

Original Research Article

STUDY ON LAPAROSCOPIC CHOLECYSTECTOMY, IT'S ROLE IN MANGEMENT OF CALCULOUS CHOLECYSTITIS, INTRAOPERATIVE CHALLENGES AND ASSOCIATED COMPLICATIONS

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ABSTRACT

Background: Laparoscopic cholecystectomy is the gold standard treatment for symptomatic gallstone disease and associated biliary disorders owing to its safety, minimal invasiveness, shorter hospital stay, faster recovery, and superior cosmetic outcomes. However, intraoperative difficulty may arise due to recurrent inflammation, dense adhesions, distorted anatomy, and thickened gallbladder walls, increasing the risk of surgical complications. This study aimed to evaluate the clinical profile of patients undergoing laparoscopic cholecystectomy, identify factors associated with operative difficulty, and assess intraoperative and postoperative outcomes.

Materials and Methods: This prospective observational study was conducted at a tertiary care hospital from February 2024 to January 2026 and included 150 consecutive patients undergoing laparoscopic cholecystectomy for calculous cholecystitis. Demographic details, clinical presentation, ultrasonographic findings, intraoperative observations, stone characteristics, postoperative complications, histopathological findings, bile culture results, and follow-up outcomes were recorded prospectively and analyzed using descriptive statistics.

Results: The majority of patients were aged 41–50 years, and females constituted 72% of the study population. Chronic cholecystitis was the most common presentation (76%), while acute cholecystitis accounted for 24% of cases. Ultrasonography demonstrated 100% diagnostic accuracy. Mixed gallstones were identified in 52% of patients, followed by pigment stones (36%) and cholesterol stones (12%). No major intraoperative complications or bailout procedures were required. Postoperative wound infection occurred in 10% of patients, while post-cholecystectomy syndrome was observed in 8%, all managed conservatively. Histopathology confirmed chronic cholecystitis in 76% and acute cholecystitis in 24%, with no malignancy detected. Sterile bile cultures were observed in 68% of cases, whereas *Escherichia coli* was the most common isolate (16%). Follow-up was available for 56% of patients, with only four cases of persistent dyspepsia.

Conclusion: Laparoscopic cholecystectomy is a safe and effective procedure for calculous cholecystitis with excellent surgical outcomes, low complication rates, and minimal postoperative morbidity when performed by experienced surgeons. Early diagnosis and appropriate surgical management contribute to favorable patient outcomes.

Keywords: Laparoscopic cholecystectomy, Gallstone disease, Chronic cholecystitis, Postoperative complications, Bile culture.

INTRODUCTION

Laparoscopic cholecystectomy has become one of the most frequently performed minimally invasive procedures worldwide. It has also become the gold standard surgical treatment for symptomatic gallstone disease and its related conditions, including acute and chronic cholecystitis and biliary pancreatitis. Compared with open cholecystectomy, the laparoscopic approach offers several advantages, such as reduced postoperative pain, shorter hospital stay, faster recovery, improved cosmetic outcomes, and earlier return to routine activities. Successful laparoscopic surgery requires specific and often unique instrumentation. Optical and electronic interfaces serve as the surgeon's eyes and sensors.^[1]

A laparoscopic surgeon can be only as good as the quality of his or her imaging system and tissue manipulator Equipment and Instrumentation. The success of any laparoscopic operation depends on both proper patient selection and the technical skill and experience of the laparoscopists. As surgeons have gained experience and techniques have become more advanced, the number of absolute contraindications to laparoscopy has decreased.

Laparoscopic cholecystectomy is performed in fully equipped operating room under sterile conditions with general anaesthesia. Instruments for conversion to an open technique should be readily available. Relative and absolute contraindications are becoming less applicable and must be evaluated on an individual basis. Laparoscopic cholecystectomy is a team effort. The surgeon who works with the same assistants on a day-to-day basis will find that operating time and technical difficulties are kept to a minimum.^[2]

Cholecystitis is a chemical or bacterial inflammation of the gallbladder and is one of the commonest biliary pathologies. It occurs in a variety of ways as calculous or acalculous, acute, chronic or acute on chronic cholecystitis. In about 90-95% of cases, cholecystitis is associated with gallstones. Whether the stones are the cause or the effect has not been defined, but they are generally implicated as a cause of the inflammatory process. A bacterial cause of cholecystitis has been proposed and positive bile cultures have been noted in 35-40% of patients with cholecystitis.^[3]

