"A STUDY OF GALLSTONE DISEASE"

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CERTIFICATE

This is to certify that the dissertation titled "A STUDY OF GALL STONE DISEASE" is the original work done by DR.M.ARUL RAJKUMAR , post graduate in the department of GENERAL SURGERY, TIRUNELVELI MEDICAL COLLEGE, TIRUNELVELI- 11 submitted to THE TAMIL NADU DR.MGR MEDICAL UNIVERSITY, Chennai–32 towards the partial fulfillment of the requirements for the award of M.S degree in GENERAL SURGERY April 2013 examination.

Prof .S.SOUNDARARAJAN, M.S.
Professor and HOD
Department Of General Surgery
Tirunelveli Medical College
Tirunelveli – 11

DR.M.S.Varadarajan M.S.,
Unit Chief
Department of General Surgery
Tirunelveli Medical College
Tirunelveli -11

DR.M.MANOHARAN, M.S.
DEAN
Tirunelveli Medical College
Tirunelveli - 11

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CONTENTS

INTRODUCTION

Calculus disease of biliary system is one of the most common disorders affecting the gastrointestinal tract constituting a major cause of morbidity. There has been a marked rise in the incidence of gall stone disease in the west during the past century. In the UK, USA and Australia, the prevalence rates varies from 15- 25%. In India, it is more common in North India than in South India . Similarly the incidence in Eastern India is higher than in the West.

Incidence of gallstones increases with age. It is more common in females than males (M:F = 1:4) . About 50% of patients with gall stones are asymptomatic. 1 to 2% of asymptomatic patients will develop symptoms requiring cholecystectomy per year, making cholecystectomy one of the most common operations performed by surgeons.

The etiopathogenesis of gallstones is multifactorial. It varies according to the type of gallstones. Primarily gallstones can be divided into two major groups. First is pure gallstones contributing to 10% of gallstones. Second is mixed and combined gallstones which accounts for 90% of gallstones. Mixed gallstones have increased preponderance for cholecystitis.

Infection seems to be a major cause of gallstones

formation. Moynihan's aphorism that *"gall stone is a tomb stone erected in the memory of the organism with in it"* is true today.

Evidence in favour of infection includes isolation of *E. coli*, *klebsiella*, *bacterium typhosum*, *streptococcus* from the bile within the gallbladder.

Slow growing actinomyces also have been recovered from the bile. These organisms reach the gallbladder via blood stream from an infective focus elsewhere in the body and also by lymphatics.

Brown pigment gallstones occur as a result of infection. Bacteria are found with in the calcium bilirubinate and protein matrix of brown pigment gallstones.

Predisposing factors are obesity,dietary factors,liver disease,gallblader disease,haemolytic anaemia,gastric surgery and terminal ileal resection. Treatment varies from medical management to surgical management. Recently minimally invasive surgery improves the patient's compliance and reduces the morbidity. Sequalae of gallstone disease contributes to most of the surgical problems in patients with the disease.

OBJECTIVES

To study the age, sex incidence and various modalities of clinical presentation.

Bacteriological analysis of the bile collected from all cases subjected to cholecystectomy in our study so as to identify the commonest type of organism associated with gall stones.

HISTORY

1924 – Findlay introduced the concept that failure of cholesterol to remain in solution was the critical factor initiating cholesterol gallstone formation.

1966 – Maki proposed that bacterial infection plays a key role in the pathogenesis of pigment gallstones.

1968 – Admirand and Small described the critical nature of the relation between the relative biliary concentrations of phospholipids, bile salts and cholesterol.

1972 – Tabata and Nakayama found that more than 80% of patients had evidence of bactibilia (defined as more than 10^5 colony forming units/ml).

1982 – National Institute of Health International Workshop classified most pigment gallstones as either black or brown.

1984 – In comparing black and brown pigment stones Cetta et al found positive bile culture in 25% of patients with black pigment stones and in 100% patients with brown pigment gallstones.

1990 – Fransesco Cetter M. documented for the first time that bile infection by E.coli is a preceding factor in brown stone formation.

1996 – Attila Csendes & Patricio Burdiles found out that no bacteria is seen in the bile culture studies of control groups , when

compared to bile culture study of patients with gallstone disease.

2006 – Crygia Stewart, J. Macleor Grifiss had postulated that biliary bacterial factors determine the pathogenesis of gallstone formation.

REVIEW OF LITERATURE

Maki expressed the classic theory of the pathogenesis of calcium bilirubinate gallstone formation in which he emphasized the role of infection of the stagnated bile and the enzymatic hydrolysis of bilirubin glucoronide into free bilirubin and glucoronic acid. This free unconjugated bilirubin which is insoluble in water, then combines with calcium in the bile to produce a calcium bilirubinate matrix.

Stewart and co- workers demonstrated the presence of bacteria in the interior of most pigment gallstones.

Kaufman and associates confirmed the role of bacteria in the formation of gallstones. In their study, bacteria were identified only within the calcium bilirubinate – protein matrix of brown pigment stones.

In a review of biliary bacteriology in 200 consecutive patients with gallstone disease, Tabata and Nakyama found that more than 80% patients had evidence of bactibilia (defined as more than 10^5 colony – forming units/ml).

In comparing black and brown pigment stones, Cetta et al found positive bile culture in 25% patients with black gallstones and

100% patients with brown pigment gallstones.

Studies by Stewart et al and Smith et al from the United States, state that bacteria were found in the majority of black and brown pigmented gallstones concluding that the bacterial infection is the primary factor in both black and brown pigment gallstone pathogenesis.

Infection has been documented at the time of gallstone removal in more than 90% brown gallstones. Bile infection by E.coli precedes rather than follows brown gallstone formation.

- In 16th century, vesalius and fallopian described gallstones found in the gallbladder of dissected human bodies.
- In 19th century – Langenbuch widened the understanding of gallstone pathology of gall bladder by performing first cholecystectomy.
- 1882 – Langenbuch – first described open cholecystectomy as the primary treatment for gallstone disease.
- In 1882 - Karl Langenbach – performed the first successful cholecystectomy.
- In 1867 – Ioenisus was the first person to extract gallstone s from the gallbladder.
- 1891 – Calot described the triangle of cholecystectomy and

dissection of this area should show the anatomic structures and allow safe dissection.

- 1924 – Schoff – classification of GS. Classified as – Inflammatory gallstones, metabolic (cholesterol) gallstones, Mixed gallstones, Pigment gallstones.
- 1978 – Piehler and Crichlow – showed that more than 70% patients developing Gallbladder carcinoma have gallstones in their gallbladder. The risk of developing carcinoma is about 1% in calculous gallbladders 20 years after the initial diagnosis of gallstones, with more incidence in men.
- 1979 – Smith and Andrens and berg – showed that dangerous surgery arises from inadequate or imprecise observation of the technical principles of cholecystectomy, insufficient experience, inadequate incision and exposure or inadequate assistance. Anomalies of the gallbladder and cystic duct should be kept in mind.
- 1981 – Schoenfield and Lachin – Treated 144 patients including 92 men and 52 women with symptomatic gallstones by conservative management and about 50% had to undergo cholecystectomy as further management.
- 1985 – McSherry and colleagues followed 135 men and wemen

with asymptomatic gallstones. Of these subjects 10% developed symptoms and7% required cholecystectomy over a median follow up of 46 months.

- 1985 – Allen et al, showed that direct instillation of MTBE (Methyltert- Butyl through a small percutaneous ether) cholecystectomy catheter can be used for dissolution of gallstones.
- 1985 – Muller et al – proposed that MTBE can be used for dissolution of gallstones (cholesterol stones) successfully in the presence of an occluded cystic duct.
- 1986 – Muhe in Boblingen (Germany) performed the first laparoscopically assisted cholecystectomy.
- 1989 – Bushenne, Sackman – ESWL (extracorporeal shock wave lithotripsy) can be done with ultrasound guidance and requires no percutaneous cholecystectomy. It is restricted to definite cases with normal gallbladder on ultrasound, opacification of the gallbladder on oral cholecystography and limited number of gallstones (1-3) of size 0.5 – 3 cm.
- 1990 - Goldfarb et al– found that patients with sickle cell disease and haemolytic anaemia are at risk of development of gallstones (pigmented) and many patients become symptomatic.

- 1991 – PA grace – performed the first Lap cholecystectomy.
- 1992 - IG Marton et al – operated on 162 pateints with gallstones.
- 1992 - Ajay K. Kripalani proved that lap cholecystectomy is a very safe procedure which reduces the morbidity and mortality associated with surgery for symptomatic gallstones.
- 1992 – Gillams et al, Hurby et al, showed that the success rate of percutaneous cholecystolithotomy is 88%.

  Procedure related complications occur in 15% and includes subhepatic bile collections, cholangitis, gallbladder perforation, pericholecystitis and wound infection. Most cases are done on an elective basis under local, intravenous or general anaesthesia.
- 1992 – Analysis of the natural history of gallstones by Gracie and Ransohoff. He followed 123 patie nts (110 men, 13 women) who had been found to have gallstones through routine screening for 15 years . At 5, 10 and 15 years of follow up, 10%, 15% and 18% respectively had become symptomatic and none of them developed complication before the onset of typical symptoms.
- 1993 – IMC Macintyre and RG Wilson showed that lap

cholecystectomy reduced the hospital stay to < 2 days and return to work with in 2 weeks.

- 1993 – Wada and Imamura found in 1850 patients with gallstones that one third of patients were symptomatic and 20% of asymptomatic patients become symptomatic over a median follow up of 13 years. Patients older than 70 years were more likely to become symptomatic.
- 1995 – Shyamal Kumar Gosh et al showed a female preponderance for GS disease.
- 1996 - Carter Dc, Russel, Bismuth H – in their book on hepatobiliary and pancreatic surgery mentioned about congenital anomalies of GB.
- 1996 – J.R. Barton et al - complications after lap cholecystectomy like bile leak can be managed endoscopically by stenting or sphincterotomy.
- 1996 – Majeed and Assalia – have done minilaparotomy cholecystectomies for 23 patients with gallstones through smaller abdominal incisions.
- 1998 – GPH, GUI, CVN Chruvu et al, operated on 92 patients with symptomatic gallstones and cholecystectomy improved the symptoms suggesting that surgery remains the gold standard for

symptomatic treatment for gallstones.

- 2000 – UL Wills et al showed that laparoscopy is useful in the management of minor bile leak after laparoscopic cholecystectomy.
- 2002 – Michael Rosen et al - Laparoscopic cholecystectomy were performed in 1347 patients. Out of this 71 patients required conversion to open surgery. Obese patients with cholelithiasis have an increased chance of conversion to open surgery. Patients with multiple co- morbid disease s have more chances of failure of laparoscopic cholecystectomy
- 2002 –Nakeeb and co- workers established that genetic factors were responsible for at least 30% symptomatic gallstone disease.
- 2002 – Schiffman and associates studied that there was a decrease in gallstone formation in obese persons who were on a low calorie diet for long periods. They also stated that previous gastric bypass surgery increases the incidence of gallstone formation.

PHYSIOLOGY OF BILE:

Bile is made up of the bile salts, bile pigments and other substances dissolved in an alkaline electrolyte solution. Bile is secreted in two stages.

(1) The first phase of secretion is by the principal hepatocytes. This secretion contains large amounts of bile acids, cholesterol and other organic constituents. It is secreted into minute bile canaliculi that lie between the hepatic cells. The canaliculi empty into terminal bile ducts and then into progressively larger ducts, finally reaching hepatic duct and common bile duct.

(2) The second phase of secretion is a watery solution of sodium and bicarbonate ions secreted by secretory epithelial cells that lines the ductules and ducts.

The normal bile secretion is between 600 – 1000ml/day. The second phase of secretion sometimes increases the total quatity of bile by as much as an additional 100%.

BILE ACIDS:

Bile acids are the major organic constituents of bile accounting for approximately 50% of the solid components. They are related structurally to cholesterol from which they are synthesized by the liver. Cholesterol in the liver is converted into cholic acid and chenodeoxycholic acid through several intermediate steps of which 7 alpha hydroxylase is the rate limiting

enzyme. These acids called primary bile acids. In the colon, bacteria convert cholic acid to deoxycholic acid and chenodeoxycholic acid to litho cholic acid . These are called secondary bile acids.

Bile salts are sodium and potassium salts of bile acids conjugated to glycine and taurine ,a derivative of cysteine. Conjugation occurs in the liver producing glycocholic acid and taurocholic acid.

ACTIONS OF BILE SALTS:

(1) They reduce the surface tension and are responsible for the emulsification of fat preparatory to its digestion and absorption in the small intestine.

(2) Bile salts tend to form cylindrical discs called micelles with the hydrophilic surface facing out and the hydrophobic surface facing in. Above a certain concentration called the critical micelle concentration, all bile salts added to a solution form micelles.

(3) The micelle plays a important role in keeping the lipids in solution and transporting them to the brush borders of intestinal epithelial cells where they are absorbed.

(4) 90 – 95 % bile salts absorbed from the termimal ileum, remaining 5 – 10 % of the bile salts enter the colon and are converted to salts of deoxycholic acid and lithocholic acid. Lithocholate is relatively

insoluble and is mostly excreted in stools, only 1% is absorbed ,however deoxycholate is absorbed.

(5) The absorbed bile salts are transported back to the liver in the portal vein and re excreted in the bile (entero hepatic circulation). Those lost in the stools are replaced by synthesis in the liver. The normal rate of bile acid synthesis is 0.2 to 0.4 gms/day.

BILE PIGMENTS:

Bilirubin and biliverdin are the two major bile pigments present in the body. During the breakdown of haemoglobin in the reticuloendothelial system, bilirubin is formed and transported to the liver. In the hepatocytes bilirubin is conjugated by the enzyme UDP glucuronyl transferase and excreted into the bile which is responsible for the characteristic golden yellow colour of the bile.

In the terminal ileum and the colon, the bilirubin is deconjugated by the specific bacterial enzymes (beta glucuronidase) and the pigment is reduced to urobilinogen. Most of the urobilinogen is excreted in the faeces as urobilin whereas a small portion of the urobilinogen is reabsorbed and reexcreted through the liver to constitute the enterohepatic urobilinogen cycle.

ENTEROHEPATIC CIRCULATION:

About 90-95% of bile salts are absorbed back from the small intestine. They then enter the portal blood and pass back to liver and are resecreted into the bile.On an average, these salts are circulated about18 times before being excreted. The remaining 5-10% of bile salts enters the colon and are converted to salts of deoxycholic acid and lithocholic acid. A small fraction of the bile salts about 500mg/day escapes absorption and is therefore eliminated in the faeces

Constituents	**Liver bile** **pH – 8 to 8.6**	**Gall bladder bile** **pH – 7 to 7.6**
Water	97.5 g/dl	92 g/dl
Bile salts	1.1g/dl	6 g/dl
Bilirubin	0.04 g/dl	0.3 g/dl
Cholesterol	0.1 g/dl	0.3 -0.9 g/dl
Fatty acids	0.12 g/dl	0.3 – 1.2 g/dl
Lecithin	0.04 g/dl	0.3 g/dl
Sodium ion	145 mEq/L	130 mEq/L
Potassium ion	5 mEq/L	12 mEq/L
Calcium ion	5 mEq/L	23 mEq/L
Bicarbonate ion	28 mEq/L	10 mEq/L

Characteristics	Black	Brown
Appearance	Shiny	Dark brown
Crushing	resist manual crushing	Easily crushable
Site	Gall bladder	Biliary tract
Association	Haemolysis and cirrhosis	No such association
Calcium bilirubinate	40%	60%
Calcium palmitate	Trace	15%
Calcium carbonate	6%	Trace
Cholesterol	2%	15%
Bile	Sterile	Infected
Appearance	Shiny	Dark brown
Crushing	resist manual crushing	Easily crushable
Site	Gall bladder	Biliary tract

FUNCTIONS OF BILE:

(1) Bile salts helps in digestion and absorption of fats and fat soluble vitamins.

(2) Neutralisation of acids.

(3) Facilitates excretion of drugs, toxins, bile pigments and various inorganic substances

(4) Large quantities of cholesterol present in the bile are solubilised in micelles allowing cholesterol to be transported without precipitation in bile.

EFFECTS OF CHOLECYSTECTOMY:

(1) Bile from the liver empties slowly but continuously into the intestine, allowing sufficient digestion of fats to maintain good nutrition.

(2) Bile ducts become dilated to accommodate some of the bile which is continuously secreted by the liver. Therefore if the tone of sphincter of oddi is high, it causes gradual rise of pressure in the biliary passage. When this pressure exceeds secretory pressure of the liver cells, it interferes with bile secretion. If the tone is low, it causes dribbling of bile into the intestine when it is not needed and results in wastage of bile.

BILIARY SLUDGE:

Biliary sludge is composed of mucin, calcium, mono conjugated bilirubin and cholesterol and is now thought to be the direct precursor of gall stones.

GALLSTONES

CLASSIFICATION:

Gallstones are classified into two types -

1) Pure gallstones

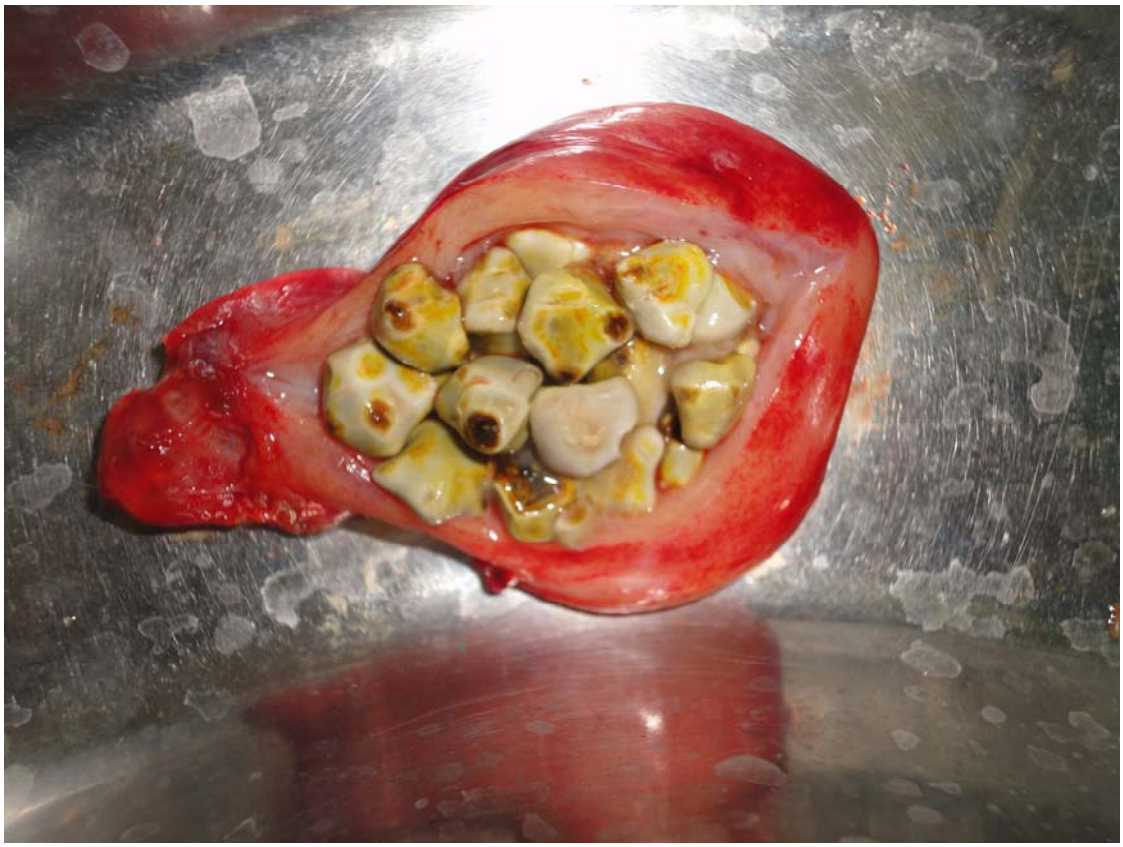
Cholesterol gallstones 70% Pigment gallstones 30% Calcium carbonate gallstones

2) Mixed and combined stones

10% gallstones are cholesterol stones.They are usually solitary with smooth surface, oval or round in shape, pale yellow in colour. They are thought to be formed in aseptic static bile and commonly found in Hartman's pouch. On section, they show radiating lines crossing the circular strata. In combined gallstone, the stone starts as pure cholesterol stone but ultimately receives mixed covering of pigment and cholesterol.

