion of cystic artery . According to a study by Ponsky JL in 1990 the incidence of bleeding was 0.2% due to injury of the cystic artery and its branches.

Injury to bile ducts:

This is the single most important complication in laparoscopic and open cholecystectomy. This complication arises usually due to improper

use of cautery during dissection, misidentification of cystic duct and failure to recognize the presence of aberrant ducts.

Stone and Bile spillage:

This rarely leads to post-operative complications as bile is usually sterile. As long as it is removed by suction and irrigation it poses no major problems.

CONVERSION FROM LAPAROSCOPIC TO OPEN PROCEDURE:

According to literature it has been reported that conversion rates of 2.6% to 14% had been described . With the experience and improved laparoscopic techniques the conversion rate has come down to 1-6% a remarkably low level.

Peters identified the following reasons for the conversion of LC to OC:

1) Difficult in dissection due to dense adhesions,
2) Severe inflammation encountered,
3) Obscure anatomy and retraction difficulty,

4) Common bile duct (CBD) problems like variation in anatomy and also includes abnormal laparoscopic intra-operative cholangiography (IOC),
5) A Failed attempt at laparoscopic CBD exploration
6) A Failed attempt at IOC,
7) Complications which includes bleeding due to injury to nearby adjacent structures,
8) Cystic duct avulsion
9) Respiratory acidosis
10) Miscellaneous factors

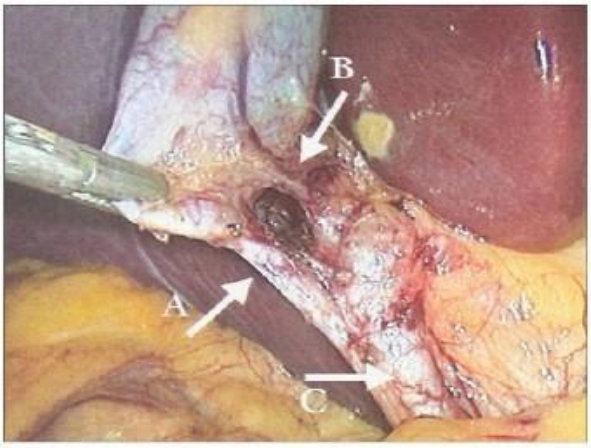
The demography of the patient, the level of experience of the surgeon, the spectrum of disease and associated pathology and technical factors all play a role in the decision to convert.

Performing the saline test

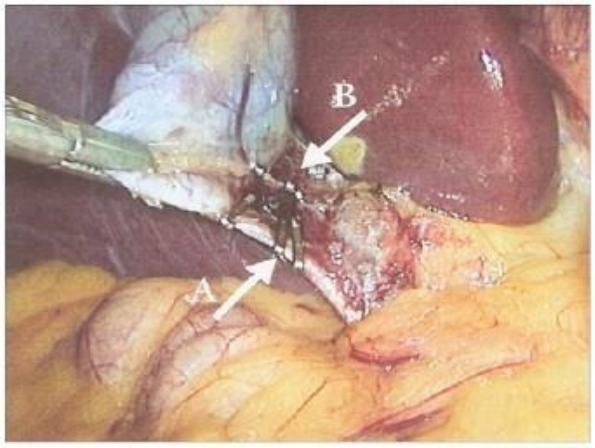
Obliteration of liver dullness

Insertion of the trocar in the umbilicus

Placement of right subcostal trocar

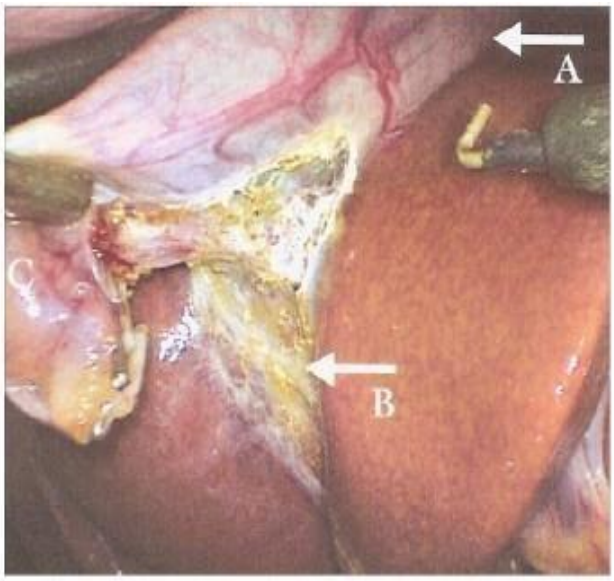


Dissection of the
cholecystohepatic triangle

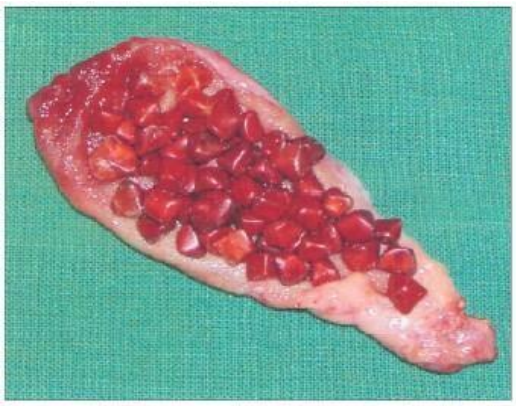


Clipped cystic artery and duct

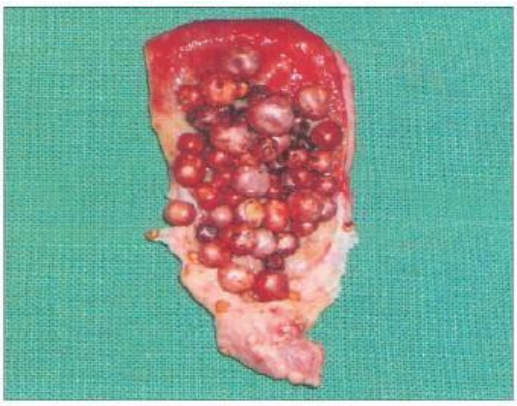
Division of cystic artery and duct



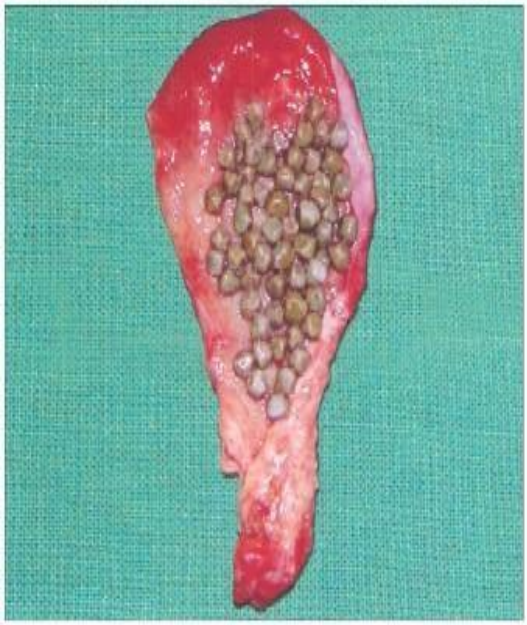
Separation of gall bladder
from the liver bed



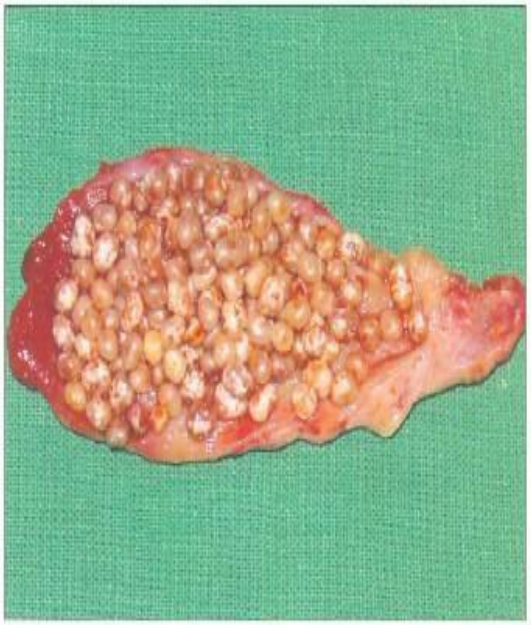
Multi faceted stones



Mixed stones



Pigment stones



Cholesterol stones

METHODOLOGY

Materials and Methods of data collection:

All patients admitted in Thanjavur Medical College Hospital. A total of 75patients presenting with symptomatic gall stone disease without choledocholithiasis between December 2017 and October 2019 were included in the study. Every patient included in the study was subjected to the following assessments which were regarded as risk factors for laparoscopic cholecystectomy:

1. Patients characteristics
2. Complaints
3. History
4. Clinical examination
5. Radiological investigations
6. Laboratory data
7. Operative findings.

Inclusion Criteria:

patients above the age of 18-70 years

- Adults with Sypmtomatic Cholelithiasis
- Adults with calculous Cholecystitis

Exclusion Criteria:

- Age < 18 years
- Gall Bladder Malignancy
- Adults with choledocholithiasis
- Perforated Gallbladder
- Patients unfit for General anesthesia

A general bio-data of the patients regarding their name, age, sex, occupation, religion, socioeconomic status and address were collected. Detailed history was taken with special reference to the duration of right upper quadrant pain or epigastric pain, periodicity, any aggravation by fatty meals and any relief by parenteral or oral analgesics.

Any significant past history was also taken into account. A routine general physical, abdominal and systemic examination was performed.

Pre-operative work up included routine lab investigations like complete blood count, renal function test, liver function tests, hepatitis profile, Chest-X-Ray and ultrasound of abdomen.Ultrasonogram of the abdomen was routinely done on all the patients to confirm the clinical diagnosis of cholelithiasis. The number and size of the calculus , as well as size of the gallbladder, its wall thickness and CBD calculi or CBD dilatation.

A routine pre-anaesthetic checkup was done for all patients. A fully explained well informed consent was taken from all patients undergoing surgery and with explanation of risk of conversion to open cholecystectomy. We also placed nasogastric tube in all patients for gastric decompression to prevent trocar injury. All cases received prophylactic pre-op antibiotics (Inj. Cefotaxime 1gm IV).The procedure was performed by different senior and junior surgeons. Standard four port technique was performed in the operation, using carbon dioxide insufflation. The Veress technique was used to obtain pneumoperitoneum. During surgery the cystic artery and cystic duct were skeletinized and clamped separately with metallic clips. Some cases a suction drain was placed. All patients were started on oral liquids and then solid diet from 3rd day after surgery,provided the patient had no nausea and vomiting.

OBSERVATION AND RESULTS

Statistical analysis and discussion

Data were entered in the excel spread sheet and variables were coded accordingly. The statistical analyses were performed using Graph pad Prism version 5 software. Data were presented as mean with Standard deviation for normal distribution/scale data. Data were presented as frequency with proportion n(%) for categorical data. Fisher's exact test was used to compare the frequencies between the groups. Unpaired 't' test was used to compare the means between the groups. $p<0.05$ were considered statistically significant.