The incidence of cholecystitis is higher in females, with a female to male ratio of 3:1 up to the age of 50 years and a ratio of 1.5:1 thereafter. The incidence varies in different parts of the world. In India, according to Wani N.A. experience, the female preponderance is 4.4: 1.^[4]

There are multiple factors which make an operation of laparoscopic cholecystectomy complicated. Repeated episodes of inflammation can result in thickened gall bladder walls, distortion of gall bladder anatomy, normal tissue planes obliterated, and dense adhesions. Acute inflammatory processes may produce oedema, hypervascularity of the

tissues, friability, and make the identification of the critical anatomical landmarks difficult. Prior ERCP+stenting procedure also results in distortion of anatomy of biliary tree. These changes can create a prolonged operative time, facilitate bleeding, make the dissection of Calot's triangle more difficult, and increase the risk of bile duct injury. Therefore, there is often a significant difference in the difficulty of the procedure that presents itself to a surgeon when two patients exhibit the same clinical symptoms. There are several grading systems to assess overall risk or intraoperative difficulty of laparoscopic cholecystectomy such as Nassar operative scale, Sugrue/Gupta scoring systems, Parkland grading scale etc depending on various parameters.^[5]

Complications associated with difficult laparoscopic cholecystectomy include bile duct injury, vascular injury, Gall bladder perforation and bile spillage, intraoperative bleeding, postoperative bile leak, jaundice, surgical site infection, port site hernias, post cholecystectomy syndrome, pulmonary and systemic complications such as pneumonia, atelectasis etc, impact on hospital stay and health care costs.^[6]

Laparoscopic surgeon should be aware of all risk factors of the patient, should be able to assess the difficulty and risks during surgery, should be well trained to manage unexpected life threatening complications, should not hesitate to use bail out techniques and should have timely decision making skill to prevent adverse outcomes and improve patient safety.^[7]

MATERIALS AND METHODS

Study Design: The aim of this study was to collect comprehensive account of the gallstone diseases, number of laparoscopic cholecystectomies performed in patients with biliary pathology, factors leading to intraoperative difficulty and associated complications. This is a prospective observational study. A prospective design was chosen as it enables the recording of the findings and outcomes of the surgery in real time, reducing recall bias and increasing data accuracy. This study was aimed to analyse the treatment method and role of laparoscopic cholecystectomy and its complications in the management of calculous cholecystitis.

Study Setting: This study was conducted in the department of General Surgery in a tertiary care teaching hospital with the state-of-the-art laparoscopic surgical facilities. This institution has a large population from urban and rural areas and routinely performs a large number of laparoscopic cholecystectomies. Experienced surgeons performed all surgeries according to the standard institutional protocol for the preoperative evaluation, surgical management, and postoperative care.

Study Duration: The data for this study were collected for 24 months from February 2024 until January 2026. The period of study was felt to be

adequate to recruit a sufficient number of patients with different pathological changes of the gall bladder. This longer study time allowed for the detailed recording of perioperative outcomes and recovery trajectory.

Study Population: The study subjects included adult patients with gallstone disease who were scheduled for laparoscopic cholecystectomy. Eligible patients were those who presented with symptomatic cholelithiasis, chronic cholecystitis, acute cholecystitis and gallstone pancreatitis with resolution. Detailed clinical evaluation was carried out on all the participants before surgery and only those who met the predetermined eligibility criteria were included.

Sample Size: In total, 150 patients participated in the study. Eligible consecutive patients were recruited during the study period, until a desired sample size was obtained.

Sampling Technique: Consecutive sampling technique was used in the recruitment of patients. All patients who met the inclusion criteria and agreed to participate were recruited in order throughout the study period. This strategy ensured that there were minimum selection bias and a representative range of the severity of gallbladder disease seen in regular clinical practice.

Inclusion Criteria

The study participants were comprised of patients with symptomatic gallstone disease and who were scheduled for laparoscopic cholecystectomy from 18 years of age. Eligible diagnosis included

symptomatic cholelithiasis, chronic cholecystitis, acute cholecystitis and gallstone pancreatitis after the acute attack. All subjects had to give informed consent in writing to be included.

Exclusion Criteria

Patients were excluded if they were younger than 18 years, if they were found to have gallbladder malignancy, choledocholithiasis necessitating major biliary surgery, or if they had abdominal surgery at the same time as the ERCP. Additional exclusion criteria were medical unfitness for laparoscopy and the patients' unwillingness to join the study, to ensure homogeneity of the study population and to minimize confounding factors.