Pigment stones : May be pure or contain Calcium bilirubinate. They constitute about 80% of all gallstones. They are dark or black brown in colour, found exclusively in the gallbladder

associated with excessive haemolysis like hereditary spherocytosis, sickle cell disease, thalassemia etc. Excessive breakdown of Hb results in an increase in bilirubin which are excreted in the bile and forms pigment stones in the gallbladder. Stones usually appear as small soft fat like masses.



Cholesterol gallstones

Calcium bilirubinate stones are brown to orange in colour and soft in consistency. These stones are more often seen in the bile ducts. These stones are often caused by infection (E.Coli and parasites).[8]

Calcium carbonate stones – rarest type of stones. They are grayish white in colour with smooth surface or articulated surface. Increased alkalinity of the bile favours this stone formation.[3]

2) Mixed or combined stones :

Mixed stones have varying proportion of all three of the stone forming constituents of the bile eg. cholesterol, bile pigment and calcium. They constitute about 10% of gallstones.

Combined stones are those in which the central core or external layers are pure and the reminder of the stone is a mixture of the constituents. Combined stones may be solitary but mixed gallstones are invariably multiple with faceted surface. Stones may vary in size from a few cm in diameter. Colour of the stone depends on the constituents of stones.[7]

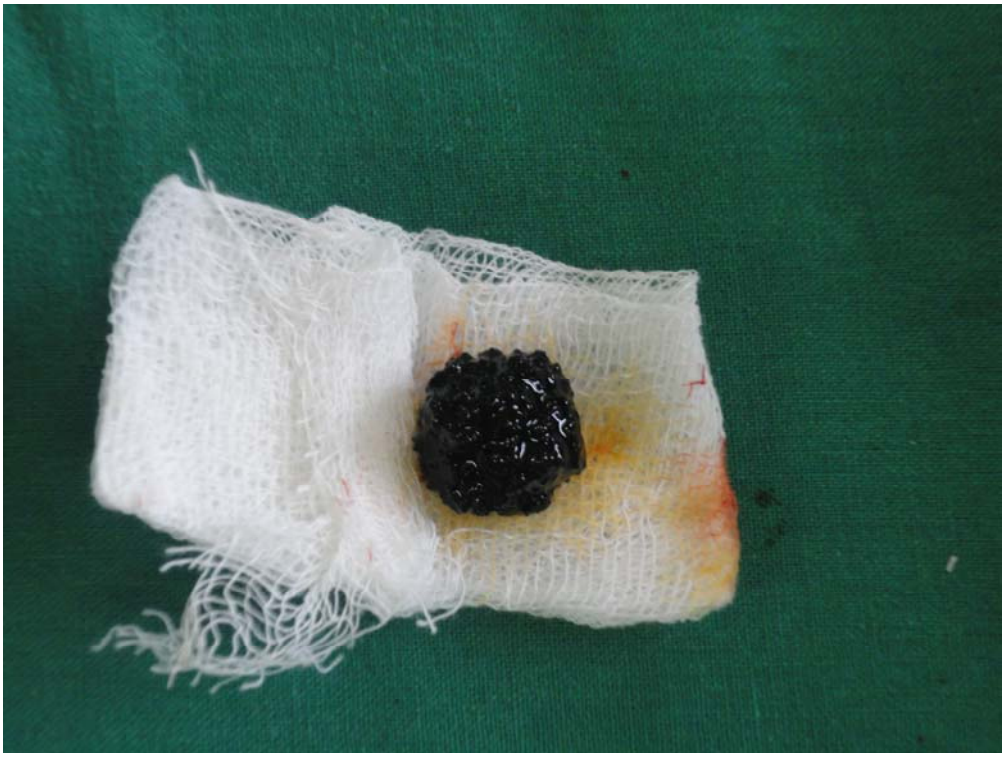
Pale yellow - Cholesterol

Black - Calcium bilirubinate

Grayish white - Calcium carbonate.

On section the laminated central nucleus may contain epithelial debris and bacteria. This suggests an inflammatory origin of stones.

Mixed stones are frequently associated with cholecystitis. In about ½ the cases bacteria can be cultured from these gall bladder bile. C hemical inflammatory changes prepare the soil for bacterial invasion.



PIGMENT GALL STONE

EPIDEMIOLOGY OF GALLSTONES :

It provides information about the prevalence and incidence of the disease.

a. **True incidence :**5 year incidence in women aged 30, 40 , 50, and 60 are (4%), (3.6%), (3%) and (3.7%) years and the same incidence rate in men were 0.3%, 2.9%, 2.5% and 3.3% at the same age. This shows that the incidence is more in women.

b. **Prevalence and incidence :** Gallstones are two times more common in women than in men. The incidence of gallstones in general population is 10%. Prevalence of gallstones in women between the ages 20 to 55 varies from 5% - 20% and after 50 years 25% - 30%. The prevalence in men is approximately half of that of women. [1]

c. **Ethnic predisposition :** Certain genetic factors play a key role in the pathogenesis of gallstone disease. Several genes that are associated with gallstone formation and resistance are identified in mice. The importance of these genes in human gallstone formation has not been established. Pima Indians in southern Arizona are an example of an extremely high risk population in which 70% of women less than 25 years are affected by the disease.[39]

Populations at the lowest risk are sub Saharan Africans and Asians.

d. **Risk factors :** Gallstone disease is multifactorial in origin and occurs sporadically. Specific risk factors predisposing to gallstones have been identified.

1) Age and gender:

Gallstone disease increases with age as cholesterol secretion into bile increases with age and bile acid formation decrease with age. Hence bile becomes more lithogenic with increasing age.[1]

Most studies report that the incidence and prevalence of gallstones is three to four fold higher in women than in men. But after age of 50 years, the incidence may become equal in male and females. This may be due to an increase in oestrogen in young women leading to an increased secretion of cholesterol into bile.[27]

2) Pathophysiology of gallstone formation with aging :

Changes in bile composition with aging accounts for an increase in the risk of cholesterol gallstone formation. Biliary cholesterol saturation index (CSI) rises with age in both men and women. This may be due to an increase in hepatic cholesterol secretion, but bile salt and phospholipids secretion remains stable. An inverse relation was seen between the age and hepatic bile salt

synthesis and activity of enzyme 7 alpha hydroxylase (rate limiting enzyme for bile salt synthesis).[3]

Factors that change with age, like change in contraction of gallbladder, ability to concentrate bile are also incriminated in gallstone formation including pigment or mixed stones.[2]

3) Obesity, weight loss and total parenteral nutrition :

Obesity is a well known risk factor for cholelithiasis . Gallstone formation is directly related to body mass index (BMI = kg /m^2). Highest BMI (45 kg/m^2) has got seven fold increased risk of gallstone formation as compare to non obese persons. This obesity related increase in gallstone formation is more in women than in men.[38]

Rapid weight loss is a recognized risk factor for gallstone formation. Gallstone develop in approximately 25% of obese persons on restricted diet intake and in upto 50% of patients who have undergone gastric by pass surgery. Gallbladder sludge or gallstone formation occurs within 6 months of surgery. Around 40% of these patients experience the symptoms of gallstones.[20,40]

The physiological alterations that lead to gallstone formation as a result of rapid weight loss are multiple.

i. Hepatic cholesterol secretion increase during caloric restriction.

ii. Increased secretion of mucin which is a potent stimulator of cholesterol crystal formation.

iii. Decreased gall bladder motility leading to biliary sludge formation. Gallstone formation can be prevented by administration of ursodeoxycholicacid in these patients. It is also found that there is a decrease in gallstone formation in obese persons who are taking low caloric diet.[40]

TPN is associated with the development of acalculous cholecystitis, cholelithiasis and cholecystitis. In 45% adults and 43% children, gallstones develop after 3- 4 months of TPN. Gallbladder sludge is seen in TPN as early as after 3 weeks due to hypomotility with bile stasis and due to failure of sphincter of oddi to relax.[40]

4) Pathophysiology of gallstone formation in obese persons :

In obese persons hepatic cholesterol synthesis is increased and cholesterol saturation index (CSI) is more. Gallbladder bile is supersaturated with cholesterol. Secretion of bile salts and phospholipids is either normal or increased. Gallbladder contractility may be decreased in the obese persons. So gallbladder stasis with supersaturated bile lead to gallstone formation.[38]

5) Pregnancy and parity :

Due to an increase in oestrogen level bile becomes more lithogenic due to an increase in cholesterol secretion and supersaturation of bile. Gallbladder volume will be doubled and stasis develops with formation of biliary sludge. Higher progesterone levels also impair gallbladder motility.[21]

Both biliary sludge and stones are silent in nature but they may become symptomatic. After delivery in 60-70% pregnant woman, biliary sludge disappears and gallstones disappear in 20-30%.

6) Drugs :

Drugs which increase the gallstone formation are oestrogens, oral contraceptives, clofibrate, octreotide, ceftriaxone (third generation cephalosporin).

Oestrogen : The observations that gallstones are seen more in reproductive age group led to initial hypothesis that oestrogen may promote gallstone formation.

Exogenous estrogen increases biliary cholesterol secretion by 40% causing cholesterol supersaturation of bile. Estrogen therapy also decrease plasma LDL and increase plasma HDL. There is an increased LDL receptor expression by liver in estrogen therapy which results in an increased uptake of LDL by liver and increased

secretion of cholesterol into bile.[1,21]

Clofibrate : Induces cholesterol supersaturation in bile and decreases bile acid concentrations by reducing the activity of enzyme 7 alpha hydroxylase, the rate limiting enzyme in the pathway of bile acid synthesis. HMG Co-A reductase inhibitors reduce the biliary cholesterol saturation index but their role in prevention of or therapy of gallstone disease has not been clearly established.[21]

Octreotide, a somatostatin analogue increases the gallstone formation. Decreased gallbladder motolity and bile stasis are associated with octreotide treatment and leads to gallstone formation.

Ceftriaxone is generally excreted in the urine but upto 40% is secreted unmetabolised in the bile and reaches 100-200 times the concentration in serum. Once it exceeds the saturation level, it combines with calcium and forms insoluble salt. In 43% children who receive ceftriaxone in high doses (20 – 100 mg/kg/day), biliary symptoms are reported.

7) Diet :

Hypertriglyceridemia is associated with an increased incidence of gallstone formation. High serum cholesterol does not seem to be a risk factor for gallstone formation. HDL levels are inversely

correlated with the development of gallstones.

Hence obese persons with hypertriglyceridaemia with low HDL levels are at greatest risk for development of gallstones. Ingestion of refined sugars and low physical activity are positively associated with the presence of gallstones in some studies. No association between alcohol, tobacco or caffeine ingestion and gallstone formation has been found.[2,38]

8) Systemic diseases :

Gallstone formation is common in diabetic persons and its complications are also more. Insulin resistant diabetes mellitus is associated with hyper triglyceridemia, obesity, hypomotality of gallbladder leading to biliary sludge formation which inturn may lead to gallstone formation.[38]

The prevalence of gallstones in persons who had spinal cord injury is about 31% and biliary complications occur in 2.2%. The mechanism responsible for the association between spinal cord injuries and gallstone formation is not known. Gallbladder relaxation is impaired in these patients. Hence biliary stasis is likely to be the cause of gallstone formation.[38]

9) Cirrhosis of liver :

Gallstone formation is 2-3 times greater in cirrhotic patients

than a non cirrhotic population at all ages. In advanced cirrhosis, there is a marked reduction in the bile salt secretion. It is stated that decrease in bile salt is matched by diminished biliary lecithin and cholesterol and bile is not lithogenic. Gallstone in cirrhosis and other chronic liver disease is usually due to chronic haemolysis and majority of the stones are pigment type. Jaundice in cirrhosis is more likely to be due to hepatic decompensation than a stone in the CBD.[26]

10) Ileal disease or resection :

In crohn's disease, extensive involvement of ileum and major resection of ileum lead to malabsorption of bile salts. This inturn leads to increased cholesterol and supersaturated bile. Therefore gallstone formation is more. Gallstones are usually cholesterol type.[40,26]

11) Gastric surgery :

Gastric bypass surgery for peptic ulcers and for gross obesity is complicated with an increase in prevalence of gallstone formation. Truncal vagotomy will adversely affect gallbladder emptying or bile lipid composition.[40]

12) Haemolytic anaemia :

Patients with haemolytic anaemia and hereditary spherocytosis are associated with an increased incidence of pigment gallstone

formation due to haemolysis.[1]

Prevalence rate :

In hereditary spherocytosis is about 43.66% In sickle cell anaemia 37%. Thalassaemia 10% Saudiarabs with sickle cell anaemia have milder haemolysis due to increased alkali resistant Hb and have got low rate of gallstone formation.

13) Other conditions :

Children with cystic fibrosis have an increased incidence of gallstones. Association with peptic ulcer and hyperparathyroidism – a firm evidence is not available.

PATHOGENESIS OF GALLSTONE DISEASE

Pathogenesis of gallstone is multifactorial. There are significant difference in the etiology of cholesterol and pigment gallstones. The understanding of this factor is important to prevent the disease and for treatment modalities. Gallstones are concretions and aggregations that are formed as a result of imbalance between bile acids and cholesterol in the ratio 1:10.

Gall stone disease is due to

1. Metabolic causes
2. Infections and infestation
3. Stasis of bile

CHOLESTEROL GALLSTONES :

The formation of cholesterol stones involves seven processes.

(1) Super saturation of bile with cholesterol.

(2) Incomplete transfer of cholesterol from the biliary vesicles to the bile salt micelles.

(3) Formation of abnormal high cholesterol containing biliary vesicles.

(4) Aggregation and fusion of unstable vesicle.

(5) Cholesterol crystallisation, nucleating and anti nucleating factors.

(6) Biliary sludge formation.

(7) Stone growth.

SUPERSATURATION WITH CHOLESTEROL:

Cholesterol is secreted by the hepatocytes into the hepatic bile as cholesterol phospholipid vesicles. The cholesterol and phospholipid molecules form a central core surrounded by bile salt molecules. This mechanism maintains cholesterol in solution. Methods used to express the solubility of cholesterol in bile are percentage saturation, the lithogenic index and the ratio of the concentration of bile salts and phospholipid over the concentration of cholesterol. The lithogenic index is the ratio of the actual amount of cholesterol that can be dissolved in the bile sample using the triangular co ordinate plots. A lithogenic index of unity or greater indicates that the bile is supersaturated with respect to cholesterol. The

normal ratio concentration of bile salts + concentration of phospholipids/ concentration of cholesterol= 10 : 1.

Source of the supersaturated bile is the liver from increased synthesis of cholesterol or a decreased synthesis / secretion of bile salts and phospholipids. In obese patients there is an increased activity of the enzyme hydroxyl methyl glutaryl Co A(HMG Co A) reductase resulting from the chronically elevated levels of insulin found in over weight individuals. Most non obese patients with cholesterol stones have a reduced absorption as the cause of the diminished bile salt pool in these patients. The most likely explanation of the super saturated bile is an exaggeration of the normal feed back mechanism between the bile salt return and the hepatic synthesis of bile acids together with an increased entero hepatic cycling possibly consequent to an abnormal excessive gall bladder contractility. Other factors are persistence of biliary vesicles and kinetic factor.

BILIARY VESICLES:

Under normal conditions, the cholesterol phospholipids vesicles are relatively stable and disappear as micelles form and take up their cholesterol and phospholipids constituents. In the pathological state, the phase change to micelles is incomplete and as more phospholipids than cholesterol is extracted into micellar aggregates with bile salts, biliary vesicles with an abnormally high cholesterol phospholipid ratio are produced. These

abnormal vesicles are unstable and are the source of cholesterol mono hydrate crystals in the bile. The crystallisation is preceded by aggregation and fusion of high cholesterol containing vesicles.

KINETIC BALANCE BETWEEN NUCLEATING AND ANTI NUCLEATING FACTORS:

Bile contains substances which either inhibit (alipoprotein A1) or promote(mucin) the growth of cholesterol crystals. An anionic polypeptide fragment of high density lipoprotein oiccurs in bile and together with immunoglobulin A constitutes the lipoprotein complex of bile. Absolute or relative decrease in the amount of anionic polypeptide fragment favours nucleation and growth of cholesterol monohydrate and pigment crystals. Mucin is a major component of biliary sludge and stone formation appears to start in the mucous gel. Recently a protein with marked nucleation promotion activity for cholesterol crystals that binds to concavalin A has been isolated from the bile of patients with and without gall stones. Its activity was found to be increased in patients harbouring gall stones.

OTHER FACTORS:

The role of calcium is indicated by the presence of calcium salts in the majoritiy of stones, with an increase in the total and free ionised calcium concerntration in the gall bladder bile. Gall bladder may alter the physicochemical composition of bile, favouring nucleation and crstal growth

by abnormal absorption/ secretion, defective surface pH, stasis resulting from impaired gall bladder emptying and stratification of bile or by providing essential nucleating factors including mucin, desquamated cells , bacteria and refluxed intestinal contents.

GALLBLADDER FACTORS :

Gallbladder contributes in gallstone formation by a complex interaction of muscular and mucosal events.

a) Stasis :

Many patients with gallstones have gallbladders that empty more slowly, incompletely. This muscle abnormality precedes gallstone formation and persists after the gallstone have been removed by dissolution therapy.This stasis is a feature of both cholesterol and pigment stones. Other factors are sequestration of bile acids within the gallbladder reducing the amount of bile salts available for cholesterol solubilisation, alterations in the secretory or absorptive function of gallbladder leading to biliary stasis.[23]

b) Phospholipids in bile :

Studies indicate that gallstone formation is accompanied by an increase in arachidonic acid containing phospholipids. Increased hydrolysis of arachidonyl lecithin provides the substrate for formation of prostanoids in the gallbladder wall. This activation of the prostanoid

synthetic cascade is accompanied by reduced gallbladder motility and increase in mucin production by the gallbladder mucosa.[12]

c) Bile mucus glycoprotiens :

The excessive production of glycoprotiens by gallbladder mucosa precedes stone formation. Mucin gel interferes with gallbladder contractility and emptying and acts as a nucleating matrix for cholesterol crystals to form cholesterol phospholipids vesicles.

d) Calcium :

Role of calcium is indicated by the presence of calcium salts in majority of gallstones. Preliminary results suggest that gallbladder bile from patients with cholesterol gallstones contain high levels of calcium. Exact mechanism by which biliary calcium increases the formation gallstones remains unknown but possible explanation includ es enhanced absorption of H_2O and solutes by the gallbladder and increased gallbladder secretion of calcium, or decreased absorption of calcium. Crystalline structures of calcium carbonate and cholesterol monohydrate crystals provide the frame work for gallstone formation. In addition to the structural role, data suggests that calcium promotes fusion of the vesicles and cholesterol crystal growth.

INFECTIONS AND INFESTATIONS

Bacteria like E.Coli ,Klebsiella,Salmonella,Parasites like Clonarchis sinensi

s and Ascaris lumbricoides

PIGMENT STONES:

These stones contain less than 30% cholesterol. They are two types black and brown.