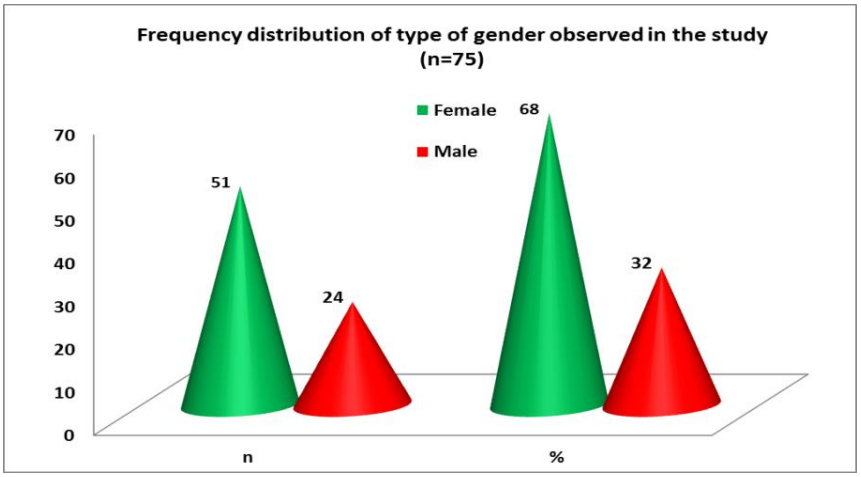
GENDER DISTRIBUTION:

Table 1.Frequency distribution of type of gender observed in the study.

S.No	Gender	N	%
1	Female	51	68
2	Male	24	32

Data are expressed as n with %. The total N=75

In 75 cases,51 were females and 24 were males.The ratio of females to males 2:1.The data given above shows that gall bladder diseases have a higher incidence in female than male.



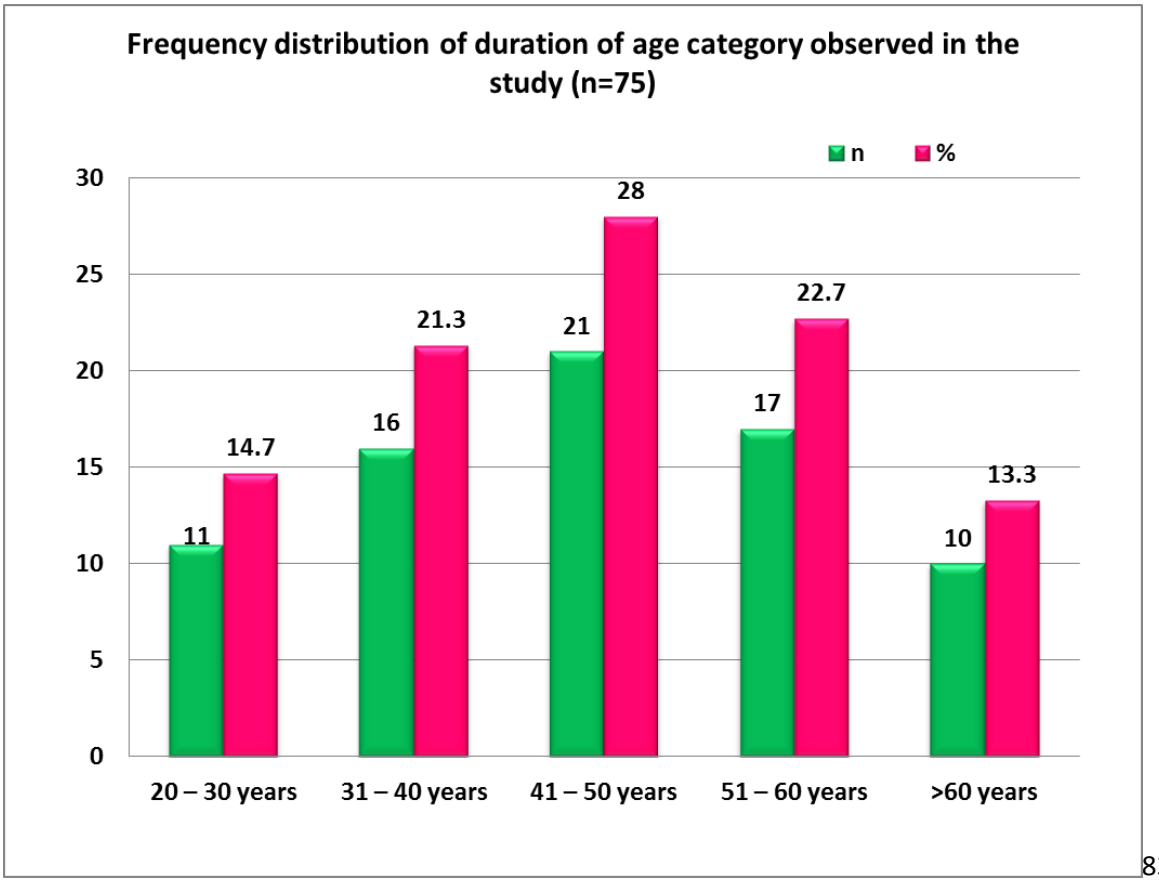
AGE DISTRIBUTION:

Table 2.Frequency distribution of duration of age category observed in the study.

S.No	Age category	n	%
1	20 – 30 years	11	14.7
2	31 – 40 years	16	21.3
3	41 – 50 years	21	28
4	51 – 60 years	17	22.7
5	>60 years	10	13.3

Data are expressed as n with %. The total N=75

The age group of the patients in this study ranged from 20 years to 70 years .The highest incidence is seen in the age group of 41-50 years.



CLINICAL PRESENTATION:

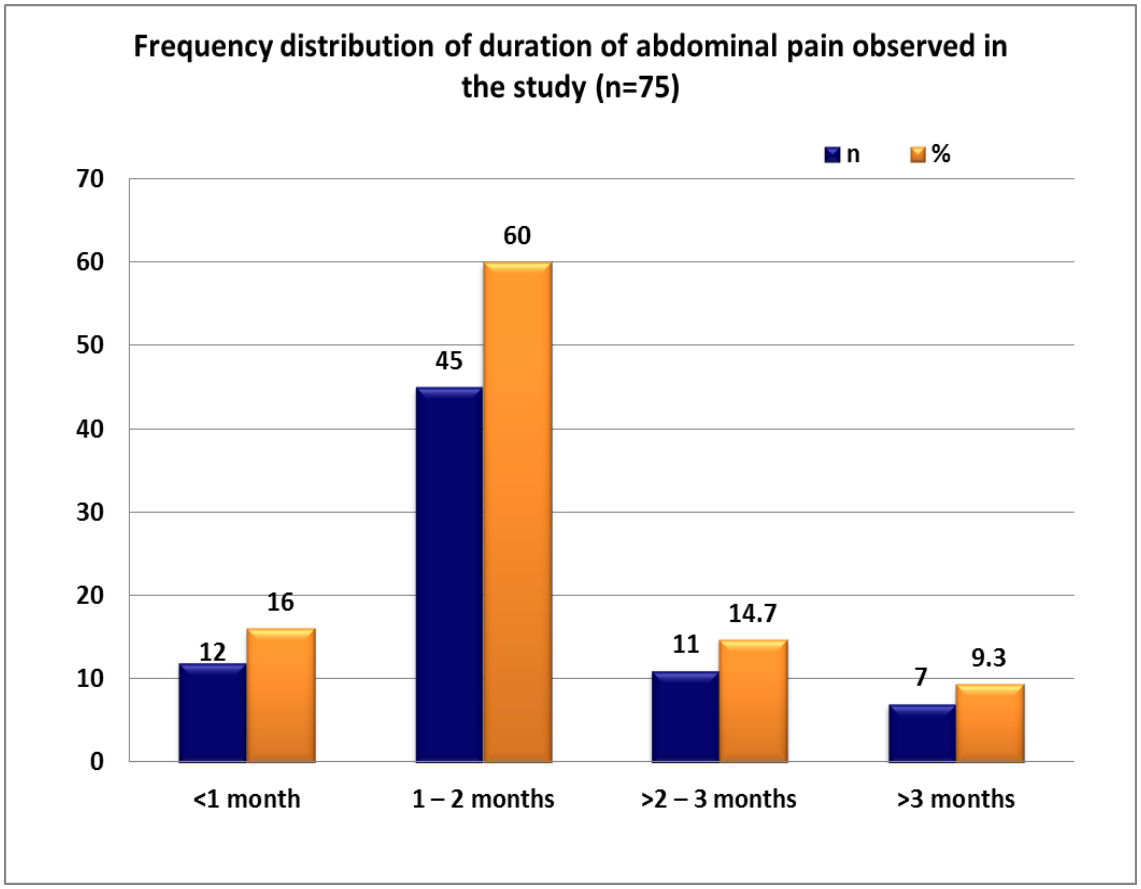
ABDOMINAL PAIN:

Table 3.Frequency distribution of duration of abdominal pain observed in the study.

S.No	Duration of abdominal pain	n	%
1	<1 month	12	16
2	1 – 2 months	45	60
3	>2 – 3 months	11	14.7
4	>3 months	7	9.3

Data are expressed as n with %. The total N=75

In our study group 60 % of the patient had abdominal pain for 1-2 months and 9.3% patient had abdominal pain for more than 3 months.



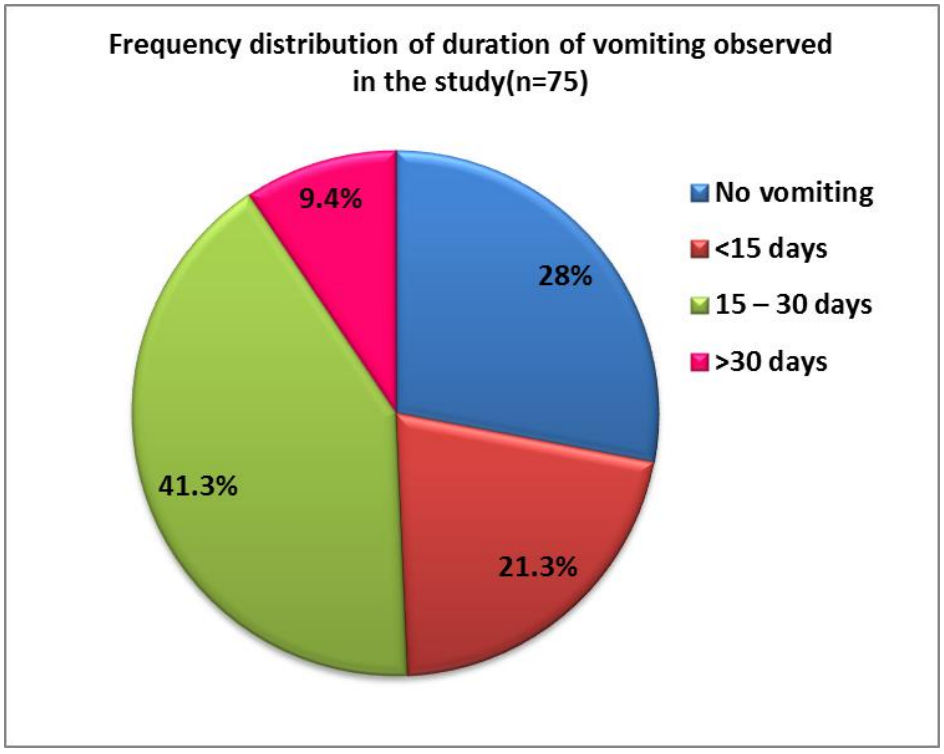
VOMITING:

Table 4. Frequency distribution of duration of vomiting observed in the study.

S.No	Duration of vomiting	n	%
1	No vomiting	21	28
2	<15 days	16	21.3
3	15 – 30 days	31	41.3
4	>30 days	7	9.4

Data are expressed as n with %. The total N=75

In our study group 41.3% of the patient had vomting for 15 -30 days and 9.4% patient had vomitng for more than 30 days.28% of the patient doesn't have vomiting.



