

A COMPARATIVE STUDY BETWEEN OPEN CHOLECYSTECTOMY VERSUS LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Objective: This study aims to evaluate the comparative effectiveness of laparoscopic cholecystectomy (LC) versus open cholecystectomy (OC) in terms of surgery duration, blood loss, postoperative discomfort, hospital stay length, cost-effectiveness, and patient satisfaction. It also assesses differences in primary outcomes, such as mortality, complications, and symptom relief, as well as secondary outcomes, including conversion rates, operative time, and recovery.

Methods: We conducted a prospective observational study involving 200 patients aged 10-70 with symptomatic gallstones confirmed via ultrasonography at Somani Hospital, Jaipur, from July 2021 to August 2023. Patients were randomly assigned to undergo either LC or OC. We collected data on surgical duration, blood loss, postoperative pain, hospitalization period, and complications, among other variables. Statistical analysis was performed using software tools.

Results: Our study involved 200 patients, predominantly female (77%). The average duration of LC was shorter (67.37 min) compared to OC (93.95 min). LC patients had a shorter average hospital stay (2.8 d) compared to OC patients (5.1 d). The conversion rate from LC to OC was 6%, primarily due to anatomical and technical challenges. Complications were significantly lower in LC (17%) compared to OC (28%).

Conclusion: LC is more efficient, entails fewer complications, and leads to a quicker recovery and shorter hospital stay compared to OC, supporting its preference in surgical practice for eligible patients with symptomatic gallstone disease. The lower rate of complications and shorter recovery time suggest that LC should be the standard care for cholecystectomy where feasible.

Keywords: Cholecystectomy, Laparoscopic cholecystectomy, Open cholecystectomy, Gallstone, Surgical outcomes, Patient satisfaction, Comparative study

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INTRODUCTION

Cholelithiasis is a major health problem in India and worldwide and cholecystectomy is the treatment of choice. In India, the prevalence is estimated to be around 4% [1]. The most common surgical intervention carried out in the biliary tract is a cholecystectomy, which involves removing the gallbladder due to inflammation or stone [2]. Gallstones are a leading cause of morbidity among Indian patients, with prevalence ranging from 10-20% [3].

Open cholecystectomy has been the mainstay of treatment for cholelithiasis and was first performed in 1882 by a German surgeon Carl August Langenbuch [4]. Open cholecystectomy is preferred over laparoscopic cholecystectomy in cardiac patients as carbon dioxide insufflations in such patients can lead to cardiac arrhythmias [5]. But with the advent of laparoscopic cholecystectomy, there has been a gradual shift in the treatment, with most surgeons preferring laparoscopic cholecystectomy over open cholecystectomy. The first laparoscopic cholecystectomy was performed by Philippe Mouret in Lyon, France and has now become the most common laparoscopic surgery performed worldwide [6-8].

In 1992, The National Institute of Health (NIH) consensus development conference declared laparoscopic cholecystectomy equivalent to open cholecystectomy and presently, it is the gold standard for symptomatic cholelithiasis [9].

Laparoscopic cholecystectomy is a safe procedure and rate of major complications is <5% [10]. The laparoscopic procedure has been shown to offer the advantages of decreased pain, shorter convalescence, reduced operative stress and limited inflammatory response [11]. Despite offering significant benefits laparoscopic cholecystectomy does have its drawbacks. Increased bile duct injuries and longer duration of operation are some of the major pitfalls associated with laparoscopic cholecystectomy [12]. Apart

from this, three-dimensional depth perception is limited, and it sometimes becomes difficult to visualise internal structures properly [13].

Gallstone may be asymptomatic. If symptomatic, patient present with pain in right hypochondrium or epigastrium. Pain usually radiates to the back. Pain is considered as colicky, but usually, it is dull and constant. Intolerance to fatty food, flatulence, dyspepsia and some change in bowel frequency usually accompany. If there is severe pain in right upper quadrant, which ebbs and flows and there is nausea and vomiting, this is called as biliary colic. Pain may last for several hours. If the stone from gall bladder migrates to common bile duct, jaundice may occur [14]. On examination, patient may have fever, tenderness in right hypochondrium is a reliable feature. Murphy's sign is usually present. Boas's sign (hyperaesthesia on right side posteriorly between 9th and 11th ribs, is diagnostic [15].

The main objective is to evaluate the said superiority of the laparoscopic over the open cholecystectomy in respect to duration of surgery, blood loss during surgery, postoperative discomfort and pain, period of hospitalization, cost-effectiveness and patient satisfaction and to assess whether laparoscopic and open cholecystectomy are different in terms of primary (mortality, complications, and relief of symptoms) and secondary outcomes (conversions to open cholecystectomy, operative time, hospital stay and convalescence).