Data Collection Procedure

Demographic data, clinical history, physical examination, laboratory tests and ultrasonographic findings were recorded in a structured data collection form following admission. For laparoscopic cholecystectomy, the surgeon operating the laparoscope assessed the gallbladder as soon as they created the pneumoperitoneum and then proceeded with further dissection after assessing the risks. The outcomes of surgery were documented during the hospital stay until the time of discharge.

RESULTS

Demographic Characteristics of Study Participants.

Table 1: Age Distribution of Study Participants (N = 150)

Age Group (Years)	Frequency (n)	Percentage (%)
18-30	28	18.7
31-40	32	21.3
41-50	36	24.0
51-60	30	20.0
>60	24	16.0
Total	150	100.0

The age distribution of the study participants is shown in [Table 1]. The age group with the highest number of patients was 41-50 years (24.0%, n=36) followed by 31-40 years (21.3%, n=32) and 51-60 years (20.0%, n=30). Young people in the age range 18-30 years accounted for 18.7% (n=28) and older people (above 60 years) accounted for 16.0% (n=24) of the population in the study. The results showed

that gall bladder disease associated with laparoscopic cholecystectomy was mainly found among middle aged people. The increased prevalence during the 4th and 5th decades of life could be explained by the effects of metabolic, dietary and hormonal risk factors that contribute to the development of gallstone.

Table 2: Gender Distribution of Study Participants

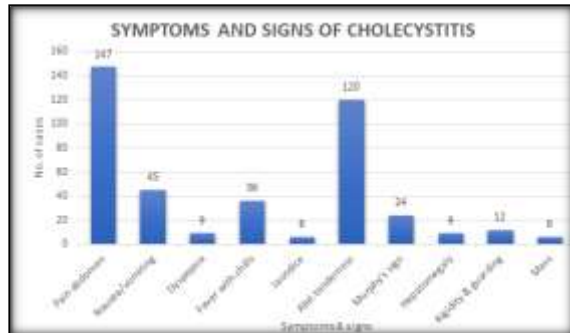
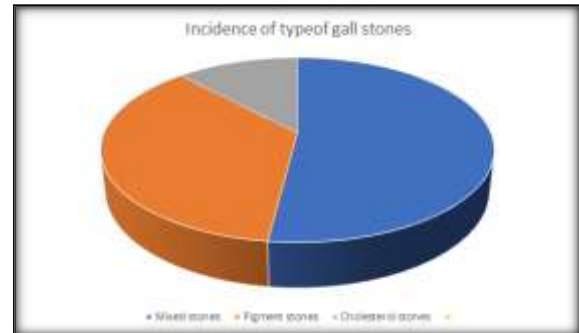
Gender	Frequency	Percentage (%)
Male	42	28
Female	108	72
Total	150	100.0

[Table 2] shows the gender-wise distribution of the study participants. Among the 150 patients included in the study, 42 (28%) were males and 108 (72%)

were females. The results indicate that the study population is slightly female predominant.

Table 3: Incidence of signs and symptoms:

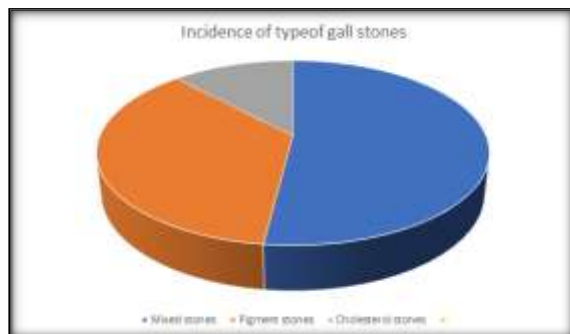
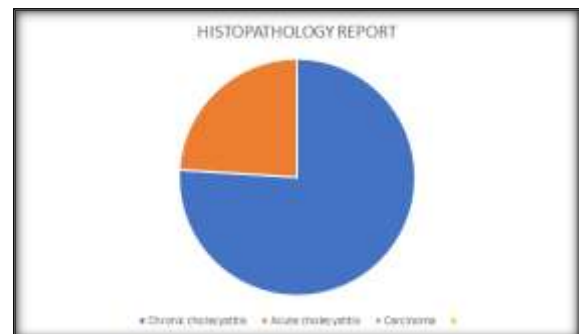
Symptoms & signs	No. of cases	% of cases
Pain abdomen	147	98
Nausea / vomiting	45	30
Dyspepsia	09	06
Fever with chills	36	24
Jaundice	06	04
Abdominal tenderness	120	80
Murphy's sign	24	16
Hepatomegaly	09	06
Guarding and rigidity	12	08
Palpable mass	06	04