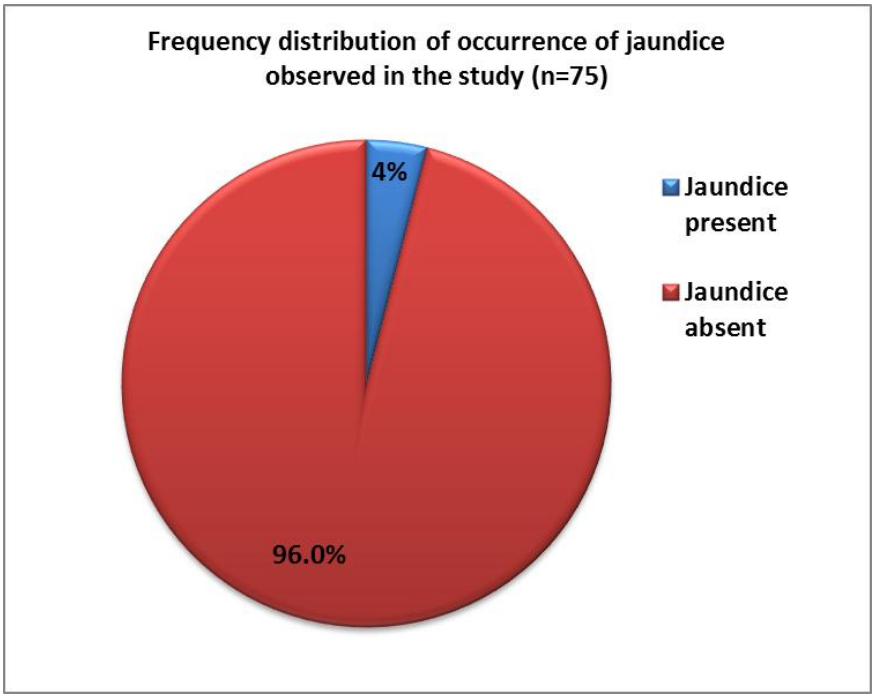
JAUNDICE:

Table 5.Frequency distribution of occurrence of jaundice observed in the study.

S.No	Jaundice as presenting symptom	n	%
1	Yes	3	4
2	No	72	96

Data are expressed as n with %. The total N=75

In our study group jaundice was seen in 3 patients.which is 3% of the total patients.



CO-MORBIDITIES:

Table 6.Frequency distribution of type of comorbidity observed in the study.

S.No	Comorbidity	n	%
1	CAD	1	1.3
2	Diabetes	4	5.3
3	Diabetes with CAD	1	1.3
4	Diabetes with HT	6	8
5	DM/HT/CAD	1	1.3
6	HT only	2	2.8
7	No comorbidity	60	80

Data are expressed as n with %. The total N=75

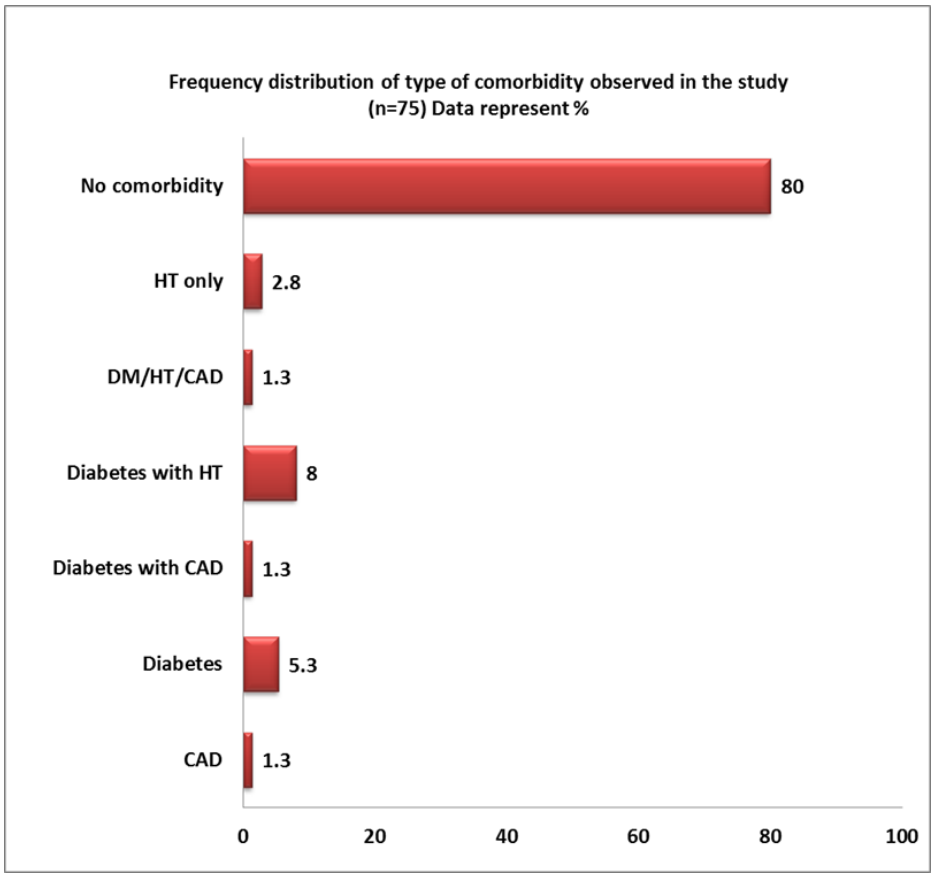
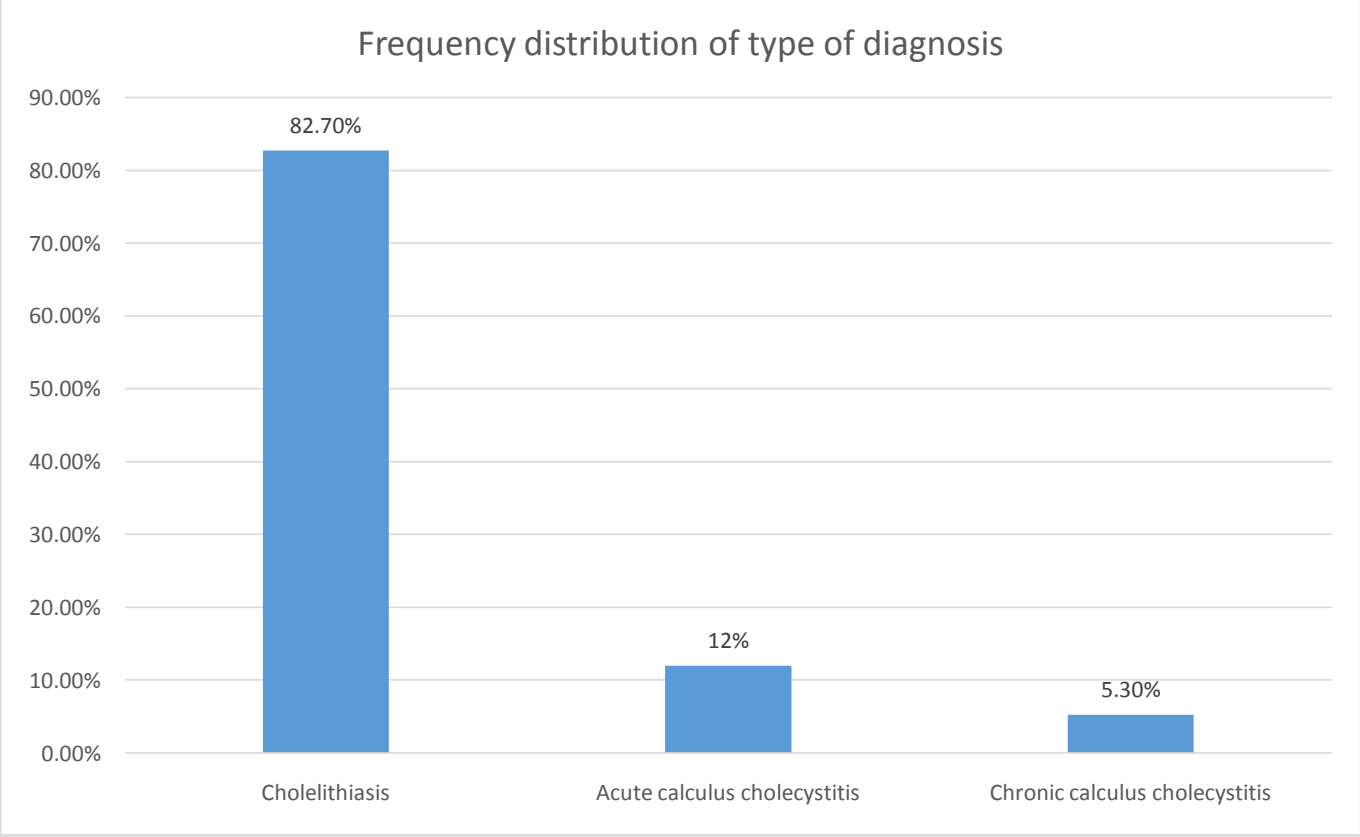


Table 7.Frequency distribution of type of diagnosis observed in the study.

S.No	Type of diagnosis	n	%
1	Cholelithiasis	62	82.7
2	Acute calculus cholecystitis	9	12
3	Chronic calculus cholecystitis	4	5.3

Data are expressed as n with %. The total N=75

In our study group 62(82.7%) patients diagnosed as cholelithiasis ,9(12%) patient diagnosed as acute calculus cholecystitis and 4(5.3) patients had chronic calculus cholecystitis

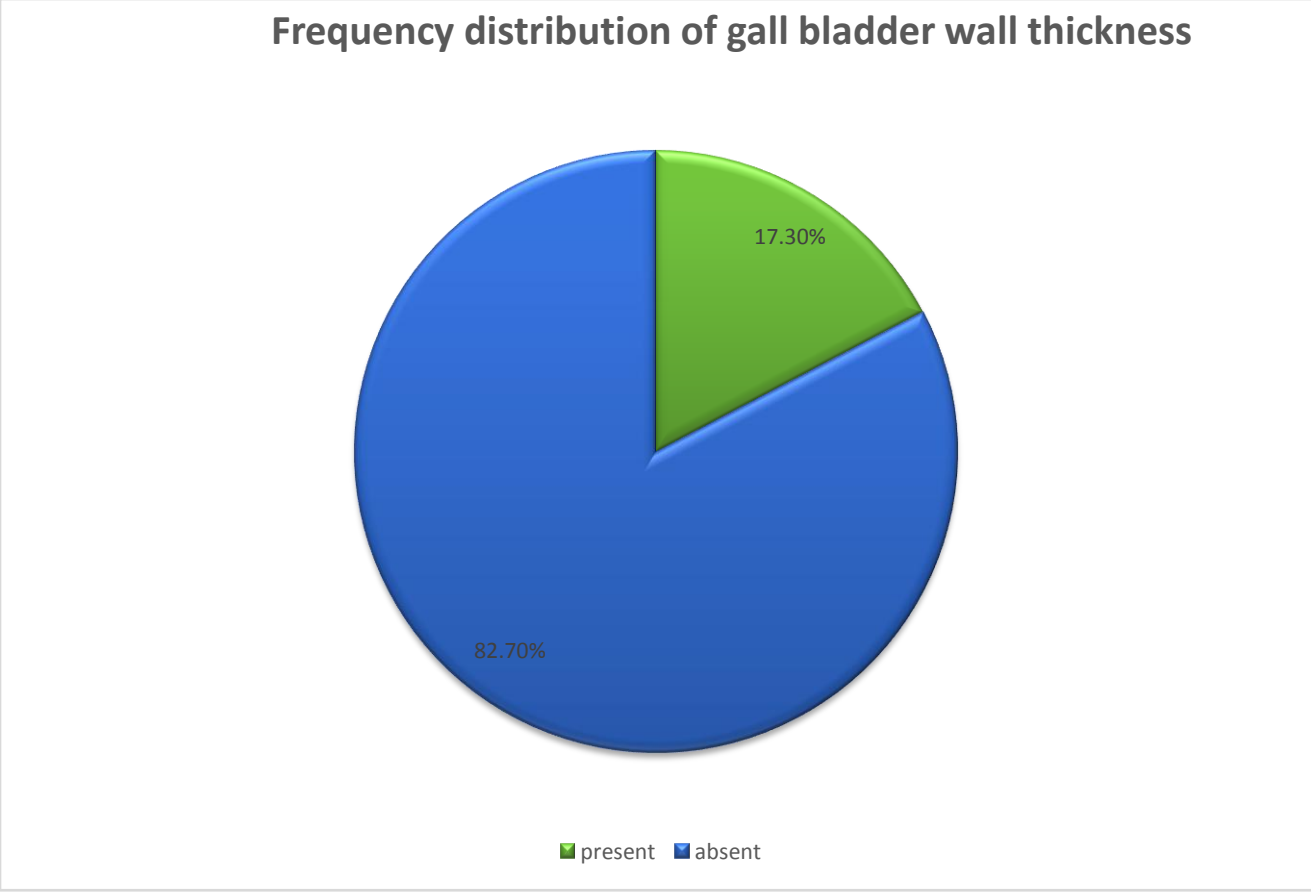


Gall bladder details

Table 8.Frequency distribution of gall bladder details observed in the study.