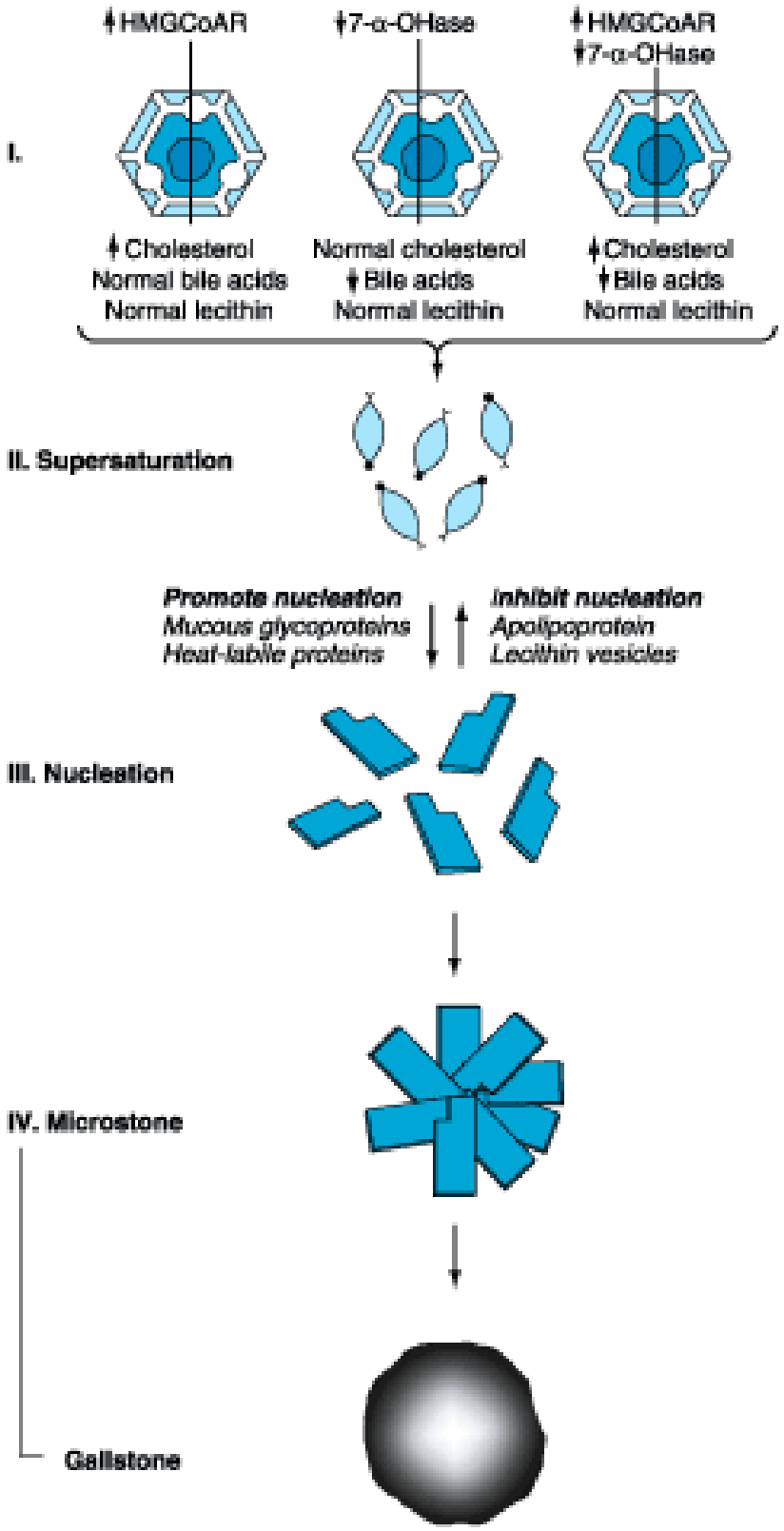
BLACK PIGMENT STONES:

Black stones are largely composed of an insoluble bilirubin pigment polymer mixed with calcium phosphate and calcium bicarbonate. Overall 20 to 30% of stones are black. Black stones accompany hemolysis, usually hereditary spherocytosis or sickle cell disease. Cirrhotic patients have an incidence of black stones. In cirrhotic patients, an elevated concerntration of mono conjugated bilirubin and a lower bile salt concentration than normal causes high prevalence of black stones. Black pigment stones have a bile which is supersaturated with calcium bilirubinate and significant increase in the gall bladder concentration of unconjugated bilirubin and calcium were documented. Calcium is a universal component of black pigment stones and both free and total ionised calcium is increased. Patients with bile acid malabsorption have low biliary cholesterol in addition to a reduced bile salt pool. There is increasing evidence for the important role of some mucins especially(MUC 3 and MUC 5B) in the development of pigment stones. The peribiliary glands are the source of the mucins. Increased mRNA

expression of MUC 3 and MUC 5 in the cells of peribiliary glands of stone harbouring intra hepatic ducts is seen.

BROWN PIGMENT STONES:

It is caused by infection by gram negative bacteria such as E coli, klebsiella and bacteriodes fragilis which elaborate and release beta glucuronidase in the bile. In many eastern countries, where infestation with Ascaris lumbricoides is endemic, the eggs of this parasite have been repeatedly identified in the nucleus of brown pigment stones. The bacterial beta glucuronidase is implicated in the hydrolysis of conjugated bilirubin with consequent precipitation of insoluble calcium bilirubinate. Brown pigment stones contain calcium bilirubinate, calcium palmitate and calcium stearate as well as cholesterol. They form in the bile duct and are related to bile stasis and infected bile. It is associated with the presence of foreign bodies within the bile ducts such as endoprosthesis(stents) or parasites such as Clonorchis sinensis and Ascaris lumbricoides.


I.
↑HMGCoAR
↑7-α-OHase
↑HMGCoAR
↑7-α-OHase
↑Cholesterol
Normal bile acids
Normal lecithin
Normal cholesterol
↑Bile acids
Normal lecithin
↑Cholesterol
↑Bile acids
Normal lecithin
II. Supersaturation
Promote nucleation
Mucous glycoproteins
Heat-labile proteins
Inhibit nucleation
Apolipoprotein
Lecithin vesicles
III. Nucleation
IV. Microstone
Gallstone

Composition of different types of gallstones :

Chemical	Pathogenesis	Morphology
Cholesterol stones (10%)	Supersaturation of bile Bile stasis Infection (rare)	Large, smooth solitary, yellowish in colour upto 4cm in diameter radiolucent.
Pigment stones (80%) Calcium bilirubinate Cholesterol with calcium bilirubinate	Haemolytic disorders (H.anaemia, infection, H.spherocytosis, Sickle cell anameia)	Multiple, jet black shiny, jackstones 0.5 – 1cm in diameter uniform in size and friable.
Mixed stones (5-10%) Cholesterol is the major constituents. Mixture of cholesterol, bile pigment, calcium salts	Combination of bile constituents Bile stasis Infection	Multiple, hard faceted or irregular mulberry shape color – yellow to green, black 10% radio-opaque.

Calcium carbonate stones (rare)	Excess calcium excretion in bile	Faceted, grayish in colour, radio-opaque.

CLINICAL MANIFESTATIONS

Majority of patients with gallstone are asymptomatic. Some have atypical or nonspecific symptoms. Others will manifest with clinically significant symptoms of gallstones.

Gallstone disease symptoms may be acute, chronic or totally absent. The differentiation between silent and symptomatic gallstones is important since this affects the management in individual case.

1) Asymptomatic or silent stones :

About 85-90% of patients with gallstones remain asymptomatic. The probability of a patient with silent gallstones developing biliary related pain is 1-2% per year and risk of developing complication like perforation and emphysema is even less (0.1% per years). The yearly risk of biliary pain decrease with time and gallstones in females are more likely to become symptomatic. In 90% of cases of carcinoma - gallbladder, gallstones are present.

2) Flatulant dyspepsia :

This is the most common symptom and is described as feeling of fullness after food associated with belching and heart burn. This is more commonly qualitative dyspepsia – for fatty food. This symptom occurs irregularly and lacks the periodicity of peptic ulcer.

Other conditions like hiatus hernia, peptic ulcer and chronic pancreatitis should be ruled out before the diagnosis of cholelithiasis is made.

3) Rt. hypochondrial pain :

In some, it may be discomfort and in some it may be excruciating pain. Pain radiates to the interscapular region or right intra scapular area. Patient may complain of aching pain over the tip of the right shoulder. Due to distension of the gallbladder diffuse epigastric pain may be complained off. Localized pain may be due to inflammation of parietal peritoneum.

4) Biliary colic :

It is a misnomer, as the biliary symptoms are usually gradual in onset and pain is localized to the rig ht upper quadrant (right hypochondrium) or epigastrium and is not a colicky pain, colic occurs when a stone is impacted in the cystic duct or at the Hartmann pouch. Episodes of biliary pain are typically seen after meals and often

associated with nausea and vomiting. Pain lasts for minute to hours and may radiate to the back or tip of the right scapula, pain resolves spontaneously or diminishes with analgesics.[26]

5) Jaundice :

Cholestatic jaundice due to complete obstruction of common bile duct (CBD) and mild or incomplete obstruction.

6) Fever :

Occurs in 1/3 of patients and may be present during an attack of colic. Fever may be seen without cholangitis, and may be associated with rigors.

7) charcot's triad

Pain, fever and jaundice. Due to cholangitis

PHYSICAL SIGNS :

1. Enlarged gallbladder may be palpable if there is mucocele or emphysema. Enlarged gallbladder is seen cholelithiasis when there is double impaction of stones i.e.one in cystic duct and other in CBD. Enlarged gallbladder is felt as a globular swelling projecting downwards just lateral to the right rectus muscle below the tip of ninth rib. It moves with respiration and side wards.

2. Tenderness and rigidity in right hypochondrium.

3. Murphy's sign (Moynihan's method) – patient is asked to take deep breath in and pressure is exerted with the fingers to palpate the fundus of the gallbladder. The gallbladder descends and hits the finger, the patient winces with pain with a catch in the breath. This examination can be done in the sitting posture. This is present in acute cholecystitis.

4. Baos sign : Hyperaesthesia between the 9^{th} to 11^{th} rib posteriorly on the right side. It suggests acute cholecystitis.

COMPLICATIONS OF GALL STONE DISEASE:

IN THE GALL BLADDER:

(1) Acute cholecystitis

It is most commonly obstructive in nature, from the impaction of a stone in cystic duct, hartmann's pouch. Initial inflammation is chemically induced and is followed by bacterial infection.

The clinical picture varies with the severity of the inflammatory process. In mild cases, the patient complains of right upper quadrant pain and tenderness. Pyrexia, severe pain and tenderness in the right hypochondrium suggest more severe degrees of gall bladder inflammation. Murphy's sign (inspiratory arrest due to pain on inspiration during gentle

palpation of the right sub costal region) is usually present. Nausea, vomiting, ileus, mild abdominal distension and toxicity are encountered in severe form of the disease. Jaundice is present in 20-25% of patients with acute cholecystitis. Finally the natural course of the disease follows any one of the following patterns namely

- Resolution – complete
- Persistence of infection – empyema of gall bladder
- Resolution of inflammation within the gall bladder with persistence of cystic duct obstruction – mucocele
- Gangrene – perforation – peritonitis
- Fistula formation

This course of the disease is altered by medical intervention.

(2) Empyema (suppurative cholecystitis)

2-3% incidence

It presents as a tender mass in the right hypochondrium and usually affects elderly patients in whom systemic signs, including pyrexia and leukocytosis are more prominant. Cultures of the contents are positive in 80%. It doubles the mortality figures of cholecystectomy.

(3) Gangrene

Patchy gangrene of the fundus of the gall bladder is present in 5-7% patients. It is more commonly present in elderly patients, diabetics, and in

patients with empyema of the gall bladder, acute acalculous cholecystitis and especially emphysematous cholecystitis. It may lead to localized free perforation of the gall bladder.

(4) Perforation

Perforation may be localized with the development of a pericholecystic abscess or resulting in generalized infected biliary peritonitis which carries high mortality reported as 30-50%. A localized perforation may involve the duodenum with the development of cholecystoduodenal fistula and resolution of the inflammatory episode. However this biliary enteric fistula persists and passage of large stone through this fistula may eventually cause gall stone ileus.

(5) Chronic cholecystitis

Chronic inflammation of the gall bladder is most commonly due to stones and the patients with chronic cholecystitis complain of recurrent attacks of epigastric or right hypochondrial pain often radiating to right side of the back. The pain is more often persistent than intermittent. Nausea and vomiting may accompany episodes of persistent pain and the severe attacks of biliary colic. Jaundice may follow an attack and indicate common bile duct obstruction by a calculus. The only reliable sign which is frequently found on clinical examination is tenderness in the right upper quadrant.

(6) Silent stones

Indication for surgery.

Stone more than 2.5 cm, multiple stones, diabetic / immunosuppressed patients, if gallbladder wall thickened, high chances of developing gallbladder carcinoma

(7) Mirizzi syndrome

(8) Porcelain gallbladder

(9) Hydrops gallbladder

(10) Carcinoma gallbladder

IN THE BILE DUCTS:

(1) Obstructive jaundice

(2) Cholangitis

Acute bacterial cholangitis is a serious life threatening emergency caused by infection of the obstructed biliary tract. In severe cases of cholangitis, neutrophilic infiltration of the sinusoids and micro abscess formation in the hepatic lobules, portal thrombosis and areas of hepatic necrosis are seen. The infection is commonly caused by gram negative organisms. The classical triad of symptoms consists of pain in right hypochondrium, intermittent fever and jaundice(charcot's triad).complete triad is seen only in 70% of cases. The liver is often enlarged. Nausea, vomiting are frequent.

(3) Acute pancreatitis

IN THE INTESTINE:

(1) Biliary fistulous disease

The biliary enteric fistula due to gallstones are cholecystoduodenal, cholecystogastric, choledochoduodenal, cholecystocholedochal and cholecystocolic. Of these cholecystoduodenal is the commonest.

(2) Gall stone ileus

2% of patients with gallstones develop gallstone ileus. It is commonly present in elderly patients due to intraluminal intestinal obstruction by a large gall stone subsequent to a fistula either cholecystoduodenal or cholecystocolic. It presents commonly as small bowel obstruction and rarely as colonic obstruction. Most commonly, terminal ileum(70%) is the site of obstruction. Colonic obstruction is due to impaction in the colon as a result of cholecystocolic fistule. It is suspected when gas is present in biliary tree or gallstone is visualized in bowel lumen

(3) Acute intestinal obstruction

INVESTIGATIONS:

PLAIN ABDOMINAL X- RAY:

Only 10% gall stones are radio opaque and can be visualised. It will also show rare cases of calcification of gall bladder called as porcelain gall bladder. The importance of this appearance is an association with carcinoma in upto 25% patients. Rarely, the centre of a stone may contain radiolucent gas in a triradiate or biradiate fissure, and this gives rise to characteristic dark shapes on a radiograph – the 'Mercedes-Benz' or 'seagull' sign. Gas may be seen in the wall of the gall bladder(emphysematous gall bladder).

BIOCHEMICAL INVESTIGATIONS:

Blood count – the count will be elevated in case of acute cholecystitis with polmorphonuclear leukocytosis.

Liver function test – bilirubin(conjugated) will be elevated in case of obstruction in the biliary tract. Serum alkaline phosphatase is markedly elevated and amino tranferase enzymes are elevated. Urine urobilinogen is absent, in case of obstructive jaundice. Alteration in liver function tests may be due to long standing obstruction of common bile duct due to gall stone or due to repeated attacks of ascending cholangitis and hepatitis.

ABDOMINAL ULTRASONOGRAPHY:

Ultrasonography is non invasive and is now the standard initial imaging technique for the investigation of the patient suspected of having a gall stone and is also the prime investigation for the patient presenting with jaundice. Sensitivity of ultrasonography to detect cholelithiasis is 95 to 99%. It will demonstrate biliary calculi, the size of gall bladder, the thickness of the gall bladder wall, the presence of inflammation around the gall bladder, the size of the common bile duct and occasionally the presence of stones within the biliary tree. Endoscopic ultrasound using an endoscope which has a miniature ultrasound transducer mounted on its tip is valuable for detecting stones in or obstruction of the lower bile duct. It may prove unsatisfactory for technical reasons in the following obesity, previous surgery, ascites, gaseous distention of the upper abdominal viscera and distal part of common bile duct.

ORAL CHOLECYSTOGRAPHY:

Visualisation of gall bladder by giving radio opaque dye. Contrast media is given which is excreted by the liver into the bile after its absorption in the intestine. Iopanoic acid is taken as tablets on the night before the examination. A control radiograph is taken before the tablets are given and a series of radiographs are taken on the following day, with further films after a fatty meal. The fatty meal stimulates gall bladder contraction and reveals

the adequacy of gall bladder function. This investigation has been discarded by most hospitals because of its inaccuracy except to show diverticulae and polyps and to assess function. Gall stones are seen as filling defects in the form of translucent areas in opaque shade of gall bladder. If the gall bladder does not contract to one third of its size in response to fatty meal, it indicates malfunction and is often associated with stones.

INTRAVENOUS CHOLANGIOGRAPHY:

Biligrafin permits radiological visualisation of the bile ducts. 20 ml is injected very slowly into a vein. X rays are taken 10 to 40 mins after the injection. The biliary tract is frequently visualised due to higher concentration of the dye(about 50 to 100 times) with in the bile. For the gall bladder this investigation is inferior to oral cholecystography and it is not useful if bilirubin level is > 3mg%.

OPERATIVE CHOLANGIOGRAPHY:

Types - intra operative and post operative.

Techniques – cystic duct cholangiography, cholecystocholangiography, CBD cholangiography, trans hepatic cholangiography, post exploratory cholangiography.

During open or laparascopic cholecystectomy a catheter can be placed in the cystic duct and contrast injected into the biliary tree. The technique defines the anatomy and is mainly used to exclude the presence of stones

within the bile ducts. A single x ray plate or image intensifier can be used to obtain and review the images intra operatively. Irrespective of the technique used, the operating table should be tilted head down approximately 20 degree to facilitate filling of the intra hepatic ducts. Care should be taken when injecting contrast not to introduce air bubbles into the system, as these may give the appearance of stone and leads to a false positive result.

RADIO ISOTOPE SCANNING

Technetium 99m labelled derivates of iminodiacetic acid(HIDA,IODIDA) when injected intravenously are selectively taken up by the retro endothelial cells of the liver and excreted into bile. This allows visualization of the biliary tree and gall bladder. The gall bladder is visualised within thirty minutes of isotope injection in 90% of normal individuals and within one hour in the remainder. The bowel is usually seen within one hour in the majority of patients.Non visualization of the gall bladder is suggestive of acute cholecystitis.If the patient has a contracted gall bladder as often occurs in chronic cholecystitis, gall bladder emptying may be reduced or delayed. Biliary scintigraphy may also be helpful in diagnosing bile leaks and iatrogenic biliary obstruction. When there is a suspicion of a bile leak following a cholecystectomy, radio isotope imaging should be performed. Scintigraphy can confirm the presence and quantify

the leak thus helping the surgeon to determine whether or not an operative or conservative approach is warranted.

COMPUTERSIED TOMOGRAPHY

This imaging modality allows visualisation of the liver, bile ducts, gall bladder and pancreas. It is particularly useful in detecting hepatic and pancreatic lesion and is the modality of choice in the staging of cancers of the liver, gall bladder, bile ducts and pancreas. In addition the presence of enlarged lymph nodes or metastatic disease can be seen.

Gall stones are often not visualised and cholecystitis is underdiagnosed.However improvements in CT technology such as multidetector helical scanner that allow for three dimensional reconstruction of the biliary tree have led to greater diagnostic accuracy

MAGNETIC RESONANCE CHOLANGIO PANCREATOGRAPHY(MRCP)

It is an imaging technique based on the principles of nuclear magnetic resonance used to image the gall bladder and the biliary system. It is non invasive and can provide either cross sectional or projection images. Contrast is not required and using appropriate techniques, excellent images can be obtained of the biliary tree that demonstrates ductal obstruction, strictures or other intra ductal abnormalities. The images obtained are comparable to those from endoscopic retrograde cholangiopancreatography

or percutaneous transhepatic cholangiography without the potential complication of either technique.It is applicable irrespective of altered or pathological anatomy that precludes endoscopic retrograde cholangiopancreatography. eg. Duodenal stenosis, hepatico jejunostomy. Thus the trend is to replace diagnostic ERCP with MRCP and restrict ERCP to those patients who require endoscopic intervention (endoscopic sphincterotomy and stone extraction , stenting)

ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP)

In the prone position,using a side viewing endoscope the ampulla of vater can be identified and cannulated. Injection of water soluble contrast directly into the bile duct provides excellent images of the ductal anatomy and can identify causes of obstruction such as stones, malignant strictures.