**Figure 1****Figure 2****Table 4: Ultrasonography Evaluation**

Sl. No	Findings	No. of cases	%
1.	Stones in gall bladder	150	100
2.	Stones in gall bladder with stones in CBD	00	00
3.	Dilated CBD	00	00

Table 5: Naked Eye Appearance of Gall Stones

Sl. No	Type of stone	No. of cases	%
1.	Mixed Stones	78	52
2.	Pigment Stones	54	36
3.	Cholesterol stones	18	12

**Figure 3****Figure****4:****Table 6: Post-Operative Complications**

Sl. No	Complications	No. of cases	%
1.	Wound infection	15	10
2.	Jaundice	-	-
3.	Recurrent jaundice	-	-
4.	Persistent biliary leak / biliary peritonitis	-	-
5.	Pneumonia	-	-
6.	Atelectasis	-	-
7.	Post cholecystectomy syndrome	12	8
8.	Pancreatitis	-	-
9.	Port site hernia	-	-

In this study, complications were minimal. Wound infection was seen in 10% of cases. 8% of cases reported back with dyspeptic symptoms that were

diagnosed as Post Cholecystectomy syndrome and were managed conservatively.

Table 7: Histopathological Examination

Sl. No	Complications	No.of cases	%
1.	Chronic cholecystitis	114	76
2.	Acute cholecystitis	36	24
3.	Carcinoma	00	00

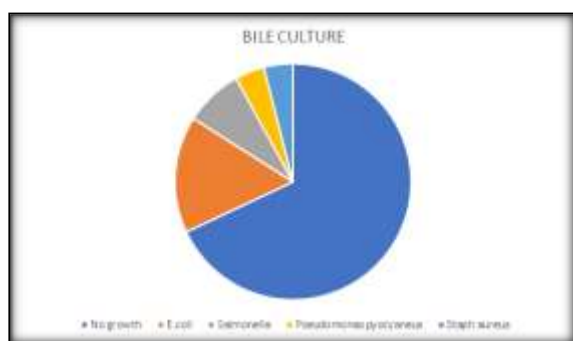
Table 8: Bile Culture

Sl. No	Organisms isolated	No. of cases	%
1.	No growth	102	68
2.	E.coli	24	16
3.	Salmonella	12	08
4.	Pseudomonas pyocyanus	06	04
5.	Staphylococcus aureus	06	04

Table 9: Follow Up

Total No. of cases operated	Cases followed up	%
150	84	56

Only 56% of our patients came for follow up of which the only problem, which we encountered in them was post- cholecystectomy syndrome 4 cases (8%). The rest were all healthy. The other 44% of the patients could not be followed up.

**Figure 5**

Bile culture was done in all cases in our study. Bile was sterile in about 102 cases (68%).

Analysis:

1. Analysis of records of Sri Siddhartha Medical college and hospital, Tumkur revealed that between February 2024 – January 2026 there were 11,880 surgical admissions among which 466 cholelithiasis cases were, which forms an incidence of about 3.92%.
2. In this study 150 cases have been studied between February 2024 – January 2026. All these cases were clinically diagnosed and ultrasonographically proved.
3. The age range was between 18-70 years. Maximum incidence was between 41-50 years. Highest incidence was in females.
4. 98% of cases presented with abdominal pain 30% of cases had nausea & vomiting. Abdominal tenderness was found in 80% of cases. Murphy's sign was positive in 16% of cases.
5. Chronic-Cholecystitis was common clinical presentation (76%). 24 % of cases presented with features of Acute-Cholecystitis.

6. Ultra-sonography was our prime investigation with diagnostic accuracy of 100%
7. In this study, no major intraoperative adverse events were noted. There was no case which needed conversion to open procedure or other bail out techniques. This shows the surgical skill and experience of surgeons even though patient related factors also matter.
8. Post-operative complications were minimal in this study.