S.No	Gall bladder details	n	%
Gall bladder wall thickness			
1	Absent	62	82.7
2	Present	13	17.3
Gall bladder with			
1	Single stone	12	16
2	Multiple stones	63	84

Data are expressed as n with %. The total N=75



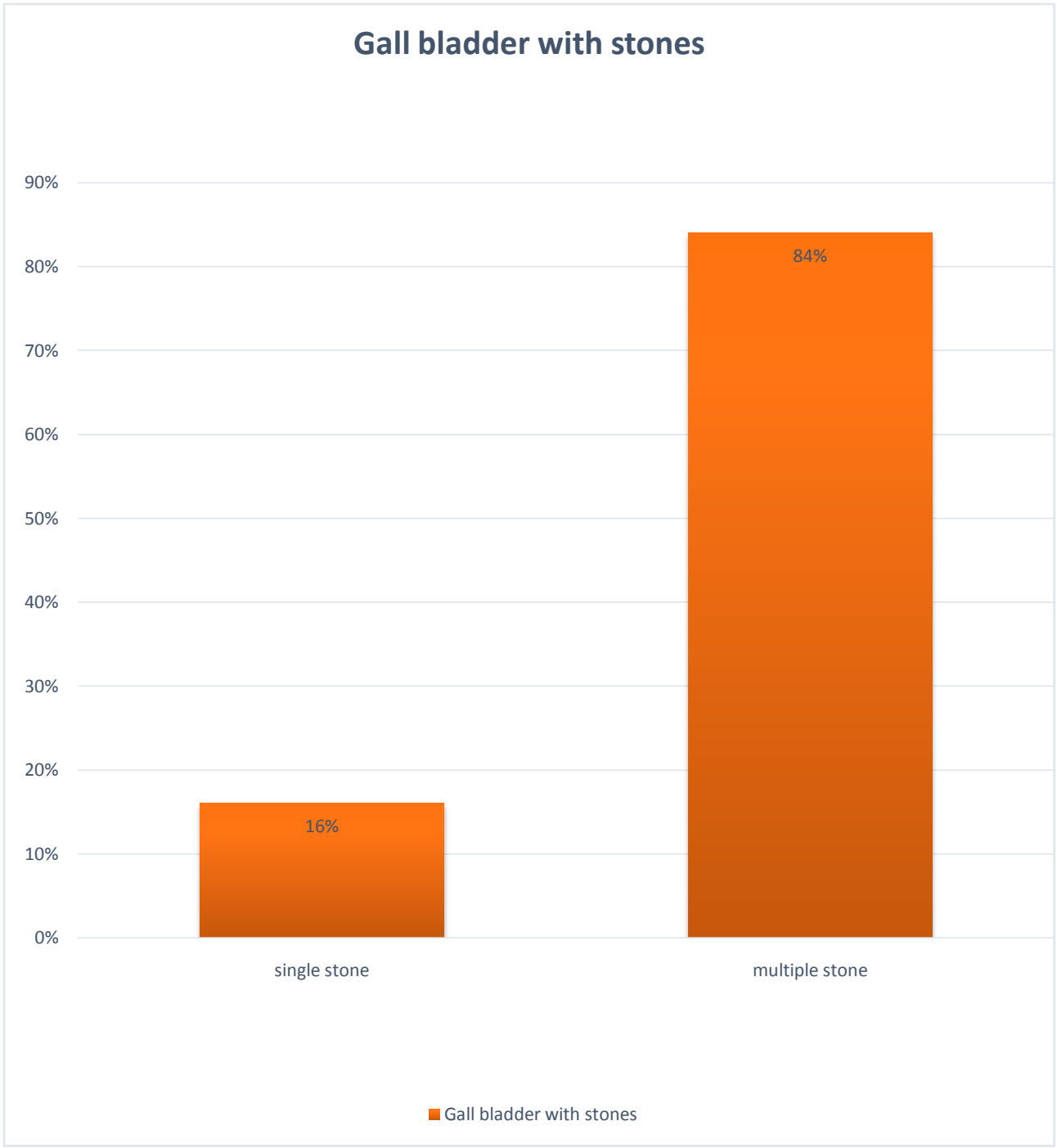

Gall bladder with stones
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
84%
16%
single stone
multiple stone
Gall bladder with stones

Table 9.Frequency distribution of type of intra-operative findings observed in the study.

S.No	Intra-operative findings	n	%
1	Bowel adhesion	3	4
2	Omental adhesion	11	14.6
3	Both bowel and omental adhesion	2	2.7
4	Omental adhesion with thickened GB	3	4
5	Structures well defined	56	74.6

Data are expressed as n with %. The total N=75

In our study 75 % of the patients had well defined structures,15% had omental adhesion and 4% with thickened gall bladder noted.4% of patients had bowel adhesions,3% of patients had both bowel and omental adhesion.

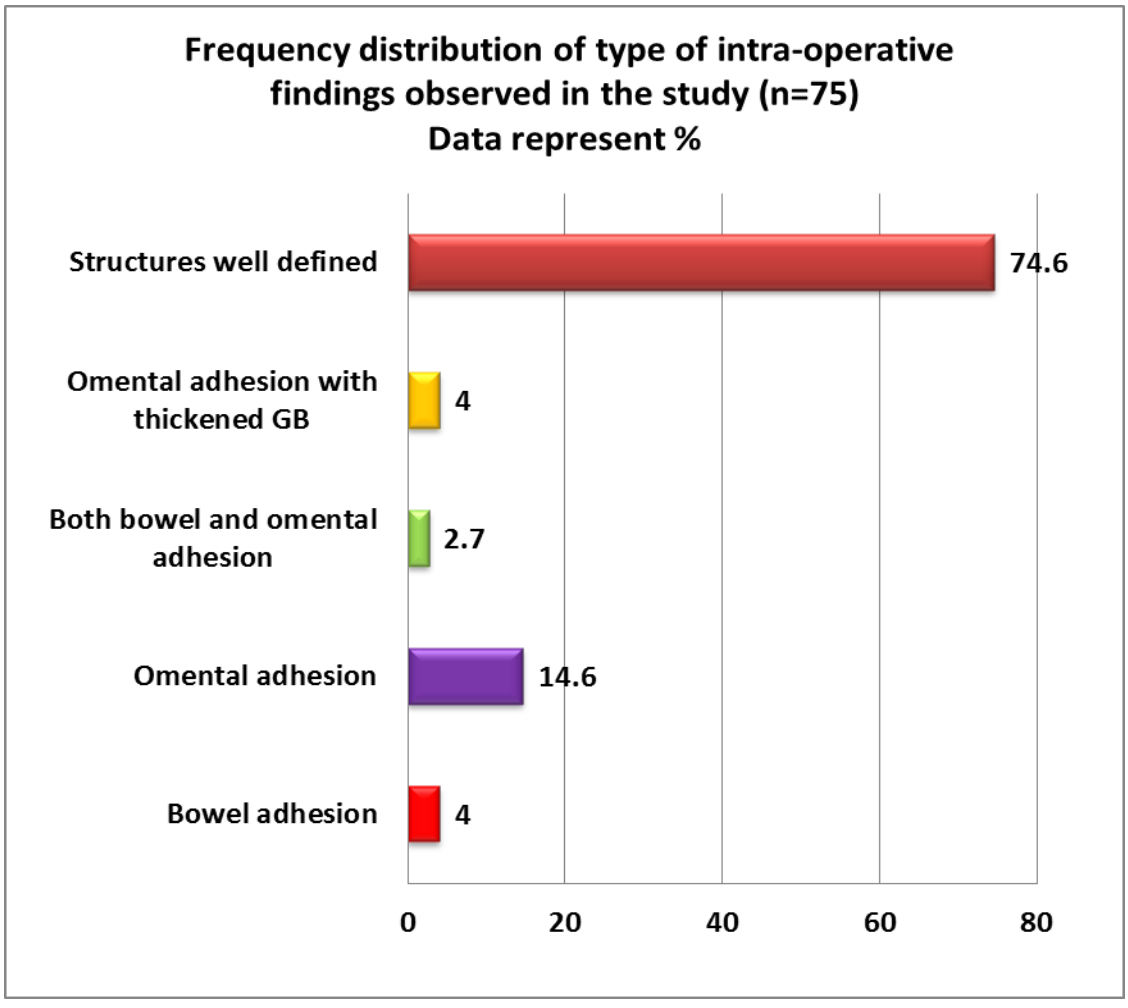


Table 10.Frequency distribution of conversion of laproscopic to open surgery in the study.

S.No	Conversion of surgical technique	n	%
1	No conversion	69	92
2	Conversion present	6	8

Data are expressed as n with %. The total N= 75

Out of 75 cases 6 cases converted to open cholecystectomy from laparoscopic cholecystectomy which accounts of about 8%.

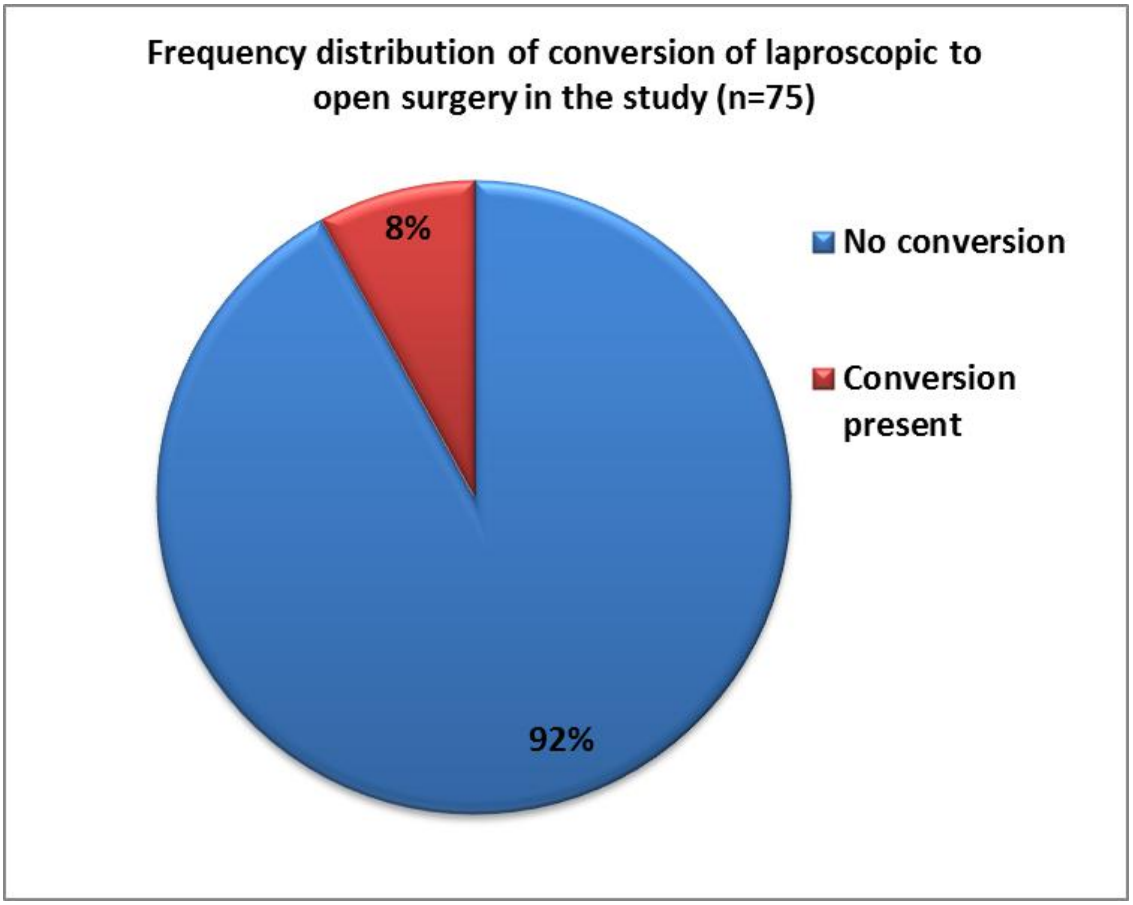


Table 11.Frequency distribution of reason for conversion of surgical procedure in the study.