Polythene cannula is made clear of air and flushed with 60% urograffin. The cannula is passed through the instrument taking care not to spill contrast medium into the duodenum since this stimulates peristalsis and makes cannulation difficult.Contrast medium is introduced slowly under fluoroscopic control. Both biliary and pancreatic ductal systems fill,but usually one duct fills first. If the pancreatic duct is filled first, contrast medium more than 2 to 2.5ml should not be injected. When the pancreatic

ductules at the tail are filled injection must be stopped, since overfilling will lead to extravasation and will cause pain. After pancreatography the tip of the cannula is readjusted to fill the biliary duct. Now 40ml of contrast can be used and preferably 25% hypaque is used to prevent obscuring of the small stones.

MAIN INDICATIONS

1. Jaundice—persistent and recurrent undiagnosed jaundice.
2. biliary tract problems—undiagnosed upper abdominal pain and post operative biliary symptoms.
3. Pancreatic diseases.

It is used for diagnostic and therapeutic purposes.

COMPLICATIONS FOLLOWING THERAPEUTIC INTERVENTIONS

1. Haemorrhage
2. Acute Pancreatitis
3. Cholangitis
4. Retroperitoneal duodenal perforation
5. Impacted dormia basket
6. Acute cholecystitis
7. Gall stone ileus—following extraction of large stones.

PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY (PTC)

This is an invasive technique in which the bile ducts are cannulated directly. It is only undertaken once a bleeding tendency has been excluded and the patient's prothrombin time is normal. Antibiotics should be given prior to the procedure. Usualy under fluoroscopic control, a needle (chiba or okuda needle) is introduced percutaneously into the liver substance in the 8^{th} inter costal space in mid axillary line. Under radiological control a bile duct is cannulated. Successful entry is confirmed by contrast injection or aspiration of bile. Water soluble contrast medium is injected to demonstrate the biliary system. Multiple images can be taken demonstrating areas of strictures or obstruction. It is used to provide external biliary drainage or the insertion of indwelling stents. The drainage catheter is placed in situ for a number of days and then dilating the track sufficiently for a fine flexible choledochoscope to be passed into the intra hepatic biliary tree inorder to diagnose strictures, take biopsies or remove stones.

If a malignant stricture at the level of the confluence of the right and left hepatic ducts or higher is suspected, a PTC is preferred to an ERCP.

COMPLICATIONS

1. Bleeding
2. biliary leak and biliary peritonitis
3. Septicemia

OPERATIVE BILIARY ENDOSCOPY (CHOLEDOCHOSCOPY)

At operation, a flexible fibreoptic endoscope can be passed down the cystic duct into the common bile duct enabling stone identification and removal under direct vision. The technique can be combined with an X ray image intensifier to ensure complete clearance of the biliary tree. After exploration of the bile duct, a tube can be left in the cystic duct remnant or in the common bile duct (a T tube) and drainage of the biliary tree established. After 7 to 10 days a track will be established. This track can be used for the passage of a choledochoscope to remove residual stone in awake patients. This technique is invaluable in the management of difficult stone disease and prevents the excessive prolongation of an operative exploration of the common bile duct.

TREATMENT

I. Non operative

II. Operative

(1) NON OPERATIVE TREATMENT

ORAL DISSOLUTION THERAPY

Chenodeoxy cholic acid and Ursodeoxycholicacid are two naturally occurring bile acids used for oral dissolution of gallstones.

CRITERIA FOR PATIENT SELECTION

1. Solitary stones

2. Normal gall bladder function

3. Stone size less than 15 mm radiolucent

4. Cholesterol stones

5. Patients with mild and tolerable symptoms

6. Patient's complaints should be reassured—treatment has a prolonged course

CONTRAINDICATION OF DISSOLUTION THERAPY

1. Chronic liver disease

2. Severe and prolonged symptoms

3. Non-functioning gall bladder

4. Radio opaque stones

5. Stones greater than 3 cm or multiple

6. Concomitant hepato biliary diseases , inflammatory bowel disease or peptic ulceration

MECHANISM OF ACTION

Chenodeoxycholic acid – specific inhibitor of HMG CoA reductase enzyme which is the rate limiting factor cholesterol bio synthesis.

Ursodeoxycholic acid –facilitates conversion of hepatic cholesterol to bile acids and also reduces the cholesterol absorption in intestine.

CHENODEOXYCHOLIC ACID

Naturally occurring primary bile acid(30 to 40% of bile acid pool) effective in reducing cholesterol saturation, alters the composition of bile by decreasing endogenous hepatic cholesterol synthesis and exogenous expansion of bile salt pool. Suppresses activity of HMG CoA reductase, a rate limiting enzyme for hepatic cholesterol synthesis. Dissolution takes place by molecule alteration of cholesterol from crystalline form to unsaturated mixed micelles. Dose 12 to 15 mg /kg/day as a single dose at bed time with a low cholesterol diet.

URSODEOXYCHOLIC ACID

A seven beta hydroxyl epimer of chenodeoxycholate which is a primary bile salt of bears. Absorbed from the intestine, undergoes entero hepatic circulation, and gets conjugated with glycine and taurine with the liver. Apart from mechanism of action similar to CDCA it also causes increased bile output and decreases absorption of cholesterol from the gut. Dose 8 to 10 mg /kg /day or 600mg taken at bed time for 6 to 12 months.

CONTACT DISSOLUTION THERAPY

A 5 French pigtail polyethylene catheter is inserted percutaneously into gall bladder under fluoroscopic control. Dissolution agent is repeatedly instilled and aspirated (10 ml is instilled and exchanged every 45 mins) agitating the gall bladder contents. Dissolution occurs within hours to days.

The procedure is terminated by removing the catheter and inserting a gel foam plug to prevent bile leakage. The solution should not be infused under pressure, should have a free access to the intestine and should not leak into peritoneal cavity.

CHEMICALS USED

1. Methyl ter-butyl ether :an aliphatic ether that effectively dissolves cholesterol stones. It is toxic to the CBD. It's complications include hemolysis, duodenitis, mild anaesthesia, nausea and vomiting. An inflammable and toxic compound that can cause haemorrhagic peritonitis.Complication rate is 50 %

2. Mono octanoic acid : A medium chain triglyceride effective as a cholesterol solvent. A solution buffered to PH7.4 infused at 3 to 7 ml per hour would dissolve a stone in 5 days. success rate reported between 50 to 80 %. When infused under pressure may cause respiratory distress or if it enters the duodenum results in diarrhoea, vomiting and abdominal cramps. Contact dissolution therapy in its present form is unlikely to have a clinical impact except in specialised centres with special equipment and requisite skill. Development of newer and safer solvents and in combination with other modalities like ESWL, trans catheter fragmentation using lasers , it may in the future find an application.

CHEMICAL CHOLECYSTECTOMY

This procedure is used with cholecystolithitomy which allows access to the gall bladder. It may become an important method of preventing stone recurrence because of the advent of non operative procedures as a treatment modality for gall stones. It has two components: Gall bladder ablation and cystic duct obstruction. A number of chemical sclerosants have shown to destroy gall bladder mucosa but reepithelialisation takes place from the cystic duct. Cystic duct occlusion using a bipolar electro coagulation catheter has overcome this. Thus chemical cholecystectomy in combination with stone removal in one stage offers a theoretical option for managing gall bladder stones and preventing recurrences. However this procedure is still in experimental stage and such an ablative iatrogenic procedure may possibly increase the likelihood of gall bladder cancer.

EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY (ESWL)

It is produced by spark gap (Dornier system),piezoceramic(Wolf system) or electromagnetic (Siemens system) generators which are focused by a concave reflector and targeted under ultrasound guidance to the stones there by inducing fragmentations. The third generation machines avoid the need for immersion in a water bath and general anaesthesia.

INCLUSION CRITERIA

1. Symptomatic gallstones

2. Single radiolucent gallbladder stone with a diameter 3cm as determined by ultrasound or upto 3 stones totalling a similar stone volume

3. Functioning gallbladder on oral cholecystogram

4. Calcification criteria. Stones with a calcified rim 3cm or less in size, not stones with diffuse calcification or multiple calcified stones or stones with a calcified nucleus.

EXCLUSION CRITERIA

1. Pregnancy
2. Symptomatic and proven peptic ulceration
3. Elderly with severe cardiac or respiratory complaints or with back problems who are unable to lie prone for 30 mins
4. Radiological evidence of CBD stones
5. Jaundice/ hepatitis/ cirrhosis
6. Acute cholecystitis
7. Acute pancreatitis
8. coagulopathy
9. Vascular aneurysm

MORBIDITY FOLLOWING ESWL:

1. Hematuria – 3%

2. Petichiae at cutaneous entry site – 4%
3. Biliary pain by passage of fragments through biliary tree – 35%
4. Transient cystic duct obstruction – 5%
5. Pancreatitis – 1%

Under the current criteria only 0 – 20% of all symptomatic and uncomplicated gall bladder stones can be treated with ESWL. The technology of ESWL for a gall stone will improve with time, increasing the efficacy of stone fragmentation while maintaining a low level of discomfort for the patient. Long term follow up studies are needed to define the place of ESWL in management of gall stone.

(2)SURGICAL TREATMENT:

1. OPEN CHOLECYSTECTOMY
2. LAPARASCOPIC CHOLECYSTECTOMY
3. CHOLECYSTOSTOMY

OPEN CHOLECYSTECTOMY:

Indications:

- Calculous cholecystitis with or without symptoms
- Acute or chronic acalculus cholecystitis
- Torsion of gall bladder
- Trauma to the gall bladder

- Carcinoma gall bladder
- Biliary peritonitis with or without demonstrable perforation
- Following cholecystostomy

a. As a second stage procedure
b. Where there is persistent biliary or mucous discharge
c. In patients with recurrent gall stones treated by non operative modality

Position of the patient: Patient should lie in supine position with operating table slightly tilted up on the right.

Incisions: Upper midline, right paramedian or right subcostal (Kocher's) incisions are used.

Adhesions between gallbladder and adjacent viscera are freed. If the gallbladder is tense it is aspirated. The most important step is to pack the operative field with three gauze packs.

i) Placed over the hepatic flexure of colon.

ii) Placed over the 1st part of duodenum and stomach.

iii) Placed over the under surface of the right lobe of liver medial to gallbladder and held in place by means of retractor.

Open Cholecystectomy done by two methods:

1) Fundus first method
2) Duct first method (retrograde)

Fundus first method:

1. Gallbladder fundus held with sponge holding forceps all adhesions are cleared from gallbladder bed. Cystic artery is isolated, separated and ligated close to the gallbladder, cystic duct is dissected and traced to its junction with CHD and ligated and divided.
2. Gallbladder with its contents are removed.

Duct first method:

Fundus of the gallbladder held with sponge holding forceps and drawn downwards and outwards.Hartman's pouch is held with another tissue forceps and is drawn downwards and to the right so that the calots triangle with cystic artery is exposed.Cystic artery is ligated close to the gall bladder wall and divided.By ligating cystic artery, subsequent dissection can be carried out without any danger of haemorrhage. The junction of cystic duct, CHD and bile duct is recognized and clearly dissected out. Cholangiography is carried out and then cystic duct is ligated and divided. Peritoneum is incised at the gallbladder margin and cleavage plane between liver and gallbladder made using blunt dissection. Vessels in the gallbladder bed are controlled by diathermy coagulation. Drainage tube is put in the region of divided cystic duct and brought outside through

separate stab incision

ADVANTAGES OF OPEN CHOLECYSTECTOMY:

a. Eradication of more specific symptoms of gall stones
b. Prevents complications of gall stones
c. No recurrence of gall stones
d. Procedure allows full inspection of abdominal viscera

DISADVANTAGE OF OPEN CHOLECYSTECTOMY:

a. Requires hospitalisation for 7 – 10 days
b. Inflicts considerable discomfort to the patient
c. About 47%of patients continue to complain of some persistence of symptoms.

Post cholecystectomy syndrome is due to

a. Retained stones in the bile duct
b. Long cystic stump remnant
c. Ampullary stenosis
d. Sphincter of oddi dysfunction

COMPLICATION:

- Haemorrhage
- Biliary injury and stricture
- Biliary fistula
- Post operative jaundice

- Accumulation of bile in right sub phrenic or sub hepatic region leads to waltman walter's syndrome
- Infection

MINI CHOLECYSTECTOMY:

A standard mini cholecystectomy is performed through a 5 cm midline incision using special instruments and the modern fixed retractor system for exposure. This limited exposure prevents a full abdominal exploration and hence leads to less post operative discomfort, paralytic ileus and quicker recovery thereby reducing the hospital stay which are the chief drawbacks of the standard cholecystectomy.

A more recent modification has been described as "CYLINDRICAL CHOLECYSTECTOMY".

The operation is based on the introduction of a 3.8 – 5.0cm diameter cylinder that is 10cm long which isolates the hepatocystic region from the surrounding structures and thus facilitates the intervention.

PARTIAL CHOLECYSTECTOMY(SUBTOTAL CHOLECYSTECTOMY):

In case of severe adhesion and difficulty in identifying calot's triangle, gall bladder fundus is opened first and the stones and contents were removed. Then subtotal resection of the gall bladder is done leaving the posterior wall attached to the hepatic bed.

A modification using a 1 cm rim of hartmann's pouch to buttress and occlude the intestinal opening of the cystic duct and leaving the structures of calots triangle undisturbed.

LAPAROSCOPIC CHOLECYSTECTOMY:

In 1987, first cholecystectomy was done in France and in 1989 in the US. This technique is gaining popularity in India. It is based on the good cosmetic result, rapid resolution of post operative pain, and a reduction of hospitalization with the ability to return to work soon after surgery.

Indications :

1. Cholelithiasis
2. Symptomatic gall bladder polyps
3. Resolving gall stone pancreatitis
4. Symptomatic chronic cholecystitis

Contraindication:

Relative:

1. Acute cholecystitis
2. Prior upper abdominal surgery
3. Common bile duct stones
4. COPD with acidosis and hypercarbia
5. Mirizzi's syndrome

Absolute:

1. Acute cholangitis
2. Severe acute cholecystitis
3. Acute pancreatitis
4. Peritonitis
5. Portal hypertension
6. Pregnancy
7. Serious bleeding diathesis

Complications:

1. Bleeding- slipped clip
2. Bile leak
3. Bowel injury
4. Biliary injury

Procedure : The procedure is performed under general anaesthesia or epidural anaesthesia. Urinary bladder is emptied. Stomach is decompressed using, nasogastric tube.

Initiation of pneumoperitoneum and placement of canulas.

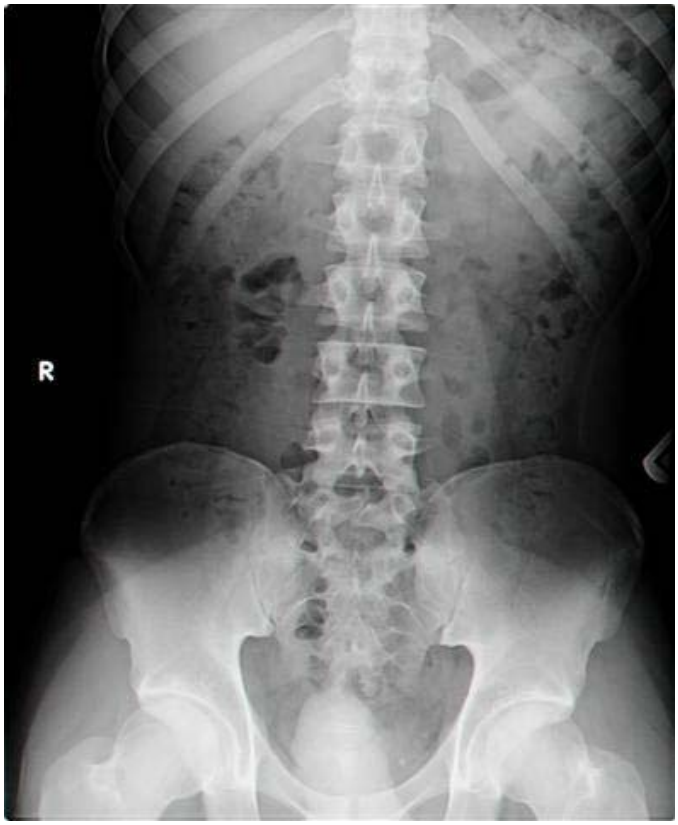
½ inch incision is made just above the umbilicus and verres needle introduced into the abdominal cavity through trocar and canula . The needle is connected to the CO_2 insufflator and peritoneum is instilled with CO_2 upto 12 mmHg pressure is reached. Rate of flow of CO_2 is 6- 10 litre/min. Laparoscope is inserted and abdominal cavity is inspected. Second canula inserted in the upper abdomen $2/3^{rd}$ of way between the umbilicus and xiphisternum. One 5.5 mm cannula is inserted 3- 4 cms below right costal margin (RCM) in the mid clavicular line (MCL). Second 5.5 canula is inserted 4- 6 cm below right costal margin in mid axillary line.Umbilical canula is used to introduce endoscope (11mm). The two 5.5 mm ports are used to retract and expose the gallbladder. The operative procedure is similar to antegrade cholecystectomy(fundusfirst)

CHOLECYSTOSTOMY:

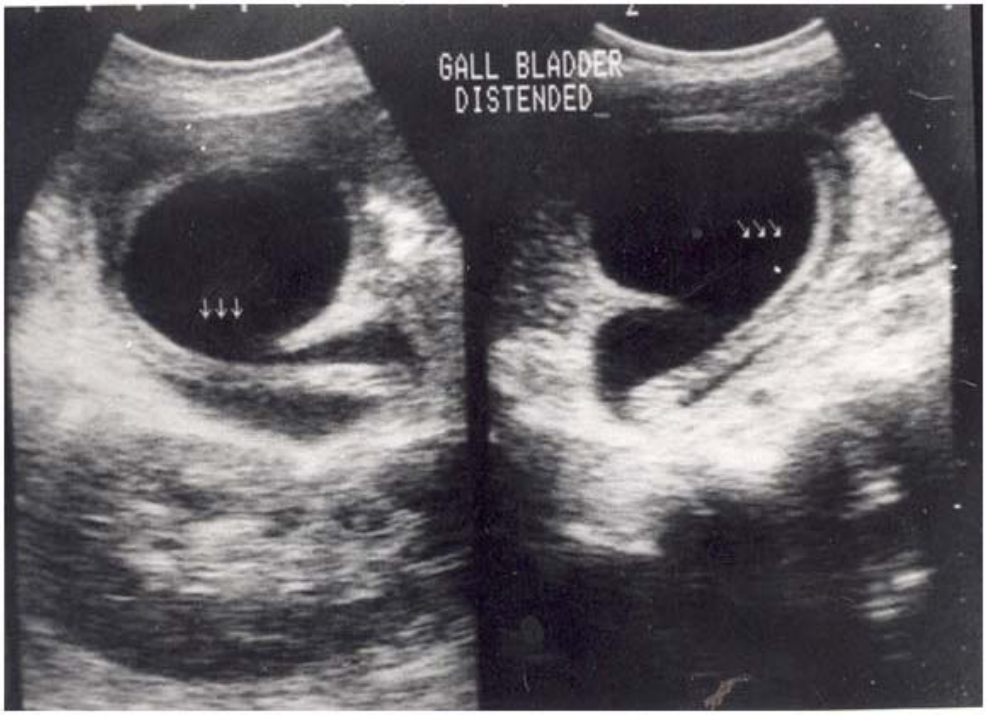
This option of simple drainage of gall bladder combined with removal of any stones is occasionally indicated

a. If it deemed that a cholecystectomy would be technically difficult- Severe inflammatory changes rendering the anatomy obscure.
b. In poor risk patients
c. For a preliminary drainage of the biliary tree obstructed by tumour in whom later resection is contemplated.