DISCUSSION

A prospective consecutive clinical study was conducted in Sri Siddhartha Medical college and hospital, Tumkur. The study group consists of 150 patients. All the cases were clinically diagnosed and ultrasonographically proved, the age range was between 18-70 years, maximum incidence was between 41-50 years, highest incidence in females, 98% of cases presented with abdominal pain, 30% of cases had nausea and vomiting, abdominal tenderness was found in 80% of cases. Chronic cholecystitis (76%) was common clinical presentation, 24% of cases presented with features of acute cholecystitis. Ultrasonography was our prime investigation with diagnostic accuracy of 100% for cholelithiasis.^[8]

Cholelithiasis is not infrequent in our hospital, with an incidence of 3.92 %. Ultrasonography proved to be 100% diagnostic. Laparoscopic cholecystectomy remains the treatment of choice in our hospital with instruments for open cholecystectomy kept available in case of conversion to open surgery. Patients are also explained about the risk of intraoperative conversion to open procedure before starting the procedure itself and consent signature is also taken. In this study, no conversions or other bail out techniques were performed. This shows the experience and surgical skill of the surgeon performing the procedure even though patient factors are also taken into account to determine the outcome of surgery.^[9]

In this study, 78 (52%) cases, mixed stones were retrieved, in 54(36%) cases, pigment stones and

18(12%) cases, cholesterol stones were retrieved. Pigmented stones are either brown or black. Black pigmented stones are often seen in chronic hemolysis or cirrhosis whereas brown pigment stones are seen in biliary tract infections. Mixed stones are multiple, multifaceted and variable in colour and are most common in incidence.^[10]

There are multiple factors which make an operation of laparoscopic cholecystectomy complicated. Repeated episodes of inflammation can result in thickened gall bladder walls, distortion of gall bladder anatomy, normal tissue planes obliterated, and dense adhesions. Acute inflammatory processes may produce oedema, hypervascularity of the tissues, friability, and make the identification of the critical anatomical landmarks difficult. Prior ERCP+stenting procedure also results in distortion of anatomy of biliary tree. In such cases it is better to use bail out techniques or conversion to open surgery to ensure patient safety. Experience matters in operating such cases. There are the situations in which even well experienced and skilled surgeon will opt for conversion to open surgery such as frozen callots where whole anatomy is obscured, mass in the gall bladder suspecting malignancy etc. Most surgeons prefer to do interval laparoscopic cholecystectomy in acute conditions for safe dissection and ensuring patient safety even though some surgeons proceed to do laparoscopic cholecystectomy in acute conditions.^[11]

In this study postoperative complications are minimal. 15(10%) cases presented with wound infections and 12(8%) cases presented with post cholecystectomy syndrome which were managed conservatively. Advantages of laparoscopic cholecystectomy such as reduced postoperative pain, shorter hospital stay, faster recovery, improved cosmetic outcomes, and earlier return to routine activities was observed in all patients in the study during postoperative period and follow up.^[12]

Bile culture was done in all cases in our study even though few cases presented with fever and jaundice. Bile culture examination reveals no growth in 102(68%) cases, E.coli in 24(16%) cases, Salmonella in 12(8%) cases, Pseudomonas pyocyaneus and Staphylococcus aureus in 6(4%) cases each. Biliary infections with gall stones are most commonly associated with factors such as pigmented stones, prior biliary procedures and stenting, bile duct strictures, choledochal cysts and systemic factors such as advanced age, diabetes mellitus, immunosuppression, parasitic infestations in endemic areas etc.^[13]

CONCLUSION

Laparoscopic cholecystectomy requires a highly coordinated, interprofessional approach to optimize patient-centered care, safety, and outcomes. From

the initial evaluation to postoperative recovery, physicians, advanced practitioners, nurses, pharmacists, dietitians, and radiologists play a pivotal role. Primary care and emergency clinicians must recognize red flags such as persistent right upper quadrant pain or sepsis to prompt early surgical referral. Their decisions regarding imaging and laboratory testing—supported by radiologists identifying anatomical variants or complex diseases—form the foundation for timely and accurate diagnosis. Surgeons and anesthesiologists collaborate to assess perioperative risk and maintain intraoperative stability, particularly in patients with comorbid conditions.

Care coordination extends through the perioperative period, with nurses facilitating patient education, monitoring for early signs of complications, and supporting early mobilization and discharge readiness. Real-time team communication during surgery is critical, particularly when intraoperative findings—such as gangrenous cholecystitis or suspected malignancy—require rapid, collaborative decision-making or conversion to open surgery.

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