S.No	Reason for conversion of surgical procedure	n	%
1	Common bile duct injury	1	16.7
2	Omental adhesion	5	83.3

Data are expressed as n with %. The total N= 6

The most common cause of conversion were omental adhesion (83.3%) and bile duct injury (16.7%)

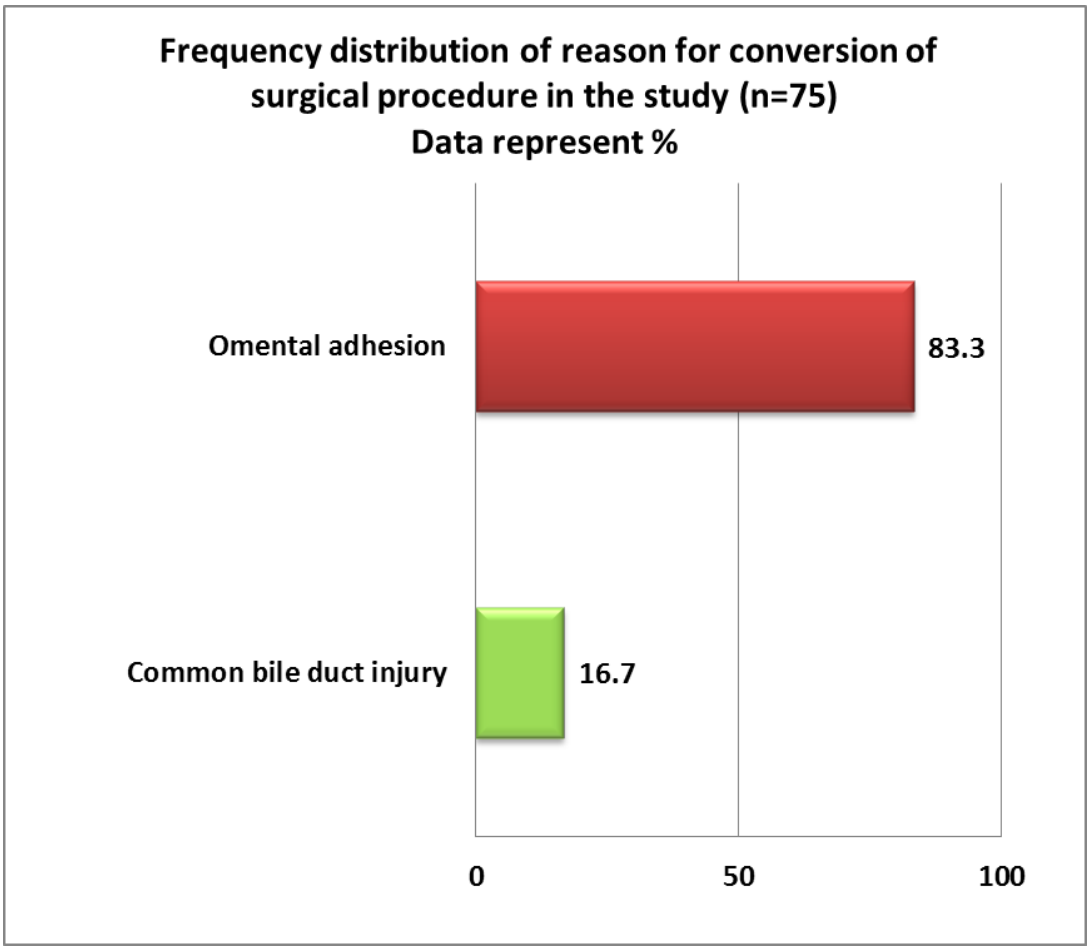


Table 12. Comparison of frequency distribution of gender with respect to the conversion status.

S.No	Gender	Conversion present (n=6)		Conversion absent (n=69)		Chi square value	df	P value
		n	%	n	%			
1	Female	2	33.3	49	71	3.602	1	0.057(NS)
2	Male	4	66.7	20	29			

Data are expressed as n with %. The total N= 75.. Fisher's exact test was done to compare the frequencies. NS = Not significant.

Table 13.Comparison of frequency distribution of duration of abdominal pain with respect to the conversion status.

S.No	Duration of abdominal pain	Conversion absent (n=69)		Conversion present (n=6)		Chi square value	df	P value
		n	%	n	%			
1	<1month	9	13	3	50	6.11	3	0.106(NS)
2	1 – 2 months	43	62.3	2	33.3			
3	>2 – 3 months	10	14.5	1	16.7			
4	>3 months	7	10.1	0	0			

Data are expressed as n with %. The total N= 75.. Fisher's exact test was done to compare the frequencies. NS = Not significant.

Table 14.Comparison of frequency distribution of intraoperative finding with respect to the conversion status.

S.No	Type of intra-operative findings	Conversion absent (n=69)		Conversion present (n=6)		Chi square value	df	P value
		n	%	n	%			
1	BA	3	4.3	0	0	43.7	4	<0.0001*
2	OA	9	13	2	33.3			
3	OA/BA	0	0	2	33.3			
4	OA/TG	1	1.4	2	33.3			
5	SW	56	81.2	0	0			

Data are expressed as n with %. The total N= 75.. Fisher's exact test was done to compare the frequencies. *indicates p<0.05 and considered statistically significant.

In my study omental adhesion was the single most common factor for conversion.

Table 15.Comparison of frequency distribution of type of diagnosis with respect to the conversion status.

Table 15.Comparison of frequency distribution of type of diagnosis with respect to the conversion status.

S.No	Type of diagnosis	Conversion absent (n=69)		Conversion present (n=6)		Chi square value	Df	P value
		n	%	n	%			
1	Acute calculus cholecystitis	6	8.7	3	50	27.6	3	0.0001*
2	Cholelithiasis	61	88.4	1	16.7			
3	Chronic calculus cholecystitis	2	2.9	2	33.3			

Data are expressed as n with %. The total N= 75.. Fisher's exact test was done to compare the frequencies. *indicates p<0.05 and considered statistically significant.

In my study acute calculus cholecystitis 3 patients (50%) were converted to open cholecystectomy from laparoscopic cholecystectomy.

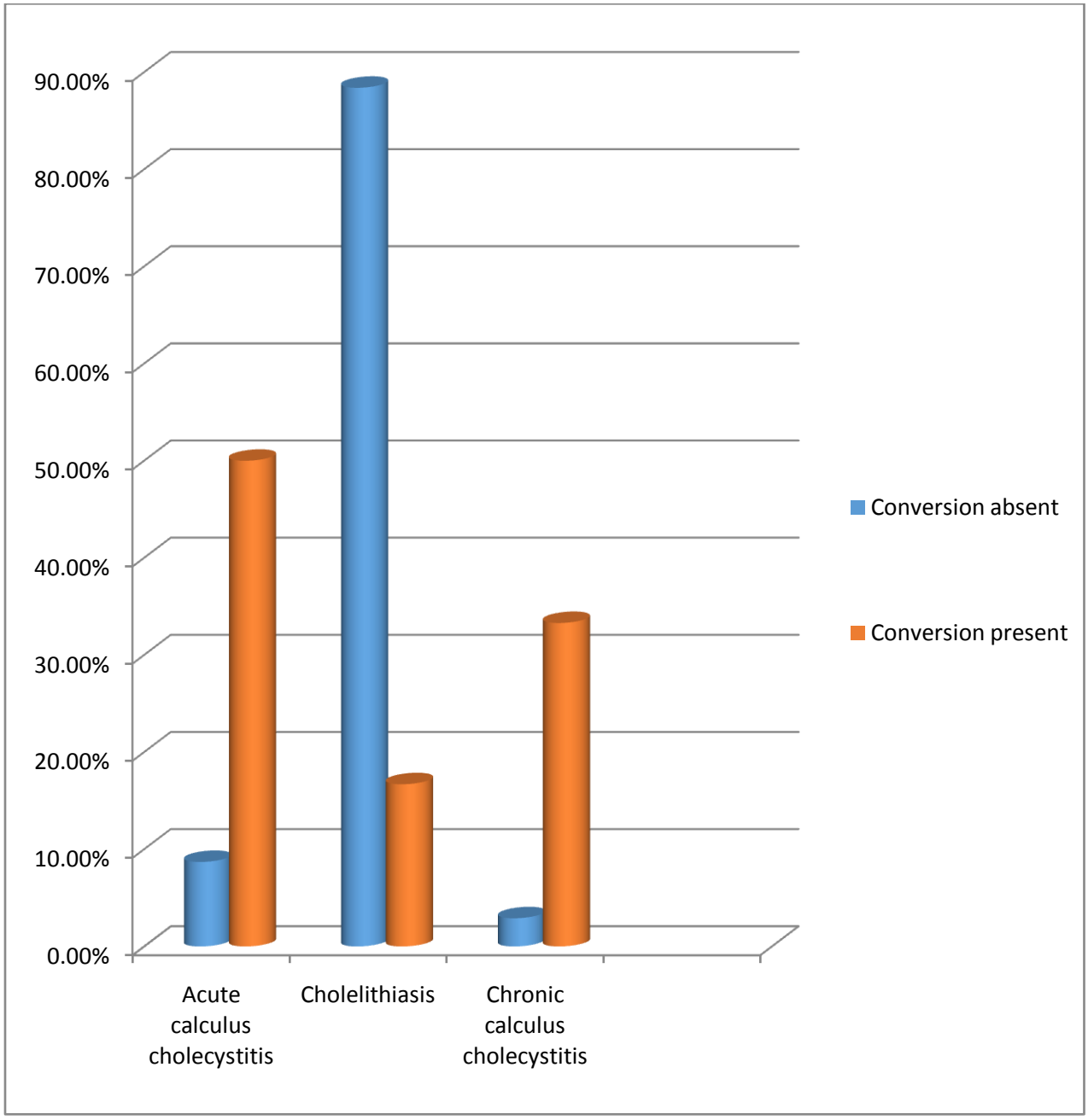


Table 15. Comparison of mean duration of surgery with respect to the conversion status in the study

S.No	Parameter	Conversion absent (n=69)		Conversion present (n=6)		t value	df	P value
		Mean	SD	Mean	SD			
1	Duration of surgery in minutes	100	17.4	125	25.1	3.25	73	0.002*

Data are expressed as n with %. The total N= 75. Unpaired 't' test was done to compare the mean values between the groups. *indicates $p<0.05$ and considered statistically significant

In our study converted cases had prolonged duration of surgery than laparoscopic cholecystectomy.