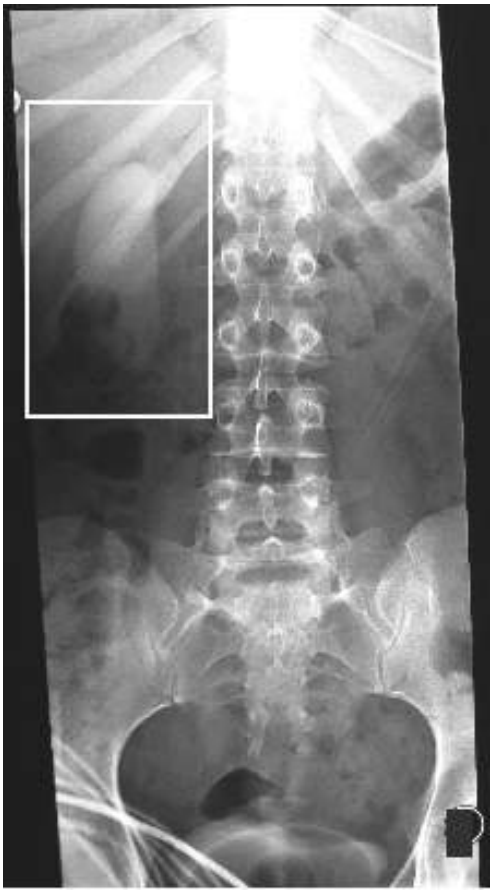
Usually performed via a sub costal incision under a local or regional anaesthesia. A T tube cholangiogram and definitive surgery is performed after an interval of 6 to 12 weeks.

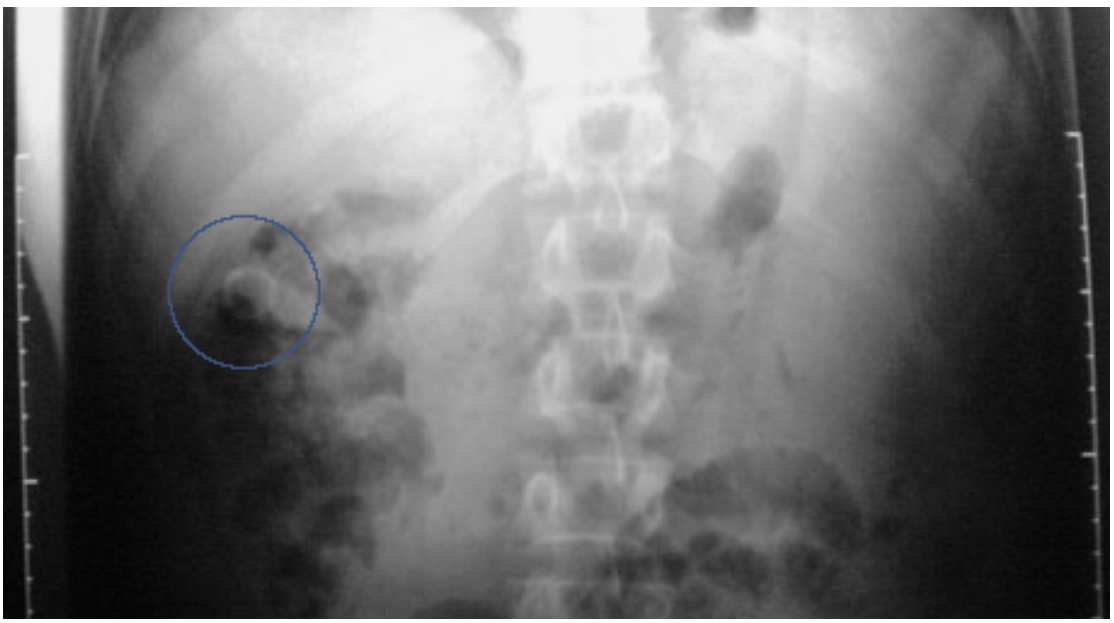


Plain x-ray of abdomen showing gallstones

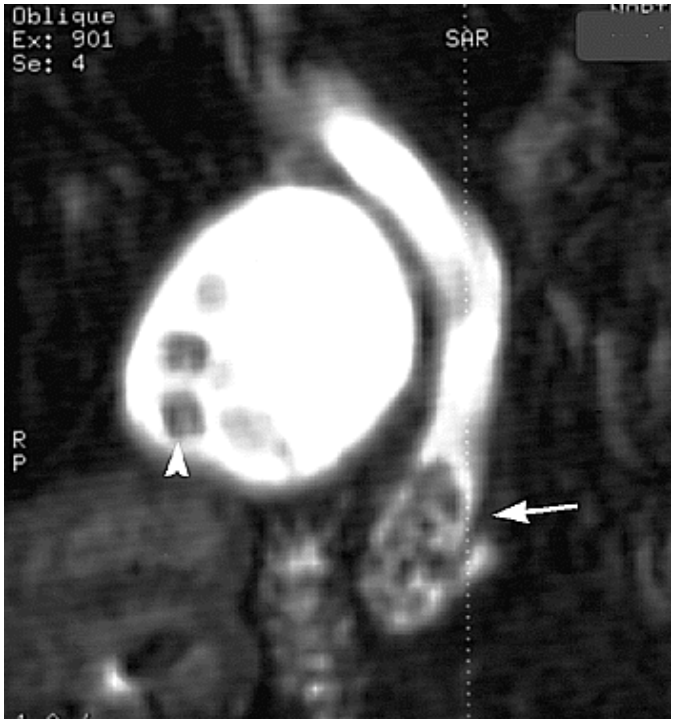


Ultrasound abdomen showing gallstones in gallbladder



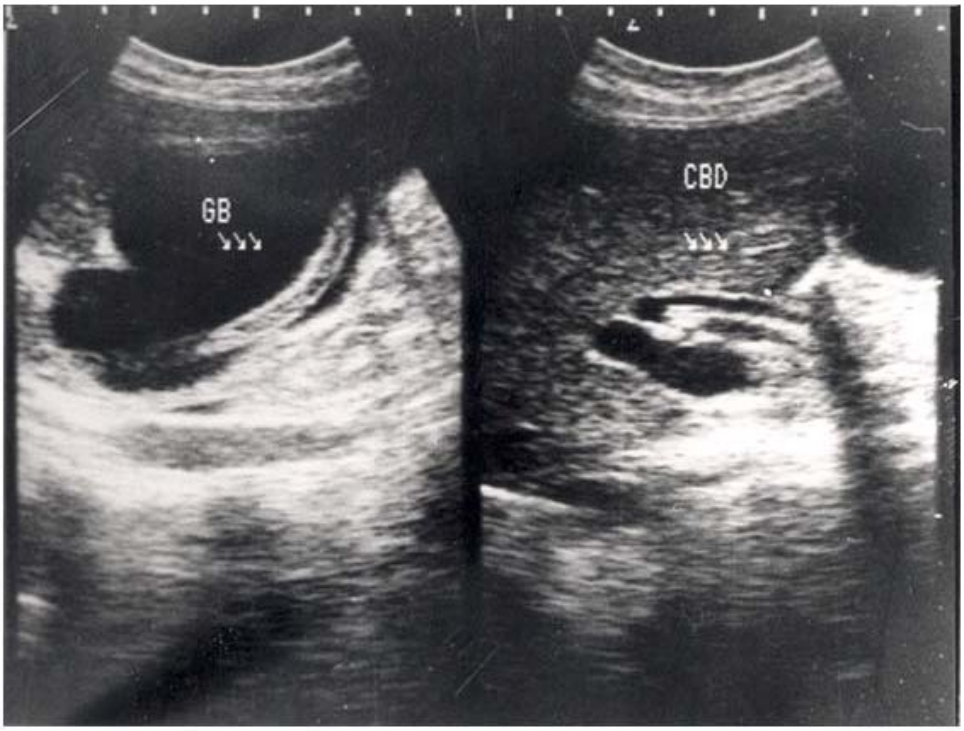


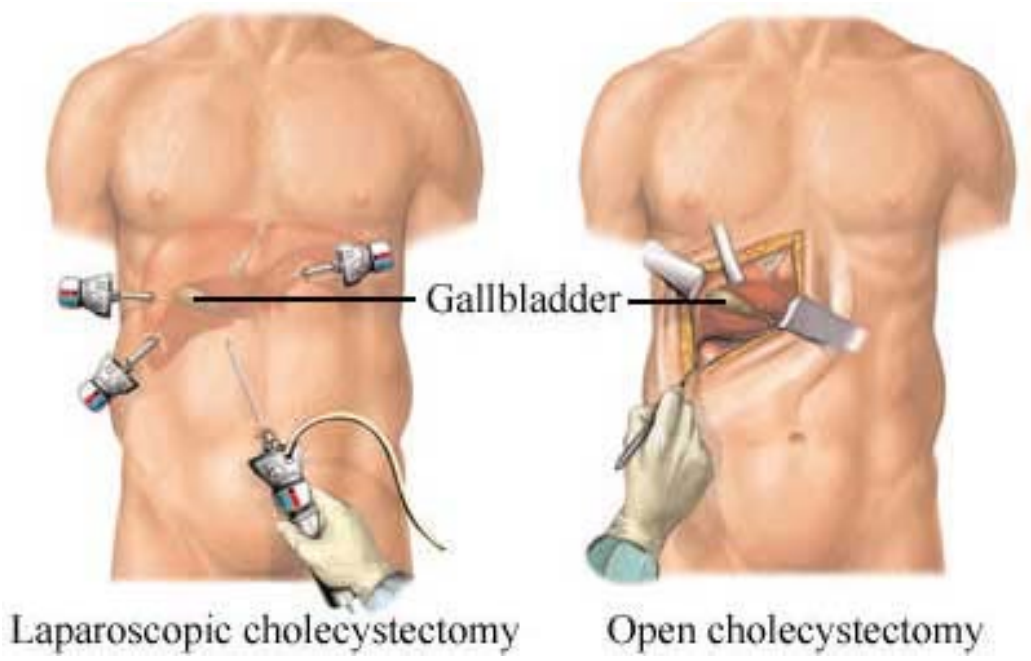
Oral cholecystogram showing gallstones in the gallbladder



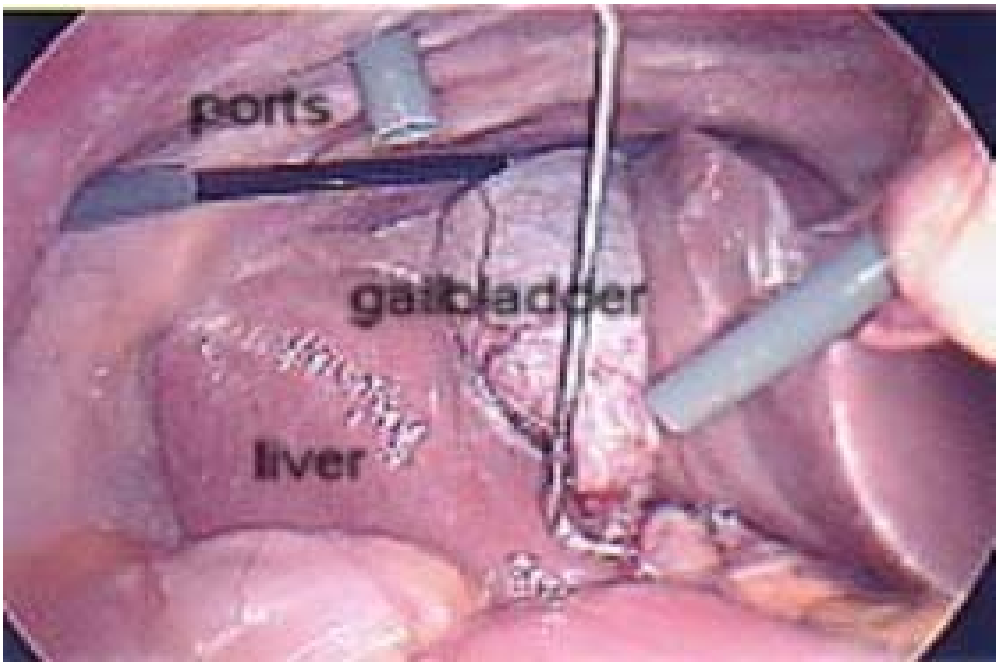
Cholecystogram

Ultrasound showing Gallstones in the gallbladder

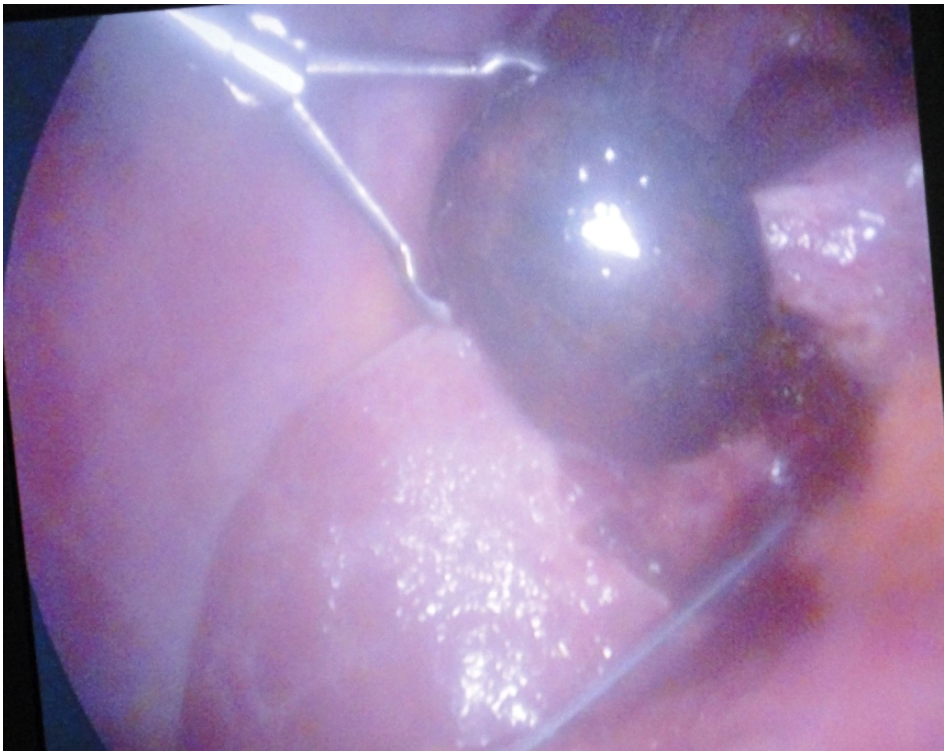


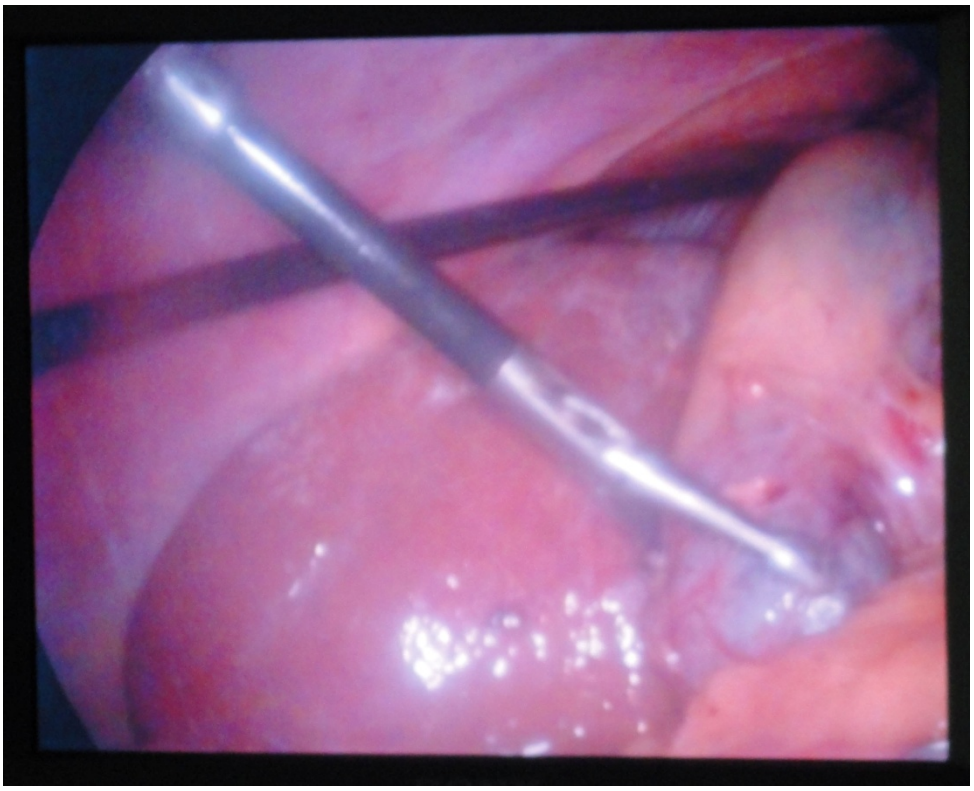


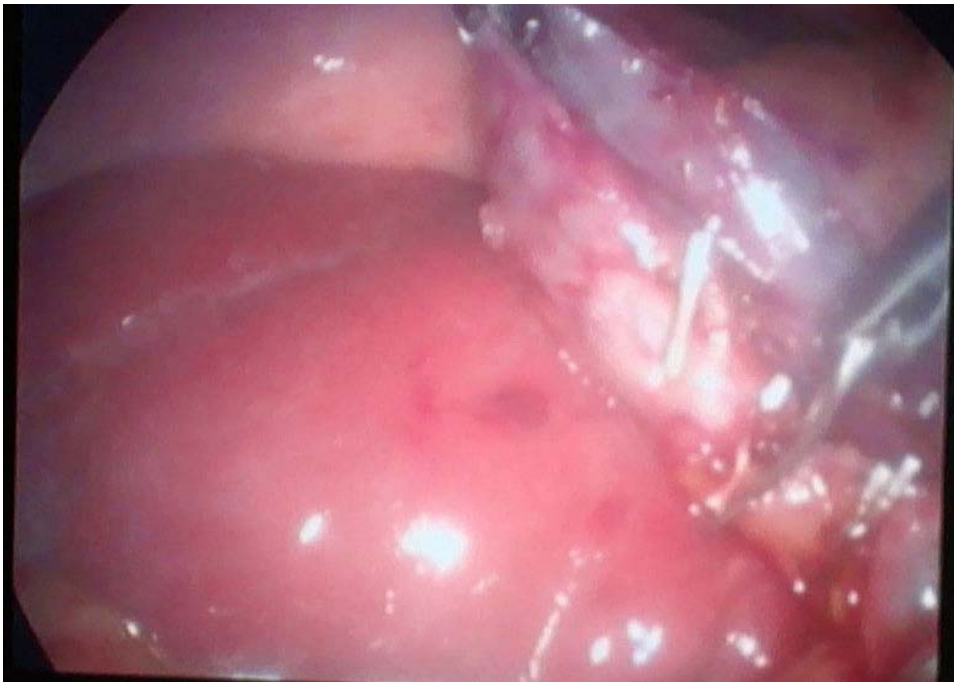
Mini Laparoscopic Cholecystectomy

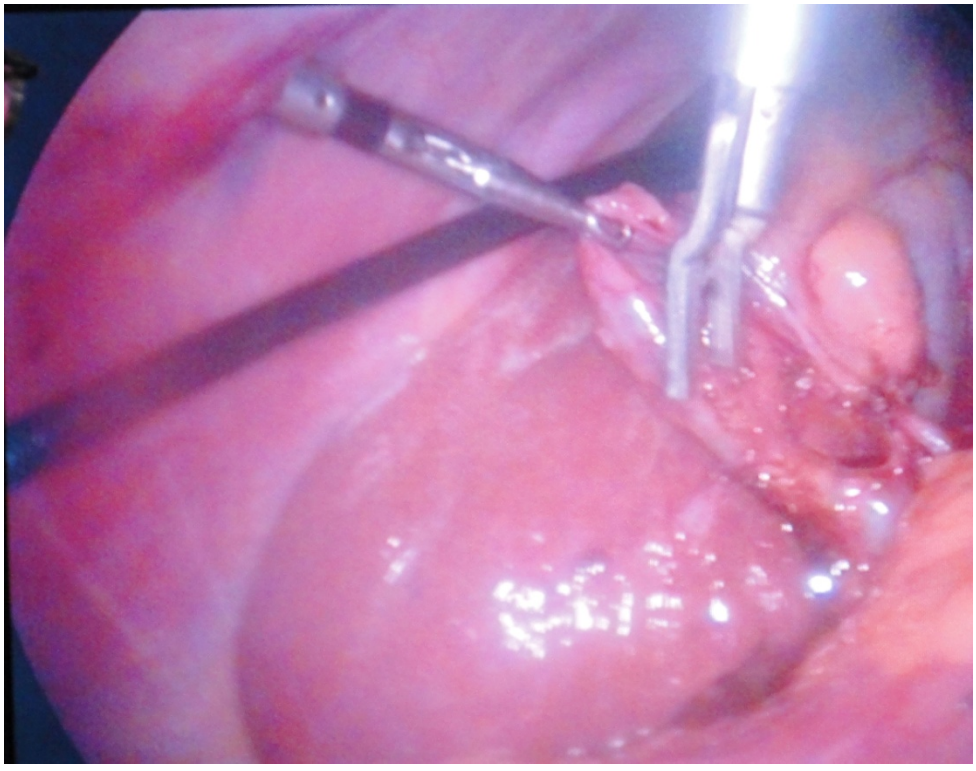


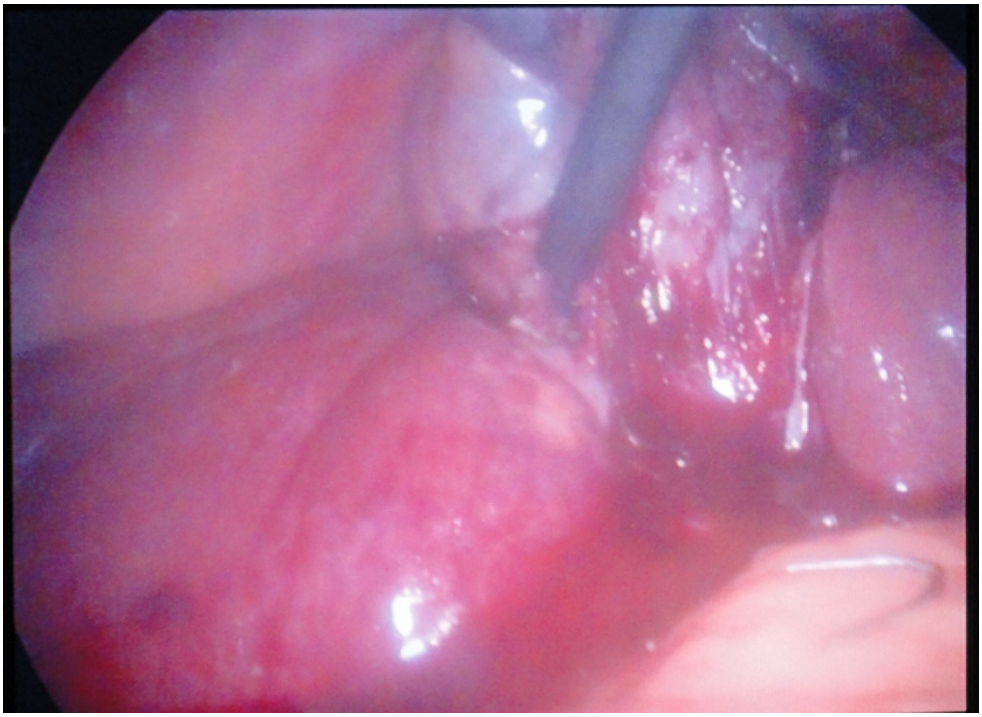
Laparoscopic cholecystectomy

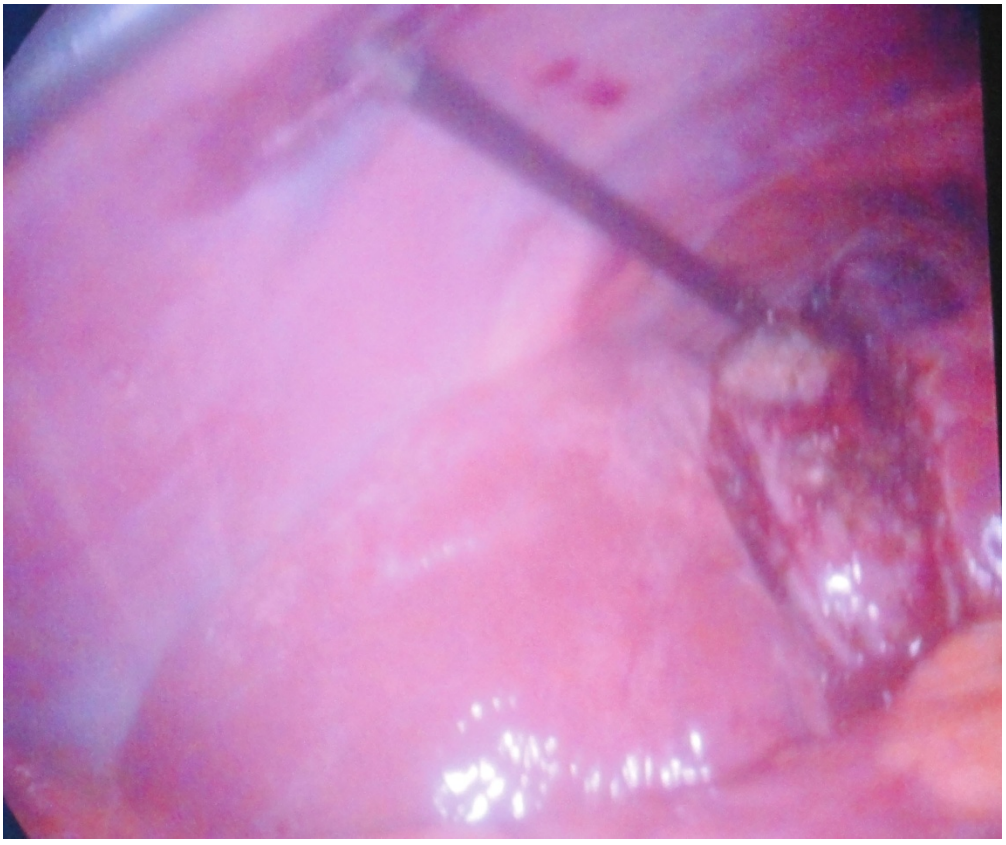


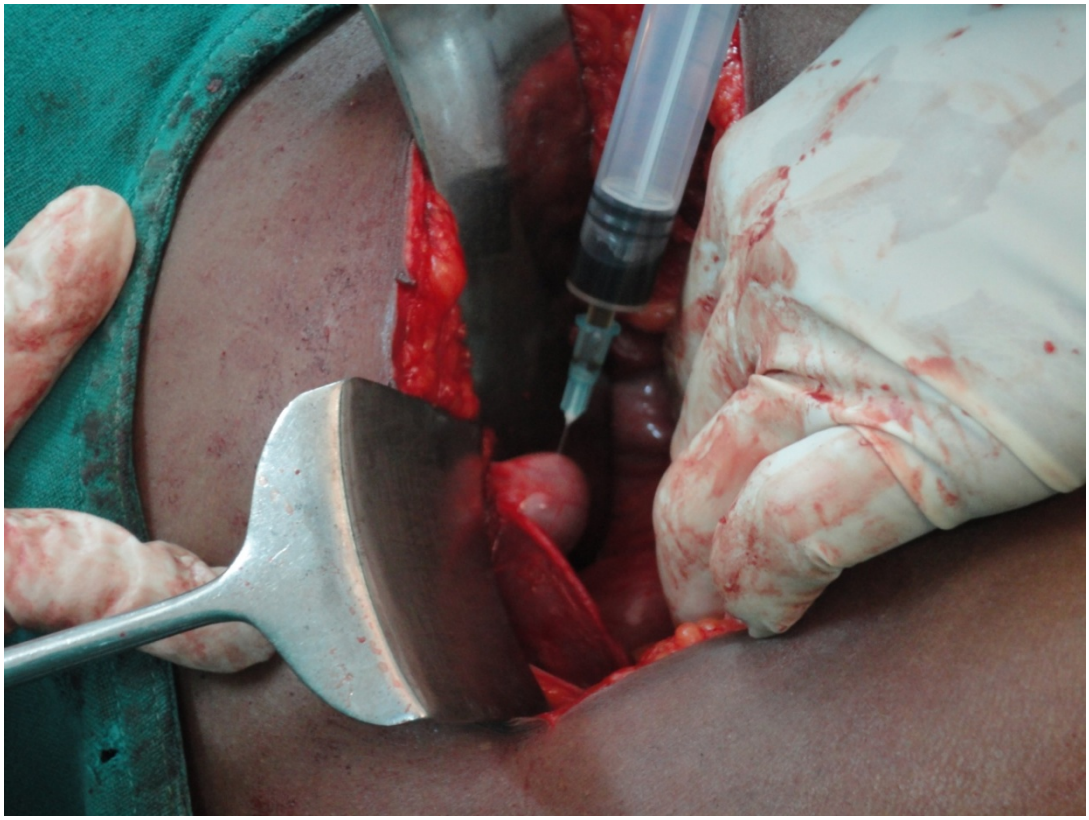




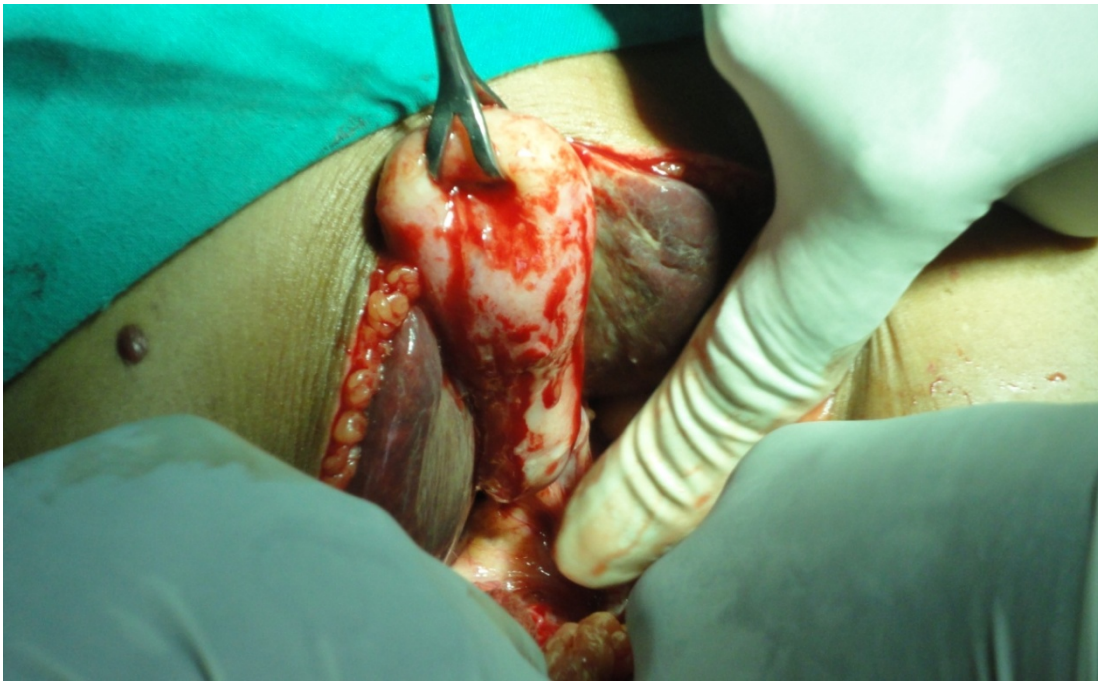




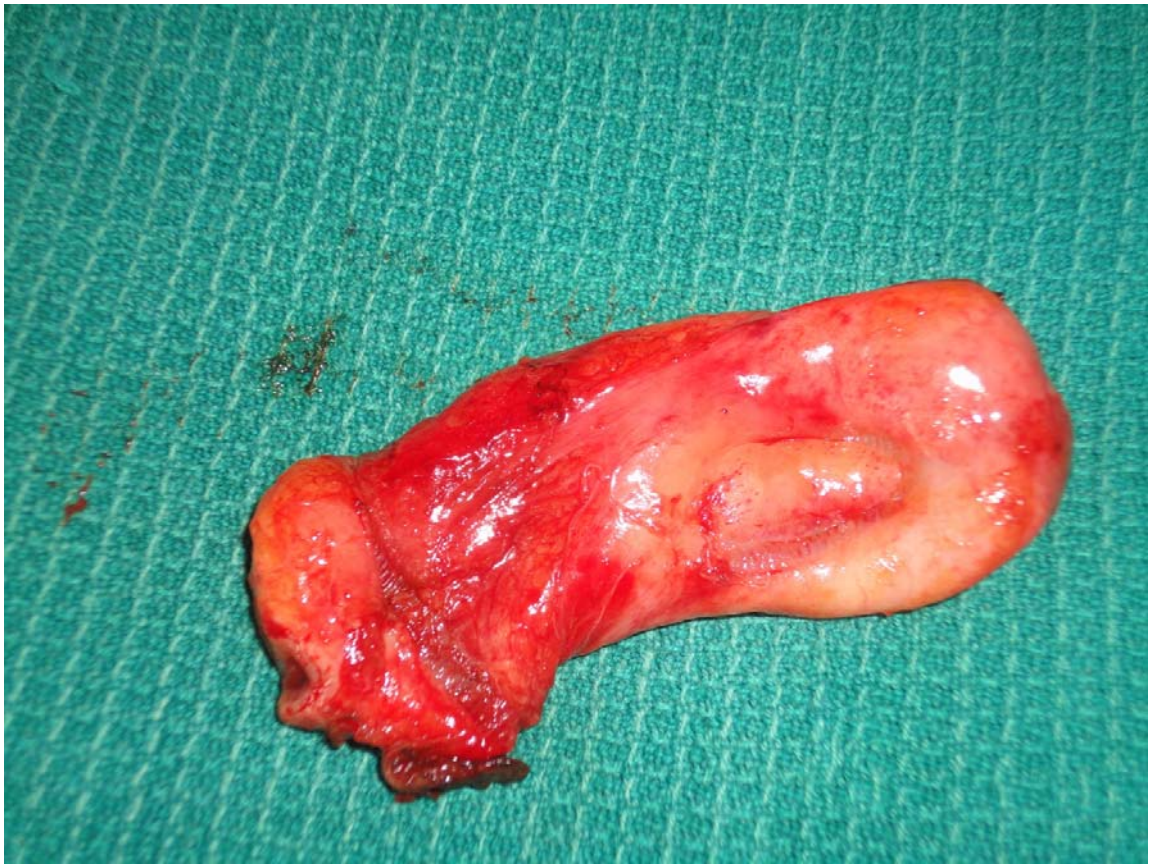


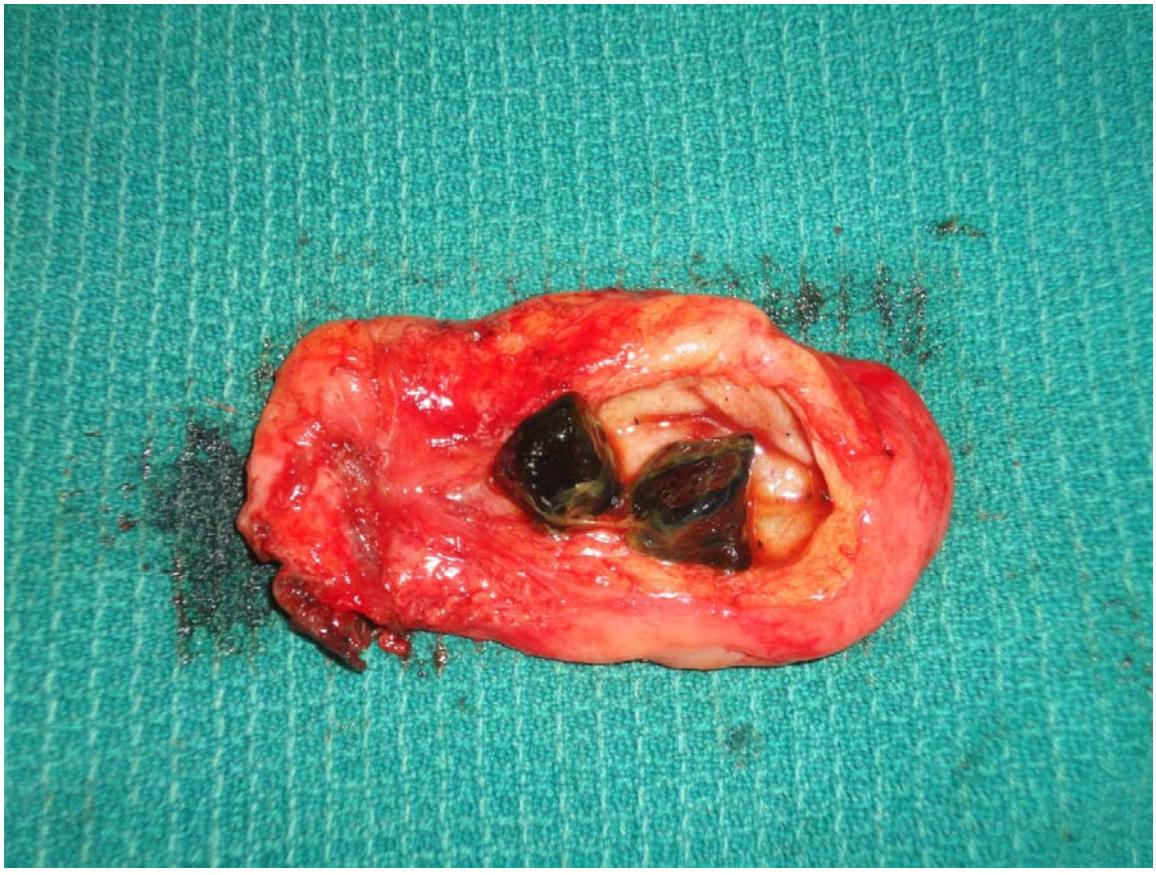


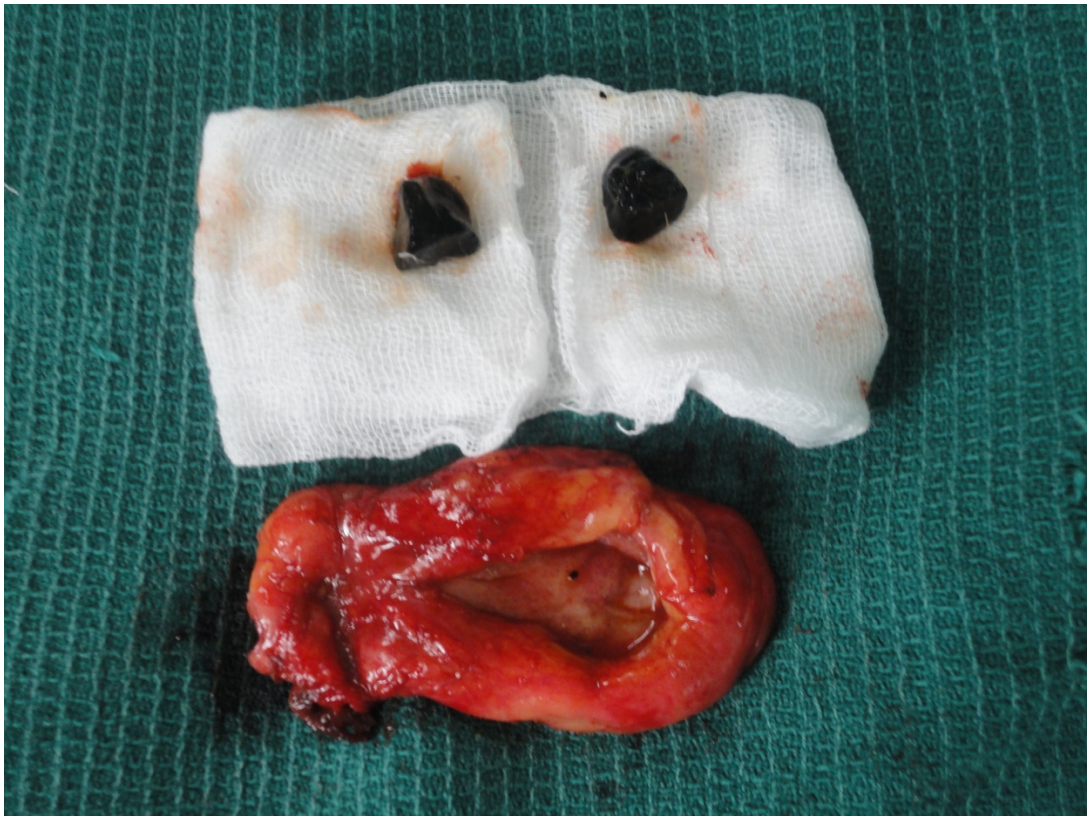
COLLECTION OF BILE FOR CULTURE



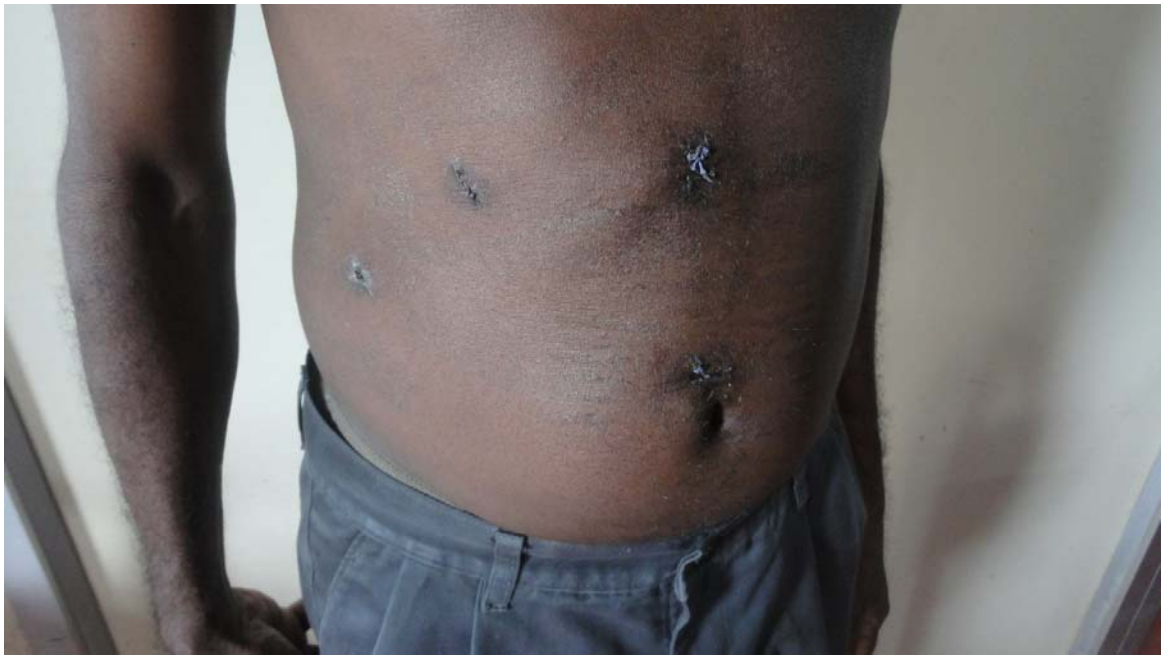
OPEN CHOLECYSTECTOMY



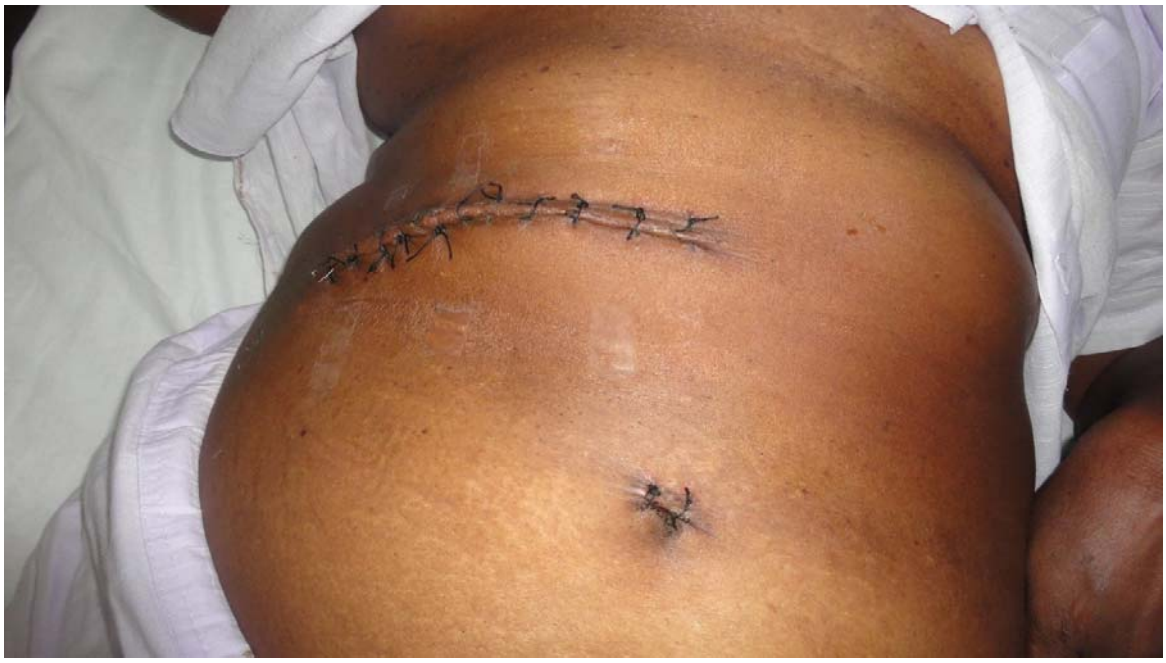




LAPARASCOPIC CHOLECYSTECTOMY

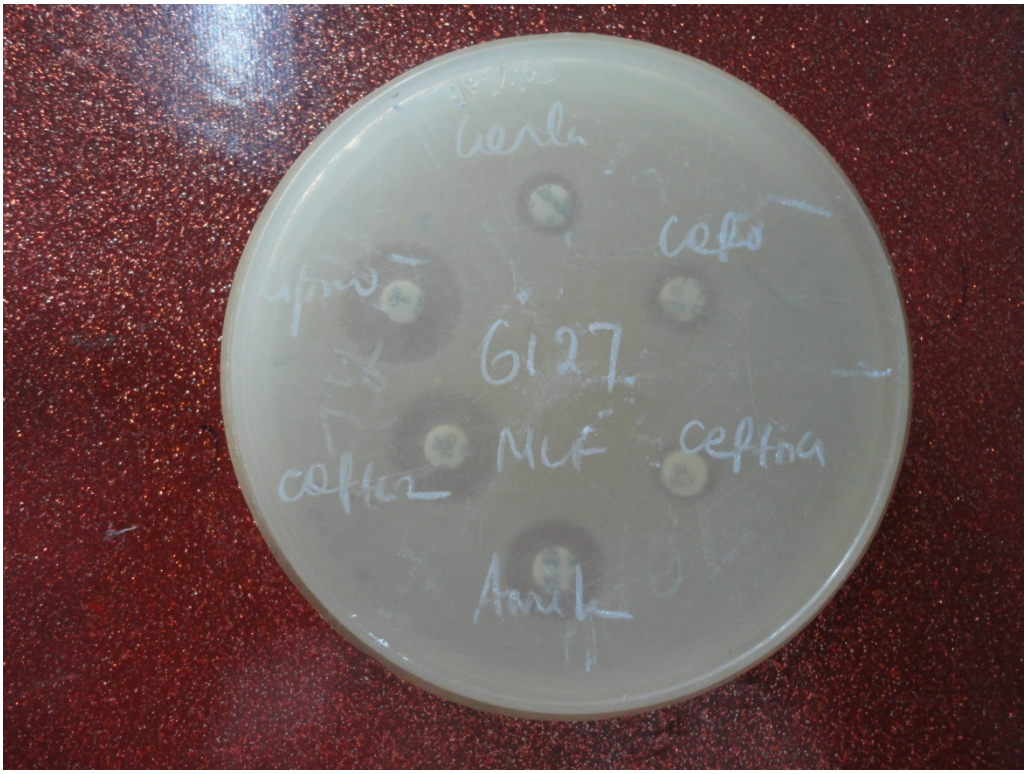


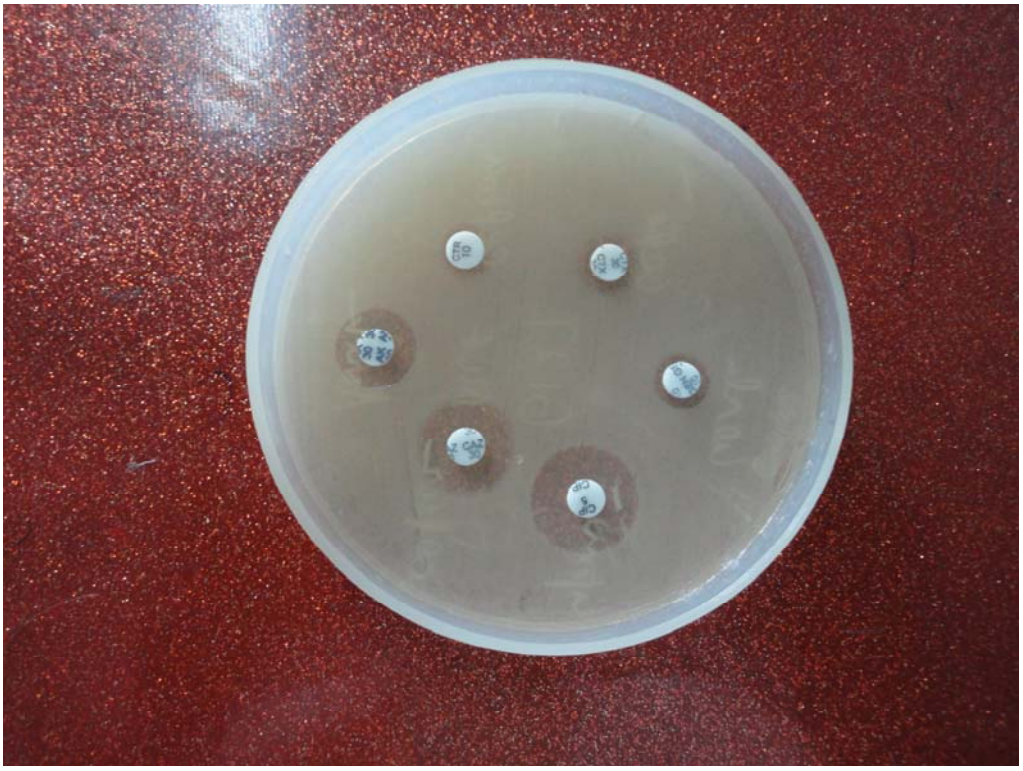
LAPRASCOPIC CHOLECYSTECTOMY



LAPARASCOPY CONVERTED TO OPEN CHOLECYSTECTOMY

PETRI DISH WITH CULTURE MEDIA





ANTIBIOTIC SESTIVITY TEST

METHODOLOY

Source of data :

Patients admitted to Tirunelveli Medical College Hospital with the diagnosis of Gallstone disease were taken for this observational study from March 2011 to October 2012.

Type of study:

It is a prospective study.

Inclusion criteria :

- Patients of age >12 years and <65 years

All proven cases of gallstone disease who got admitted to the hospital for cholecystectomy both open and laparoscopic cholecystectomy.

Exclusion criteria :

Acute cholecystitis

Acute acalculus cholecystitis Emphyema gall bladder Mucocele of the gall bladder

Jaundice patients

Gallstones with multiple common bile duct stones (multiple CBD and intrahepatic stones).