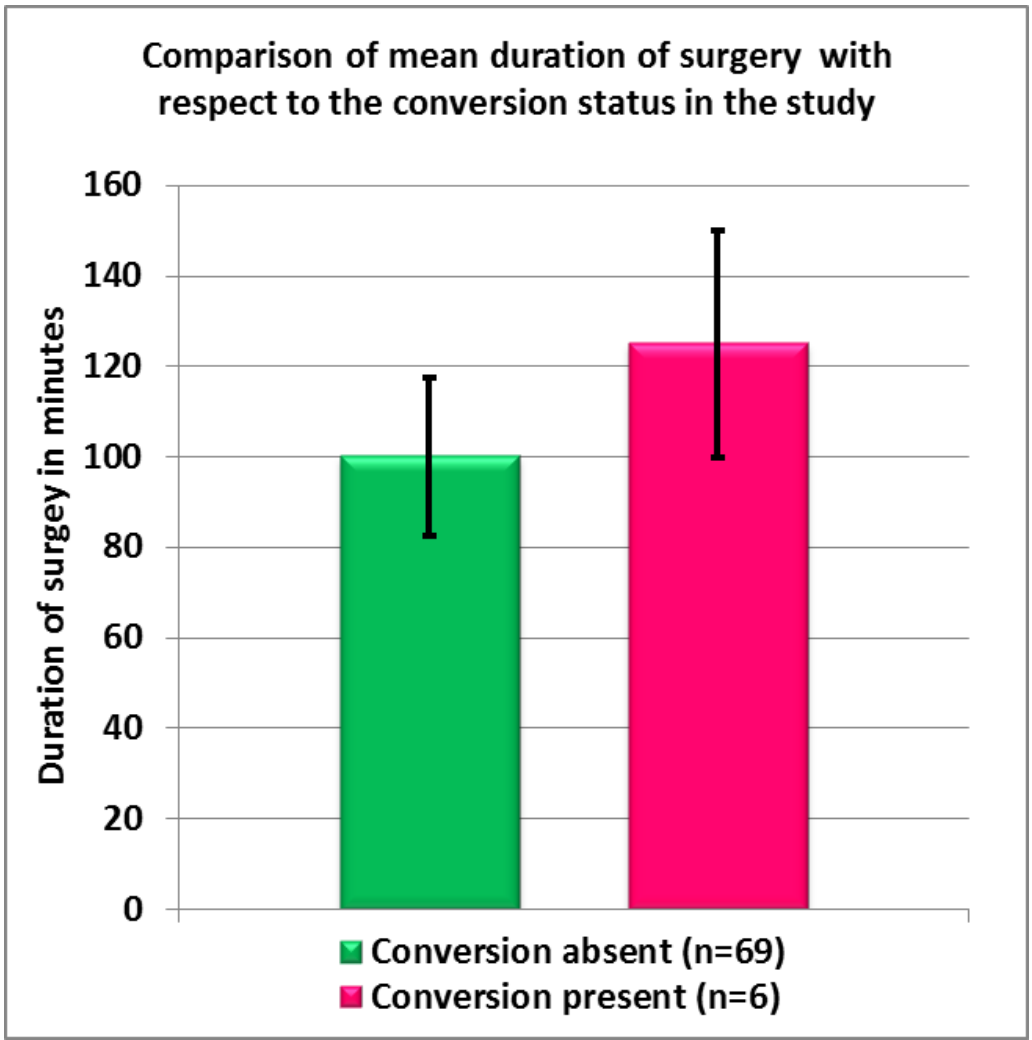


Table 16. Comparison of mean duration of hospital stay with respect to the conversion status in the study

S.No	Parameter	Conversion absent (n=69)		Conversion present (n=6)		t value	df	P value
		Mean	SD	Mean	SD			
1	Duration of hospital stay (days)	5.04	0.81	8.67	3.1	7.49	73	<0.0001*

Data are expressed as n with %. The total N= 75. Unpaired 't' test was done to compare the mean values between the groups. *indicates $p<0.05$ and considered statistically significant

The duration of hospital stay were more in converted cases.

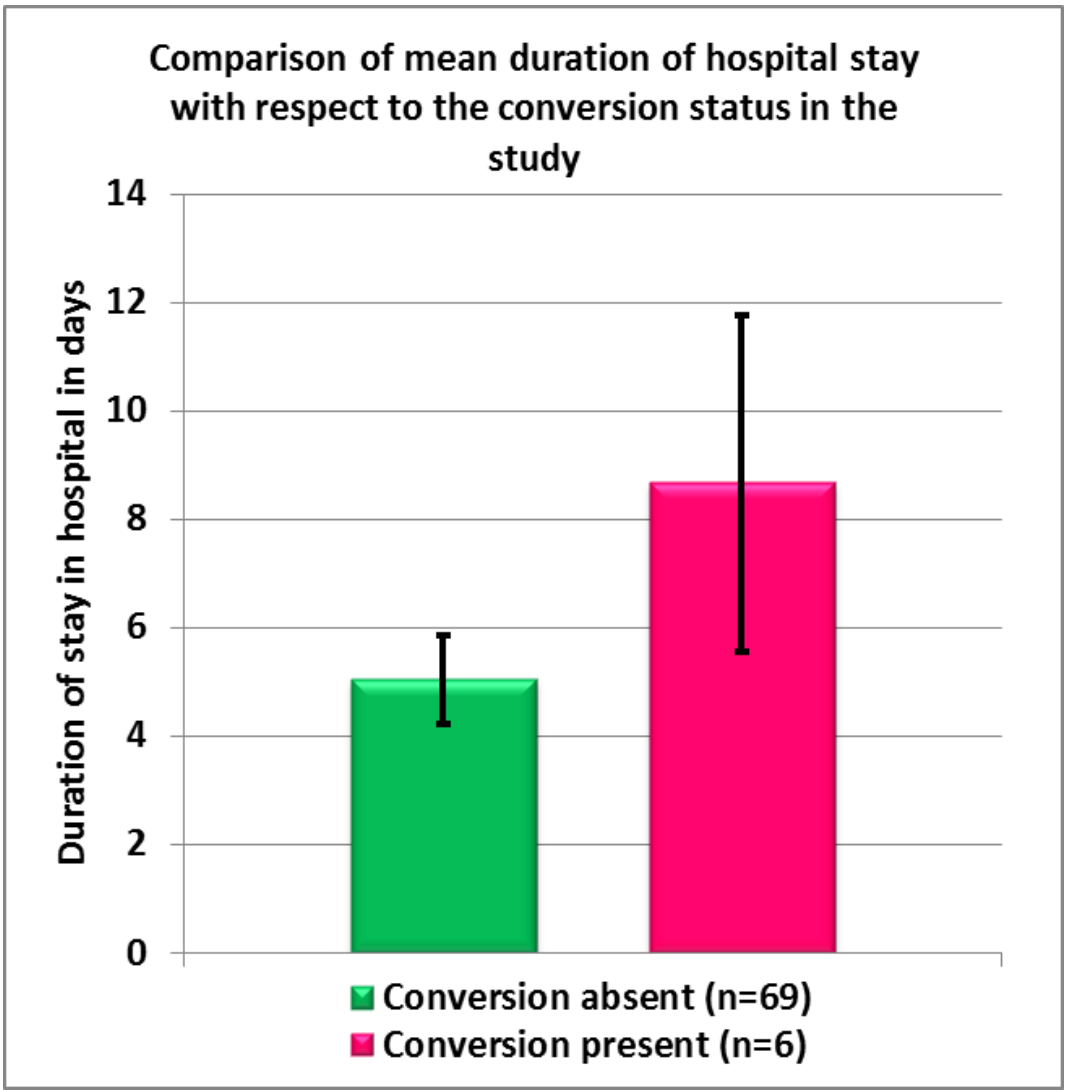


Table 17.Comparison of frequency distribution of stone quantities with respect to the conversion status.

S.No	Gall bladder Stone quantity	Conversion present (n=6)		Conversion absent (n=69)		Chi square value	df	P value
		n	%	n	%			
1	Multiple	5	66.7	59	85.5	1.458	1	0.244(NS)
2	Single	2	33.3	10	14.5			

Data are expressed as n with %. Fisher's exact test was done to compare the frequencies. NS = Not significant.

Table 18.Comparison of frequency distribution of state of gall bladder wall thickening with respect to the conversion status.

S.No	Gall bladder wall thickening	Conversion present (n=6)		Conversion absent (n=69)		Chi square value	df	P value
		n	%	n	%			
1	Present	5	83.3	8	11.6	19.8	1	<0.0001*
2	Absent	1	16.7	61	88.4			

Data are expressed as n with %. Fisher's exact test was done to compare the frequencies. *indicates $p<0.05$ and considered statistically significant. The relative risk was 23.8 with 95% confidence interval of 3 to 187.6.

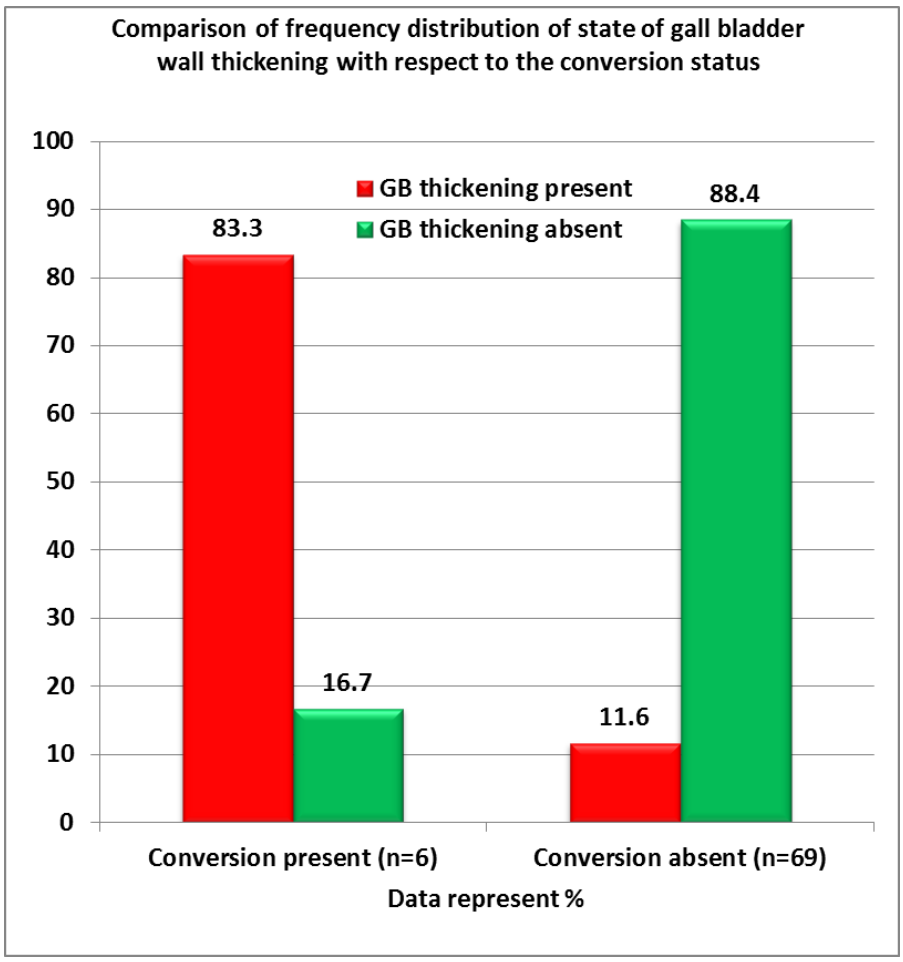


Table 19.Comparison of frequency distribution of comorbidities with respect to the conversion status.