Patients who refused surgery

TOTAL NUMBER OF PATIENTS : 50

Proforma: Details of proforma and master chart attached in the annexure

Sample collection :

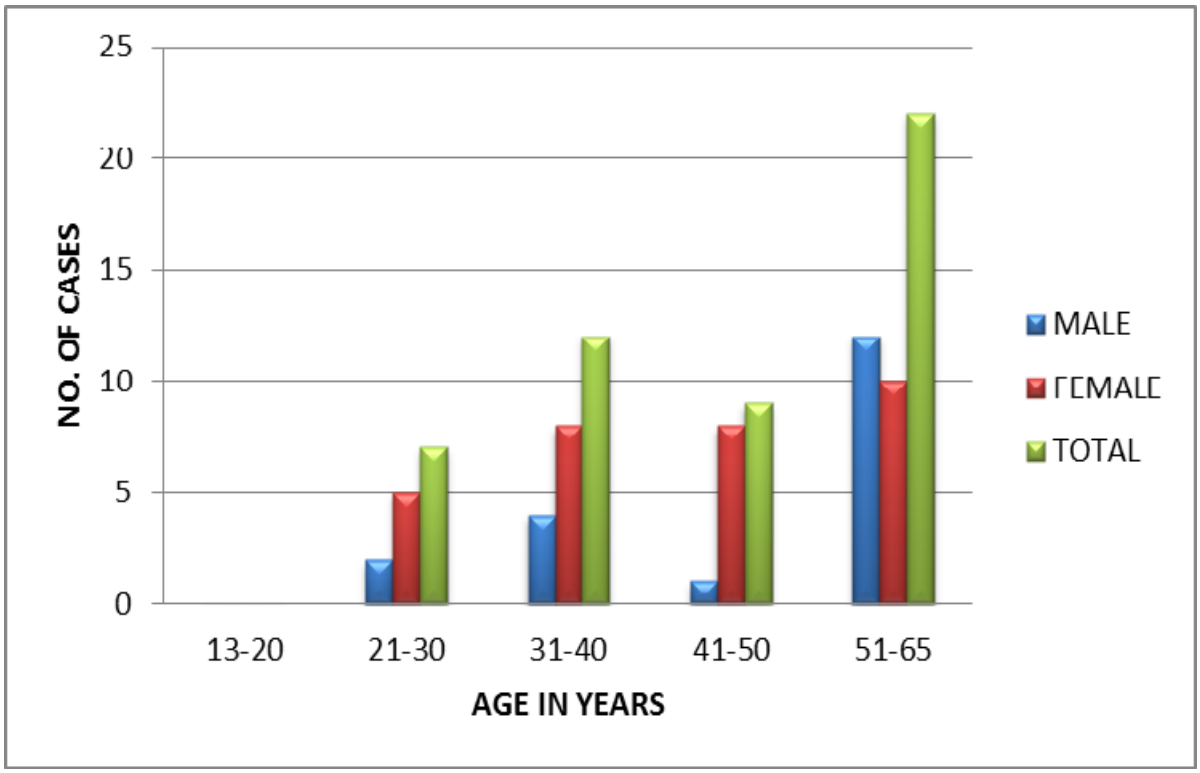
a) Bile :

Bile was aspirated from the gallbladder of the patient who underwent open cholecystectomy using a sterile syringe (5ml) .In case of laparoscopic cholecystectomy, bile was collected from excised gall bladder. The sample was collected in sterile bottle and was transferred to microbiology laboratory. In the laboratory the bile sample was inoculated in the basal media like nutrient agar, MacConkey agar, blood agar in the temperature of 37^{o}c and the results were read after 18-24 hours for growth of organisms. Identification of species was done using biochemical tests like indole test, citrate test, urease test, TSI test, oxidase test, gram staining, motility test. Antibiotic sensitivity testing was done after identification of the organism. Antibiotic sensitivity test was done with amikacin, gentamycin, ciprofloxacin, ceftazidime, cefotaxime, ceftriaxone, cotrimoxazole, ceftazidime + clavulanic acid

AGE AND SEX DISTRIBUTION

In our study the age group of 51 – 65 years was more commonly affected, 22 among 50 cases were found to belong to this group. Females were more commonly affected in the ratio of 3:2.

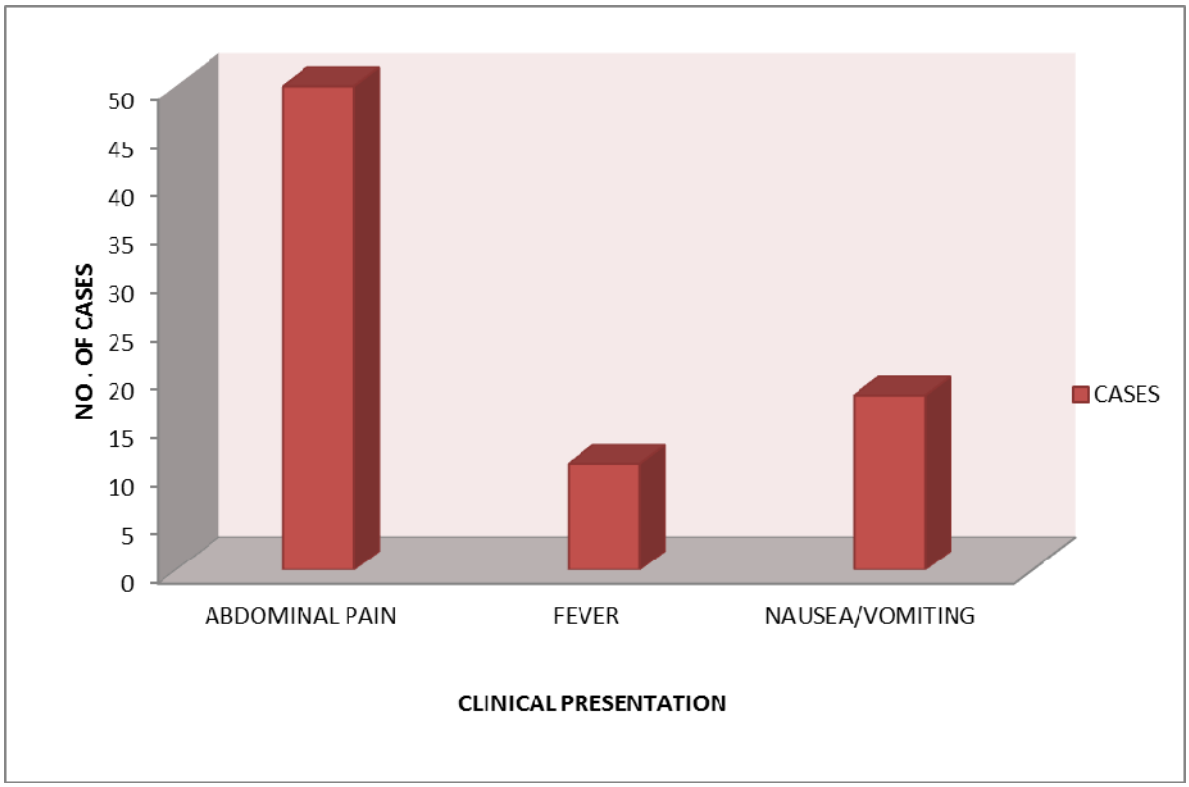
AGE	MALE	FEMALE	TOTAL
13-20	0	0	0
21-30	2	5	7
31-40	4	8	12
41-50	1	8	9
51-65	12	10	22
TOTAL	19	31	50



CLINICAL PRESENTATIONS OF GALL STONE

The most common clinical presentation among the cases studied was abdominal pain, all the cases studied presented with abdominal pain. The second most common presentation was nausea/vomiting, which was the presenting symptom in 18 cases.