S.No	Comorbidities	Conversion present (n=6)		Conversion absent (n=69)		Chi square value	df	P value
		n	%	n	%			
1	Present	2	33.3	13	18.8	0.724	1	0.394 (NS)
2	Absent	4	66.7	56	81.2			

Data are expressed as n with %. Fisher's exact test was done to compare the frequencies. NS= Not significant.

DISCUSSION

Cholelithiasis is a very common disease entity. Complications of cholelithiasis are frequent and serious and this has made this disease as one of the most important surgically correctable diseases.

It is important to keep in mind that conversion from laparoscopic surgery to open surgery is not seen as a complication, but rather a matter of sound surgical judgment as safety of the patient is of foremost importance.

Age incidence

It is said that gallbladder disease affects all ages, however they were more common in the 3rd,4th and 5th decades of life as 72% of the cases in our study belonged to these decades.

Maximum incidence was seen in the 41-50 years age group i.e, 21 patients (28%) followed by that in 51-60 years i.e, 17 patients (22.7). All the 75 patients were planned for elective laparoscopic cholecystectomy. 6 out of the 75 patients i.e, 8 % were converted to open cholecystectomy. Age wise conversion noted in our study is as follows ,,1 in theage group of 20-30years,1 in 30-40 years,2 in 40-50years,2 in 50-60 years,,with equal incidence of conversion in 40- 50years and50- 60 years attributed to omental adhesion. Similar peak incidence in the 4th and 5th decade have been reported by workers like Thomas B Hugh et al and R Schmitz et al

Sex incidence

The main sufferers of gallstone disease in our study were females as compared to males. Out of total 75 cases, 51 (68%) were females and 24 (32%) were males,which are very much similar to the study observed by Frazee et al and U.Berggren et al

In our study, 66.7% males required conversion as compared to 33.3% females; this was similar to Brodsky etal.andalso found the male gender as a significant determinant for conversion to open cholecystectomy.

The reason for the higher conversion rates in male patients remains unexplained. It has been observed that the male patients have more intense inflammation and fibrosis, resulting in a more difficult dissection of the Calot's triangle and through the plane between the liver and GB.

Symptomatology

Out of 75 operated patients, 80% presented with a chief complaint of pain in the right hypochondrium, 20% presented with pain in the epigastrium .,,3 patients presented with vomiting and jaundice,

Co-morbidities

In our study of 75 cases of laparoscopic cholecytectomy, conversion from laparoscopic to open cholecystectomy was required in 6 cases out of which1 patient had coronary artery disease,1 had hypertension.In our study comorbidities was not influencing the conversion of laparoscopic cholecystectomy to open cholecystectomy

Ultrasonography

Ultrasonogram is the best initial, non-invasive, economical and an easily available investigation. In our study, 13 out of 75 patients showed a thickened gall bladder wall on ultrasonography, of which 5 patients were converted. Out of the remaining 62 patients in whom the gall bladder wall was not thickened, 1 patient were converted due to intra-operative events (common bile duct injury) by which the thickened Gall bladder shows a significant chance of conversion from laparoscopic cholecystectomy to open cholecystectomy.

In a study by Pawanlal et al, they have found a significant correlation between the gall bladder thickness and conversion from laparoscopic to the open procedure (sensitivity 41.18%) and a positive predictive value of 70 . It suggesting that **gall bladder thickness is a good**

predictive factor for conversion to open surgery. Our finding coincides with these studies.

Pre-operative diagnosis

In a study a retrospective analysis by Chahin F over a period of 3 years of 557 patients who have undergone laparoscopic cholecystectomy; 88 of the patients had acute cholecystitis. The author concluded that conversion rates were around 22% in patients with acute cholecystitis when compared to 5.5% of patients with chronic cholecystitis.

In our study of 75 patients, 9patients had acute calculus cholecystitis and out of which 3 patients (50%) and chronic calculus cholecystitis(33.3%)were converted.

According to OhriAshish ,SinghKuldip within 72 hours of the symptoms the tissue planes are inflamed and edematous but are easier to dissect, having no adhesions at all. After 72 hours, the tissue becomes more friable and becomes more risky to dissect till after 3-4 weeks time when the inflammation has subsided and fibrosis sets in.

In a study by Koo KP et al the author experienced that in acute cholecystitis, laparoscopic cholecystectomy has a high conversion rate if delayed for more than 72 hours.

Previous acute cholecystitis results in scarring and fibrosis of the GB, and causes dense fibrotic adhesions that makes laparoscopic dissection difficult. Gall bladder wall thickness is related to inflammation and fibrosis that follows previous attacks of acute cholecystitis, and thus it may reflect difficulty in delineating the anatomy during surgery.

Duration of surgery

The average duration of surgery in our study was 100mins. The average duration of surgery in other studies are as follows-

Series	Duration of surgery
Axe ROS et al	93 minutes
Sooper et al	95 minutes
Bart M Redemaker	78 minutes
Ravimohan SM et al	46.8 minutes
AJ Karayiannakis et al	105 minutes

Average duration of surgery in other studies.

The mean duration of surgery in our study in converted cases was 125 min and successful laparoscopic operated was 100 min.

Period of hospital stay

The period from day of surgery to discharge is taken as period of hospital. The total period of post-operative hospital stay in our study was around 5.04 days.

Compared to our study, the study by U. Berggren et al and Roohul-Muqim et al reported a post-operative stay of 1.8 days and 2.06 days respectively which is much shorter than seen in our study.

The reason for the longer hospital stay in the hospital could be because most of our patients were from rural and poor background who insisted on staying till sutures were removed and therefore majority of cases discharged after a week even though many of the patients could have been discharge much earlier.

Conversion to open procedure

Conversion to open procedure is considered a major morbidity of laparoscopic cholecystectomy as it loses its supremacy over open cholecystectomy once the conversion takes place. The conversion rate in our study was 8 % and this is similar to the conversion rate of 2.6% to 14% reported in most studies.

In 5 cases(83.3%) out of the 6 cases, conversion was enforced due to dense adhesions in the calots triangle , 1 case (16.6%) due to common bile duct injury.

This may be due to the fact that there is differences in the institutional and individual practice as well as experience of operating team.

Difficult anatomy at the Calot's triangle accounted for conversions (83.3 %); the reasons for common bile duct injury due to bowel adhesion (16.7%).Ibrahim et al also found difficult anatomy as the most common reason for conversion to open procedure . According to our study we observed that individual anatomy was obscured primarily due to dense omental adhesions (83.3%) .

SUMMARY

- The present study of 75 patients has shown that gallstone diseases were more common in females than to males with a ratio of 2: (68 % females and 32% males).
- The most common age of presentation of gallstone diseases is 41-50 years (28% of the patients presented in this group).
- Most of the patients had right hypochondrium pain followed by vomiting (71%) and jaundice (4%) as the chief complaint.
- Ultrasonography is the most economical, simplest, easiest and an initial tool for the evaluation of gallstone diseases.
- Patients with thickened gallbladder wall had a higher rate of conversion i.e, 5 out of 13. This was one of the important parameter.

  Patients who presented on admission with acute cholecystitis had a higher conversion rate to open procedure as compared to those who presented with only cholelithiasis.
- The mean operation time was 100 minutes.
- The average duration of post-operative hospital stay was 5.04 days.

- The main cause for conversion from laparoscopic cholecystectomy to open procedure was difficulty in identifying the anatomy of the Calot's triangle as a result of dense omental adhesion (83.3%) followed by common bile duct injury (16.7%) .
- Laparoscopic cholecystectomy is a safe and reliable surgery. With growing experience by the surgeons in laparoscopic technique, complications and conversion rate can be brought down to a minimum.

CONCLUSION

Patients presenting on admission with acute cholecystitis had a higher rate of conversion. An ultrasound finding suggestive of a thickened gallbladder wall is a good indicator of conversion.Therefore ultrasonography can predict difficult laparoscopic cholecystectomy and thus the likelihood of conversion to open surgery.

The main reason for conversion from laparoscopic cholecystectomy to open procedure was difficult anatomy due to dense omental adhesions.

Conversion from laparoscopic cholecystectomy to open procedure should not be visualized as a complication but rather it should be considered a reflection of sound surgical judgment in difficult cases.

However, laparoscopic cholecystectomy is a safe and minimally invasive technique, with low conversion rate and the most common cause of conversion in our study was the presence of dense adhesions at Calot's triangle.

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FACTORS NECESSITATING CONVERSION OF LAPARASCOPIC CHOLECYSTECTOMY TO OPEN CHOLECYSTECTOMY IN THANJAVUR MEDICAL COLLEGE HOSPITAL

PROFORMA

Name **Age** **Sex** **Occupation**

Admitted in	OPD	CASUALITY
Presented as	Elective	Emergency
Patient was	Symptomatic	Asymptomatic

Presenting Symptoms	Pain Abdomen	Vomiting	Jaundice
Duration of Symptoms			

Nature of Surgery	Elective	Emergency	
Details of Gall Bladder	Wall thickness	Thickened	Normal thickness
	No. of stones	Single	Multiple
	Inflamed	Not inflamed	Empyema

UGI Scopy

Past History	Jaundice	Pancreatitis

Operative Finding	Omental Adhesion
	Thickened GB
	Contracted GB

Surgeon Characteristics	Senior	Junior

Time before Conversion

Reasons for Conversion

Difficulty in Dissection	Anatomical	Technical
Anaesthetic Complications		
Development Of Complications		

Type of Incision	Mid line	Kocher's

ஆராய்ச்சிக்கான ஒப்புதல் கடிதம்

"FACTORS NECESSITATING CONVERSION OF LAPAROSCOPIC CHOLECYSTECTOMY TO OPEN CHOLECYSTECTOMY"

புறநோயாளி எண் : தேதி :

பெயர் : வயது :

இனம் : ஆண் / பெண்

இந்த ஆய்வின் நோக்கம் மற்றும் விவரங்கள் எனக்கு தெளிவாக அறிவிக்கப்பட்டது. எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்துகொண்டு நான் என் விருப்பத்தினைத் தெரிவிக்கிறேன்.

இந்த ஆய்வின் நன்மைகளைப் பற்றி மருத்துவர் மூலம் தெரிந்துகொண்டேன்.

இந்த ஆய்வில் பிறரின் நிர்பந்தமின்றி என்னுடைய சொந்த விருப்பத்தின்பேரில் பங்கு பெறுகிறேன் மற்றும் நான் இந்த ஆய்விலிருந்து எப்போது வேண்டுமானாலும் விலகிக் கொள்ளலாம் என்பதனையும் அறிந்துகொண்டேன்.

நான் என்னுடைய விருப்பத்தின்பேரில் முழு ஒப்புதலுடன் இந்த மருத்துவ ஆய்வில் என்னை சேர்த்துக்கொள்ள சம்மதிக்கிறேன்.

மருத்துவர் கையொப்பம் பங்கேற்பாளர் கையொப்பம்

நாள் :

இடம் : தஞ்சாவூர்.