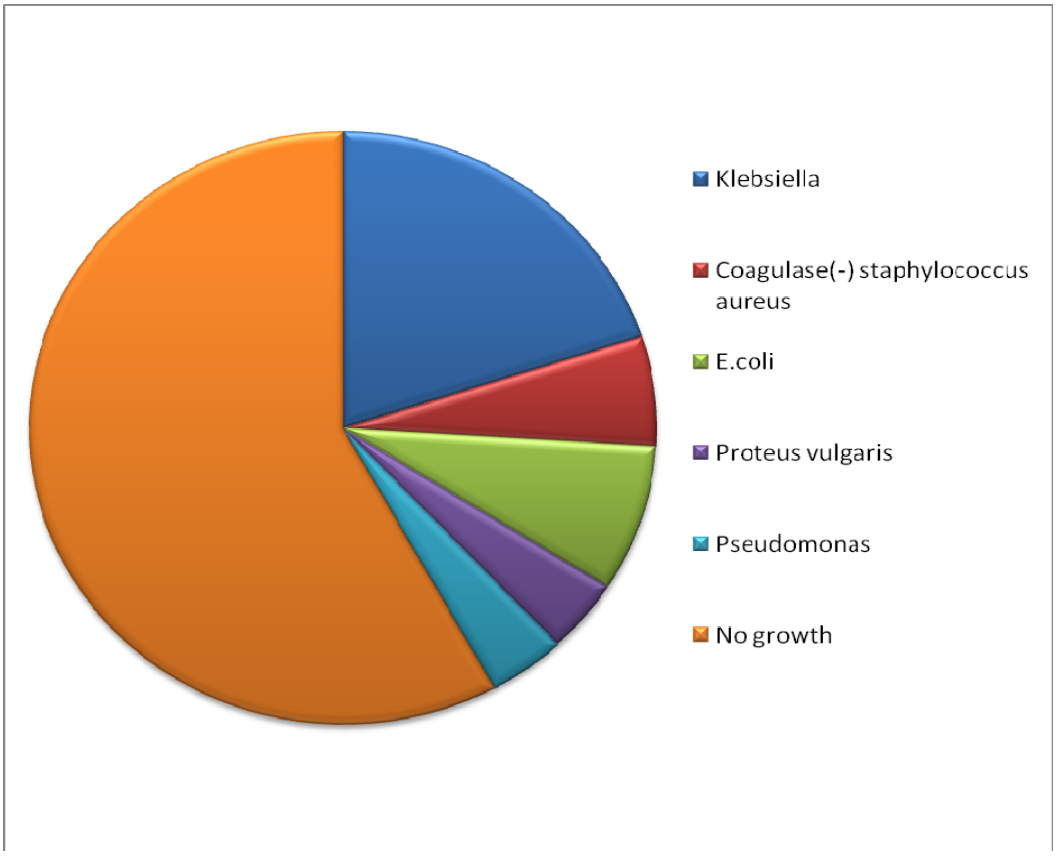
PRESENTATION	CASES
ABDOMINAL PAIN	50
FEVER	11
NAUSEA/VOMITING	18



BACTERIOLOGY OF BILE CULTURE IN GALL STONE DISEASE

Culture reports of the bile revealed organism in 21 cases. KLEBSIELLA was the most common organism followed by E-Coli.

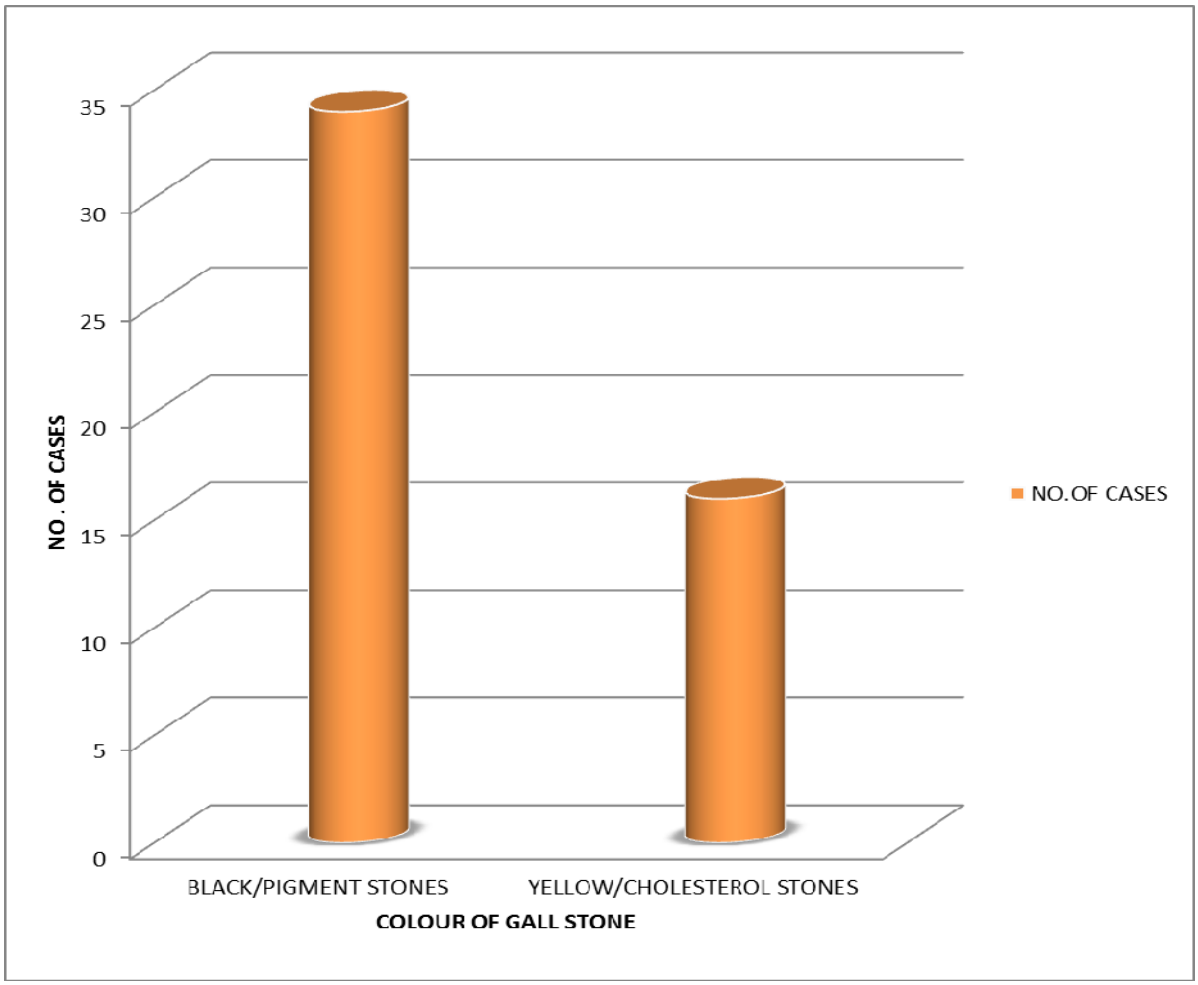
BACTERIA	NO.OF CASES
Klebsiella	10
E.coli	4
Coagulase(-) staphylococcus aureus	3
Proteus vulgaris	2
Pseudomonas	2
No growth	29



COLOUR OF GALL STONES

In our study most of the stones recovered from the gall bladder were Black/Pigment stones, which constituted 68% of the cases studied.

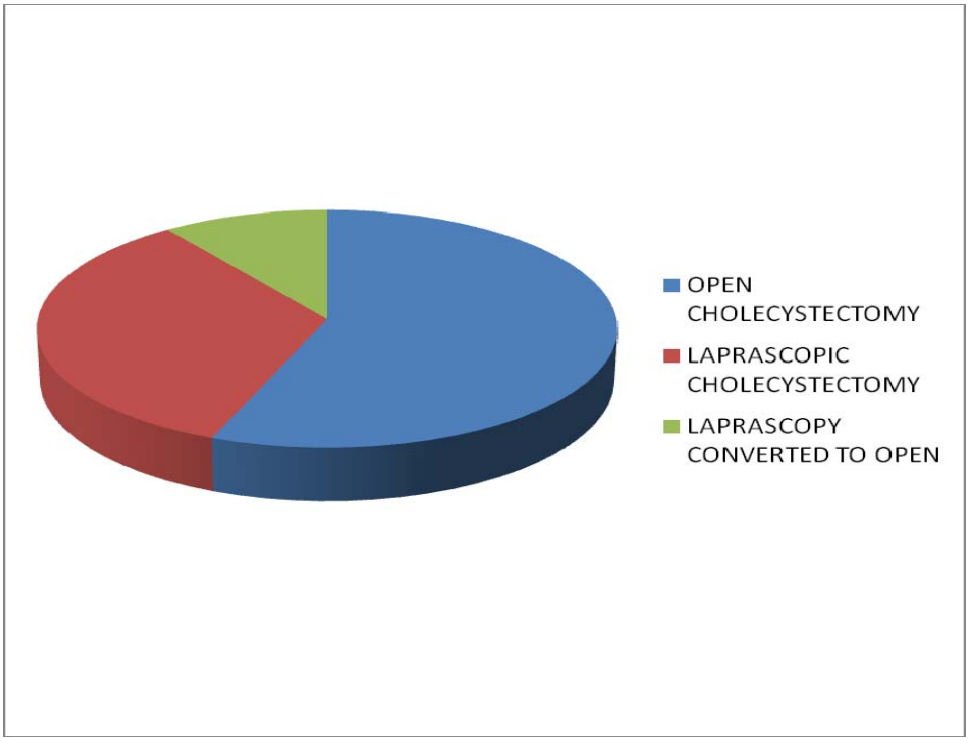
COLOUR	NO.OF CASES
BLACK/PIGMENT STONES	34
YELLOW/CHOLESTEROL STONES	16



SURGICAL TREATMENT

Total number of cases operated -50

PROCEDURE	NO.OF CASES
OPEN CHOLECYSTECTOMY	28
LAPAROSCOPIC CHOLECYSTECTOMY	17
LAPAROSCOPY CONVERTED TO OPEN	5



DISCUSSION

The age and sex incidence of gallstone formation observed in our study is given in Table no 1 and Fig 1 of results. The incidence was more in females (62%) 31 numbers than in males (28%)- 19 numbers among the total 50 cases. Similar observations were given by National Academy of Medical Sciences in Nepal. However in the study of C-Y Chen et al 1995 the incidence is more common in males. The incidence of gallstone was highest (22 numbers) in 51 to 65 year age group in both males and females followed by age group 31-40 years (12nos).

The sex distribution of gallstone formation observed in our study was found to be comparable and similar to the observation made by Ahmed H Kissebah et al.

The clinical presentation of gallstone disease observed in our study was abdominal pain followed by nausea and vomiting. The observations of our study were similar to that of Multicentre Italian Study of Cholelithiasis, DIEHL et al and Kelinische waarde van et al Netharlands.

The bacteriology of bile culture observed in our study [Table no 3 Fig no 3 of results] revealed KLEBSIELLA as the commonest organism followed by Escherichia Coli. However in the study of Chang WTLee et al1991-2000, Muhsin Kaya et al Turkey 2010-2011

and Manojkumar Sahu, Amith Kumar Datta et al 2007-2008 the commonest organism was E.Coli.

The colour of Gallstones observed in our study [Table no 4 and Fig.4]. was black pigment stone(34nos) similar to the obsrevations made by Pammysinha et al.

In our series out of 50 cases, 28 cases were treated with open cholecystectomy, 17 patients with laproscopic cholecystectomy and in 5 petients laproscopic cholecystectomy was converted to open cholecystectomy.

CONCLUSION

From observation of our prospective study of 50 cases , the following conclusions were derived

- Gallstone disease is common in females than in the males and the age group was 51 to 65 years.
- All the cases presented with right hypochondriac pain . Nausea and vomiting were present in 18 cases and fever was present in 11 cases.
- Ultrasound abdomen was the main investigation to detect gall stones and MRCP to know the anatomy of common bile duct.
- In our study, 28 patients underwent open cholecystectomy , 17 patients underwent laparoscopic cholecystectomy and 5 patients underwent laparoscopy which was converted to open cholecystectomy for practical difficulties.
- 21 cases showed organisms in bile culture –of which 17 were females and 4 were males .
- The most common microorganism isolated from bile culture was Klebsiella in our study although E. Coli is the commonest organism as per standard text books.Our study revealed E.Coli growth only in 4 patients.
- 34 cases in our study showed pigment stones and 16 cases were

cholesterol stones.

- Histopathological examination of gallbladder wall showed features of chronic calculus cholecystitis in all the cases.

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ANNEXURE

ANNEXURE – I PROFORMA

NAME :

AGE : I.P. No. : SEX : WARD No :

RELIGION : UNIT : OCCUPATION :

D.O.A. : ADDRESS :

D.O.S. : D.O.D. :

COMPLAINTS

1. Abdominal Pain :
2. Sensation of Fullness :
3. Nausea and Vomiting :
4. Jaundice :
5. Fever :
6. Mass :
7. Itching over the body :
8. Appetite :
9. Bowel habits :
10. Colour of the urine :

HISTORY OF PRESENTING ILLNESS

1. Abdominal Pain

a. Mode of onset

b. Site of pain

c. Character of pain

d. Duration of each attack

e. Radiation or referred pain

f. Effect of pressure and respiration

g. Relation to food

h. Relieving factors / Aggravating factors

2. Sensation of Fullness

3. Nausea and vomiting

4. Jaundice

a. Duration

b. Sites

c. Intensity

d. Type

e. Itching

f. Variation in intensity

g. Recurrent attacks

5. Fever

a. Duration

b. Type

c. Severity

d. Diurnal variation

e. Associated with chills and Rigors

6. Mass / Lump

a. Site

b. Mode of onset

c. Progression

d. Pain in the swelling

e. Any associated factors

f. Blood disorders

PAST HISTORY

1. Jaundice with pain and fever
2. Similar attacks of pain
3. Blood transfusion
4. Vaccination
5. Drugs
6. Abdominal surgery like
7. Enteric fever

PERSONAL HISTORY

1. Diet
2. Appetite
3. Dislike for fatty food
4. Sleep
5. Alcohol amount and quantity
6. Smoking
7. Bowel habits
    a. Amount of stool
    b. Colour of stool
8. Micturation :
    a. Amount of urine
    b. Colour of urine

MENSTRUAL HISTORY

1. Menarche
2. LMP
3. PARA
4. Post Partum
5. Abortion

FAMILY HISTORY

1. Jaundice

2. Gallstones

3. Diabetes

TREATMENT HISTORY HISTORY OF ALLERGY

PHYSICAL EXAMINATION

1. General appearance :

2. Built

3. Anemia

4. Cyanosis ±

5. Clubbing ±

6. Lymphadenopathy

7. Jaundice

8. Anasarca

9. Thrombophlebitis

10. Spider naevi

VITAL SIGNS

1. Pulse

2. Blood pressure

3. Respiratory rate

4. Temperature

ABDOMINAL EXAMINATION Inspection

. Contour

. Movement of all quadrants with respiration

. Skin

. Engorged veins

. Visible pulsations and peristalsis

. Umbilicus

. Hernial orifices

. External genitalia

Swelling

. Site - Surface
. Size - Borders
. Shape - Movement with
. Extent - Plane of the swelling

Palpation

1. Local rise of temp/hyperaesthesia
2. Tenderness
3. Position
4. Size
5. Shape
6. Extent
7. Surface
8. Borders
9. Mobility
10. Murphy's sign ±
11. Consistency
12. Plane of the swelling
13. Liver

    Size

    Borders

Consistency

Surface

Mobility with respiration

14. Spleen

PERCUSSION

- Light percussion of abdomen

AUSCULTATION Systemic examination

- Cardiovascular System
- Respiratory system
- Central nervous system

PROVISIONAL DIAGNOSIS INVESTIGATIONS

1. Blood

a. HB

b. TC DC

c. CT

d. PTT

e. BT

f. PT

g. RBS

h. Blood Urea

i. Serum Cholesterol

j. Serum Creatinine

2. Urine

a. Albumin
b. Sugar
c. Microscopy
d. Colour

3. Liver Function tests:

a. S. Bilirubin
b. S. Alkaline Phsophate
c. S. Albumin
d. S. Globulin
e. SGOT
f. SGPT
g. Total proteins

4. Ultrasound
5. Radiological examination
6. CT Scan

DIAGNOSIS TREATMENT

Medical

Surgical - Open

Laparoscopic

Postoperative investigations :

Bile culture report Histopathological report

MASTER CHART

S.NO	NAME	AGE	SEX	IP NO	CLINICAL FEATURES		SURGERY	USG ABDOMEN	TYPE OF STONE	BILE CULTURE
					A.P	OTHERS				
1	Parameswari	24	F	10193	+	-	L	+	C	Pseudo
2	Ragumath nisha	35	F	10336	+	-	L	+	P	Kleb
3	Seeniammal	50	F	10366	+	N/V	O	+	P	Kleb
4	Arputhamani	55	F	10148	+	N/V	L	+	P	NG
5	Thirumalmani	40	M	18579	+	-	L=>O	+	P	NG
6	Michel	54	M	19679	+	F/N/V	O	+	C	NG
7	Esakkiappan	30	M	24116	+	-	L=>O	+	P	Kleb
8	Thangammal	55	F	23408	+	F/N/V	O	+	C	NG
9	Vasantha	32	F	24176	+	-	L	+	C	Staph
10	Palanichamy	58	M	24850	+	-	O	+	P	NG
11	Alagu sundaram	57	M	30734	+	-	O	+	P	NG
12	Balasubramanian	57	M	35420	+	-	L=>O	+	C	NG
13	Narayannan	64	M	40063	+	F/N/V	O	+	P	NG
14	Vallithai	40	F	40730	+	-	L	+	P	NG
15	Chandra	40	F	42123	+	-	O	+	C	NG
16	Arumugthammal	47	F	40035	+	-	O	+	P	NG

17	Elango	34	M	43394	+	-	L	+	P	NG
18	Guruvammal	60	F	45080	+	F/N/V	O	+	P	Kleb
19	Murugan	60	M	46869	+	-	O	+	P	NG
20	Jeyalakshmi	51	F	46904	+	-	L	+	C	NG
21	Santhosam	64	F	49471	+	F/N/V	O	+	P	NG
22	Thirumalai	55	M	47689	+	-	O	+	P	Kleb
23	Mohammed	54	M	52562	+	-	O	+	P	NG
24	Paulsamy	40	M	52217	+	-	O	+	P	NG
25	Sudalaimadathy	50	F	39612	+	-	O	+	P	NG
26	Banu	35	F	47948	+	N/V	L	+	P	NG
27	Soosaimuthu	50	M	47116	+	F/N/V	O	+	C	Staph
28	Sudalaiammal	63	F	55270	+	-	O	+	P	E.coli
29	Sarojini	60	F	51978	+	-	L	+	P	Kleb
30	Neelavathy	62	F	58586	+	-	O	+	P	NG
31	Sudalai	65	F	57346	+	F/N/V	O	+	C	NG
32	Mallika	26	F	7720	+	N/V	L	+	P	NG
33	Palkani	30	F	12821	+	-	L	+	C	Kleb
34	Rakkumuthu	65	M	7678	+	F/N/V	O	+	P	Kleb
35	Narayanan	60	M	9954	+	-	O	+	P	NG
36	Prem kumar	23	M	12704	+	-	L	+	C	NG
37	Lakunan	52	M	29019	+	-	O	+	C	NG

38	Shanthi	42	F	24163	+	-	O	+	P	Proteus
39	Sundari	52	F	25134	+	-	L=>O	+	P	Kleb
40	Rajeswari	32	F	7624	+	-	L=>O	+	P	Kleb
41	Gomathy	49	F	55266	+	-	O	+	P	E.coli
42	Mariammal	44	F	52245	+	N/V	O	+	C	NG
43	Vijaya	33	F	56536	+	-	L	+	C	Staph
44	Rajathi	56	F	2794	+	F/N/V	O	+	P	Proteus
45	Latha	29	F	6452	+	N/V	L	+	P	E.coli
46	Ramalakshmi	37	F	49218	+	F/N/V	L	+	P	NG
47	Arumugakani	26	F	50201	+	N/V	L	+	P	E.coli
48	Kaladevi	50	F	48486	+	-	O	+	C	Pseudo
49	Thangaiah	59	M	53023	+	F/N/V	O	+	C	NG
50	Pattan	40	M	52267	+	-	L	+	P	NG

A.P- Abdominal Pain

F – Fever

N – Nausea

V – Vomiting

C – Cholesterol stone

P – Pigment stone

NG – No Growth

L – Laparoscopic cholecystectomy

O – open cholecystectomy

Staph – staphylococcus aureus

Kleb - Klebsiella

Pseudo - Pseudomonas