MASTERCHART

SL No	Name	Age	Sex	IP NO	DM/CAD/HTN	Presenting			Diganosis	Gall bladder details	No of Stones	Inflammation	Intra operative finding	Duration of surgery	TIME BEFORE CONVERSI	REASON FOR CONVER	TYPE OF INCISION	Duration of Post op hospital stay	Follow up
						Abd pain	Vomiting	Jaundice											
1	Johan	58	F	54565	DM	60 days	0	0	chronic calculus cholecystitis	N	S	I	SW	100mins	-	-	-	6	uneventful
2	Ashok	22	M	70430	NIL	10days	0	0	Acute calculus cholecystitis	N	S	I	SW	110 MINS	-	-	-	4	uneventful
3	**Arivarasan**	**22**	**M**	**11282**	**NIL**	**10 days**	**10 days**	**5 Days**	**Acute calculus cholecystitis**	**T**	**M**	**I**	**OA**	**110 mins**	**45 mins**	**omental adhesions, failure to dissect calots triangle**	**kochers incision**	**7**	**uneventful**
4	Malliga	40	F	54680	NIL	45 days	20 days	0	Cholelithiasis	N	M	NI	SW	80mins	-	-	-	5	uneventful
5	Neelavathy	35	F	39079	nil	60 days	5 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	4	uneventful
6	Rani	45	F	15526	nil	60days	30 days	0	Cholelithiasis	N	S	NI	SW	120 MINS		-	-	5	uneventful
7	Roopan	24	M	8966	nil	40 days	0	0	Cholelithiasis	N	M	I	SW	100 MINS	-	-	-	4	uneventful
8	Ramachandran	70	M	59953	DM/CAD	25 DAYS	0	3 days	Acute calculus cholecystitis	N	M	I	OA	120 MINS	-	-	-	6	uneventful
9	Nagarajan	50	M	6771	nil	90days	0	0	chronic calculus cholecystitis	N	M	I	OA	130 MINS	-	-	-	6	uneventful
10	Meena	48	F	65024	nil	45days	10days	0	Cholelithiasis	N	S	I	SW	110 MINS	-	-	-	5	uneventful
11	mallika	50	F	13238	nil	60days	5days	0	cholelithiasis	N	M	NI	SW	80 MINS	-	-	-	6	uneventful

12	Magesh wari	26	F	64199	nil	10 days	10 days	0	Acute calculus cholecystitis	N	S	I	SW	90mins	-	-	-	5	uneventful
13	Jenmaro hini	37	F	4939	nil	4 days	4 days	0	Acute calculus cholecystitis	N	S	I	SW	120mins	-	-	-	4	uneventful
14	Deivani	70	F	55003	DM/HTN	80 days	30 days	0	cholelithiasis	T	M	I	SW	90 MINS	-	-	-	6	uneventful
15	Ambiga	42	F	64546	NIL	120 days	0	0	cholelithiasis	T	S	I	SW	100mins	-	-	-	5	uneventful
16	**Anju**	**33**	**F**	**67706**	**nil**	**3 days**	**3 days**	**0**	**Acute calculus cholecystitis**	**T**	**M**	**I**	**OA/BA**	**110mins**	**30 MINS**	**Dense omental adhsion in calots triangle**	**Kochers incision**	**7**	**uneventful**
17	Gandhimadhi	65	F	54678	DM/HTN	20 days	1 day	0	Acute calculus cholecystitis	T	S	E	OA/TG	90mins	-	-	-	6	uneventful
18	Ayisha	23	F	56784	NIL	45 days	1 day	0	cholelithiasis	N	M	I	SW	80mins	-	-	-	4	uneventful
19	Chandra	40	F	13381	NIL	180 days	1 day	0	cholelithiasis	T	M	I	OA	95mins	-	-	-	5	uneventful
20	**santhanam**	**52**	**M**	**1880**	**HTN**	**90 days**	**10 days**	**0**	**chronic calculus cholecystitis**	**N**	**M**	**I**	**OA**	**90 mins**	**35 mins**	**omental adhesions, failure to dissect calots triangle**	**kochers incision**	**8**	**uneventful**
21	Kowsalya	58	F	57811	NIL	60 days	30 days	0	Cholelithiasis	N	M	I	BA	130 mins	-	-	-	5	uneventful

22	Durai	53	M	6550	CAD	60 days	30 days	3 days	chronic calculus cholecystitis	T	M	I	OA/TG	140mins	40MINS	omental adhesions	kochers incision	8	uneventful
23	Valarmathi	56	F	20730	DM	180 days	0	0	Cholelithiasis	N	M	I	SW	120mins	-	-	-	6	uneventful
24	Supriya	24	F	3566	NIL	90 days	0	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	5	uneventful
25	Sushma	50	F	36785	NIL	365 days	0	0	Cholelithiasis	N	M	I	SW	90mins	-	-	-	6	uneventful
26	subha	22	F	3343	NIL	180 days	30 days	0	Cholelithiasis	N	M	I	SW	110mins	-	-	-	6	uneventful
27	Sujatha	47	F	62151	NIL	90 days	0	0	Cholelithiasis	N	M	I	SW	90mins	-	-	-	5	uneventful
28	Shanmugapriya	38	F	56910	NIL	20 days	15 days	0	Acute calculus cholecystitis	N	M	I	OA	80mins	-	-	-	4	uneventful
29	Selvi	43	F	52504	NIL	60 days	60 days	0	Cholelithiasis	N	M	NI	SW	70mins	-	-	-	4	uneventful
30	Gandhi	40	M	15397	NIL	30 days	0	0	Cholelithiasis	N	M	I	SW	75mins	-	-	-	5	uneventful
31	Aarthi	22	F	66128	NIL	60 days	0	0	Cholelithiasis	N	M	I	SW	120mins	-	-	-	4	uneventful
32	Abdul	56	M	7092	NIL	30 days	15 days	0	Cholelithiasis	N	M	NI	SW	80mins	-	-	-	6	uneventful
33	Devika	37	F	8802	NIL	90 days	0	0	Cholelithiasis	N	M	I	OA	110mins	-	-	-	5	uneventful
34	Kala	22	F	36885	NIL	150 days	10 days	0	Cholelithiasis	N	M	I	BA	120mins	-	-	-	4	uneventful
35	Kalaiselvi	46	F	18974	NIL	30 days	0	0	cholelithiasis	T	S	I	OA/BA	150mins	40mins	CBD injury	kochers incision	15	conservative management
36	Karupaiyan	50	M	6057	NIL	60 days	30 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	6	uneventful
37	Saminathan	60	M	9432	nil	60 days	30 days	0	Cholelithiasis	N	M	I	SW	80mins	-	-	-	5	uneventful
38	Maniyarasan	37	M	46552	NIL	30 days	20 days	0	Cholelithiasis	N	M	I	OA	85mins	-	-	-	5	uneventful
39	Nagarathinam	70	F	6040	HTN	90 days	60 days	0	Cholelithiasis	N	M	I	SW	70mins	-	-	-	7	uneventful

40	Nirmala	48	F	36978	NIL	45 days	20 days	0	Cholelithiasis	N	M	NI	SW	110mins	-	-	-	5	uneventful
41	Sasikumar	43	M	1220	nil	60 days	10 days	0	Cholelithiasis	N	M	NI	SW	120mins	-	-	-	5	uneventful
42	Vasuki	55	F	33903	NIL	45 days	20 days	0	Cholelithiasis	N	M	I	SW	110mins	-	-	-	6	uneventful
43	Mathanam	50	M	44578	NIL	20 days	15 days	0	Acute acalculus cholecystitis	T	-	I	OA/TG	150mins	50mins	Omental adhesion,failure to dissect calots triangle	kochers incision	7	uneventful
44	Kowsalya	58	F	57811	NIL	60 days	30 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	5	uneventful
45	Saroja	59	F	5387	DM/HTN	60 days	0	0	Cholelithiasis	N	M	I	SW	85mins	-	-	-	6	uneventful
46	Gowri	37	F	12880	nil	20 days	10 days	0	Cholelithiasis	T	M	I	SW	120mins	-	-	-	4	uneventful
47	Ravi	35	M	9628	nil	30 days	10 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	4	uneventful
48	Komalavalli	62	F	6958	nil	60 days	30 days	0	Cholelithiasis	N	M	I	SW	110mins	-	-	-	6	uneventful
49	Lalitha	52	F	3587	nil	90 days	60 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	5	uneventful
50	Radha	32	F	3484	nil	45 days	20 days	0	Cholelithiasis	N	M	I	SW	90mins	-	-	-	4	uneventful
51	Arunachalam	63	F	68783	DM/HTN/DM	50 days	40 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	6	uneventful
52	Suseela	50	F	50046	NIL	90 days	20 days	0	Cholelithiasis	N	M	I	SW	90mins	-	-	-	5	uneventful
53	Thangarasu	62	M	33797	nil	60 days	30 days	0	Cholelithiasis	N	M	I	SW	90mins	-	-	-	6	uneventful
54	Vairamani	50	M	65654	nil	45 days	30 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	5	uneventful
55	Krishnammal	44	F	34545	nil	48 days	30 days	0	Cholelithiasis	N	M	NI	SW	80mins	-	-	-	4	uneventful
56	Theresa	60	F	44567	DM/HTN/CAD	45 days	20 days	0	Cholelithiasis	N	M	I	SW	100mins	-	-	-	6	uneventful
57	Kasinathan	65	M	44423	DM/HTN	28 days	15 days	0	Cholelithiasis	N	M	I	OA	110mins	-	-	-	6	uneventful

58	Selvarani	45	F	33878	nil	30 days	0	0	Cholelithiasis	N	M	I	SW	120mins	-	-	-	5	uneventful
59	Rajendran	48	M	34611	nil	60 days	15 days	0	Cholelithiasis	N	M	I	SW	120mins	-	-	-	5	uneventful
60	Sakriya	32	F	44537	nil	60 days	30 days	0	Cholelithiasis	N	M	I	SW	110mins	-	-	-	4	uneventful
61	Allirani	35	F	65800	nil	45days	nil	0	Cholelithiasis	T	M	NI	SW	70mins	-	-	-	4	uneventful
62	Neelamani	51	F	9132	DM/HTN	150 days	10 days	0	Cholelithiasis	T	M	I	OA	120mins	-	-	-	6	uneventful
63	Abdul razaq	58	M	5102	nil	30 days	0	0	Cholelithiasis	N	M	I	OA	110mins	-	-	-	5	uneventful
64	Velambal	65	F	9174	nil	30 days	15 days	0	Cholelithiasis	N	M	I	SW	110mins	-	-	-	5	uneventful
65	Jayanthi	45	F	53046	nil	30 days	15 days	0	Cholelithiasis	N	M	NI	SW	90mins	-	-	-	5	uneventful
66	John	29	M	7786	nil	35 days	20 days	0	Cholelithiasis	N	M	I	BA	130mins	-	-	-	4	uneventful
67	Bakkiyam	67	F	31792	nil	70 days	45 days	0	Cholelithiasis	N	M	NI	SW	150mins	-	-	-	5	uneventful
68	Renuga	27	F	19165	NIL	50 days	45 days	0	Cholelithiasis	N	M	I	SW	80mins	-	-	-	4	uneventful
69	Bargathnisha	37	F	38958	nil	30 days	0	0	Cholelithiasis	T	S	I	SW	120mins	-	-	-	4	uneventful
70	Anbu	40	M	48936	nil	40 days	20 days	0	Cholelithiasis	N	M	I	SW	90mins	-	-	-	4	uneventful
71	Gomathi	50	F	55126	nil	60 days	30 days	0	Cholelithiasis	N	M	I	SW	80mins	-	-	-	5	uneventful
72	Lakshmi	59	F	65737	DM	90 days	60 days	0	Cholelithiasis	N	M	I	SW	80mins	-	-	-	6	uneventful
73	Thomas	60	M	29064	DM	60 days	30 days	0	Cholelithiasis	N	M	NI	SW	100mins	-	-	-	6	uneventful
74	Ponnaiyan	46	M	23121	nil	28 days	10 days	0	Cholelithiasis	N	M	I	SW	80mins	-	-	-	4	uneventful
75	Johnbeevi	58	F	64789	nil	60 days	0	0	Cholelithiasis	N	S	I	SW	80 mins	-	-	-	5	uneventful

OA	OMENTAL ADHESION
BA	BOWEL ADHESION
SW	STRUCTURE WELL DEFINED
TG	THICKENED GALL BLADDER