MATERIALS AND METHODS

This study included a total of 200 patients of 10-70 y of age with sonographically detected symptomatic gallstones. The present study was conducted on above patients admitted in the surgical wards of SOMANI Hospital, Jaipur, from July 2021 to August 2023 and who underwent laparoscopic cholecystectomy (LC) or open cholecystectomy (OC) for their condition.

Informed consent was taken from all the participants.

Inclusion criteria

- Symptomatic patients, male and female both
- With one or multiple gallstones diagnosed on ultrasonography

Exclusion criteria

- Patients age below 20 y and those above 80 y
- History or investigations suggesting jaundice, gall bladder mass, mucocele, empyema, portal hypertension, cirrhosis of the liver, coagulopathy and pregnancy.

Complete history of the disease was taken from the patient and proper physical examination was done for diagnosing a patient with gallbladder stone. The following investigations were performed before the operation-complete blood count, blood sugar level, routine urine examination, liver function test, chest X-ray, ECG, serum electrolytes, viral markers and abdominal ultrasound.

The patients following details were also recorded: Number of calculus, Size of calculus, Gallbladder wall thickness, Pericholecystic collection, CBD calculi and dilatation of CBD. Adhesion (Yes/no), Hemorrhage (Yes/no), Organ injury (Yes/no) and other causes.

The patients were explained in detail about both the procedure.

Blood loss was calculated using by gravimetric method by swab weighing. In laparoscopic cholecystectomy it was measured by the volume of irrigation fluids and subtracted from volume from the fluid collected in suction bottles to estimate the final blood loss.

Patients were admitted a day prior to surgery in case of elective cholecystectomy from OPD. Some patients were admitted from the emergency department of hospital as they had presented with acute abdominal pain. The patients were evaluated for duration of surgery, duration of post-operative pain, period of postoperative hospital stay, post-operative resumption of normal diet and incidence of postoperative wound infection.

The gall bladder was dissected from the liver bed with diathermy and removed via the epigastric port site with endobag. Three doses of prophylactic antibiotics in the form of third-generation cephalosporins were used. Drains were applied in the gall bladder bed in selective cases.

The details of the study parameters were filled in a MS excel sheet and subjected to statistical analysis using statistical software.

RESULTS

The study comprised 200 patients with symptomatic gallstones, including 46 males (23%) and 154 females (77%), with an age distribution ranging from 10 to 70 y. The average age was 43.36 y. Ultrasonography findings revealed single calculus in 23% of cases and multiple calculi in 59%. The remaining patients had either a mucocele or empyema.

Regarding the surgical procedures, 166 patients (83%) underwent laparoscopic cholecystectomy (LC), 22 patients (11%) underwent open cholecystectomy (OC), and 12 cases (6%) initially attempted as LC were converted to OC. The main reasons for conversion included difficult anatomical locations and severe adhesions.

The mean duration of LC was 67.37±10.86 min, significantly shorter than the OC duration of 93.95±18.80 min. Cases converted from LC to OC had an average duration of 82.17±15.81 min. Post-operative complications were less frequent in the LC group, with a complication rate of 17% compared to 28% in the OC group. The complications included excessive bleeding, bile duct injuries, fever, and wound infections.

Patients undergoing LC had a significantly shorter average hospital stay of 2.8±0.86 d compared to 5.1±0.61 d for those undergoing OC. The post-operative resumption of normal diet and activity was quicker in the LC group, aligning with the reduced hospitalization period.

In summary, LC demonstrated a clear advantage over OC in terms of shorter operation times, fewer complications, and reduced length of hospital stay, supporting its use as the preferred method for cholecystectomy in appropriately selected patients.

Table 1: Age and sex distribution

Age group (years)	No. of patients	% of patients
10-20	8	4
21-30	25	12.5
31-40	57	28.5
41-50	63	31.5
51-60	27	13.5
>60	20	10
Total	200	100%
Mean±SD (Age)	43.36±12.48	
Sex distribution	No. of patients	% of patients
Male	46	23
Female	154	77
Total	200	100%

Table 2: Pre-operative USG findings

Pre-operative USG finding	No. of patients	% of patients
Mucocele	20	10
Empyema	16	8
Single calculus	46	23
Multiple calculus	118	59
Total	200	100%

Table 3: Duration of surgery

Procedure performed	Duration of surgery (Mean±SD)
Laparoscopic	67.37±10.86
Laparoscopic converted to open	82.17±15.81
Open laparoscopic	93.95±18.80
Total	100

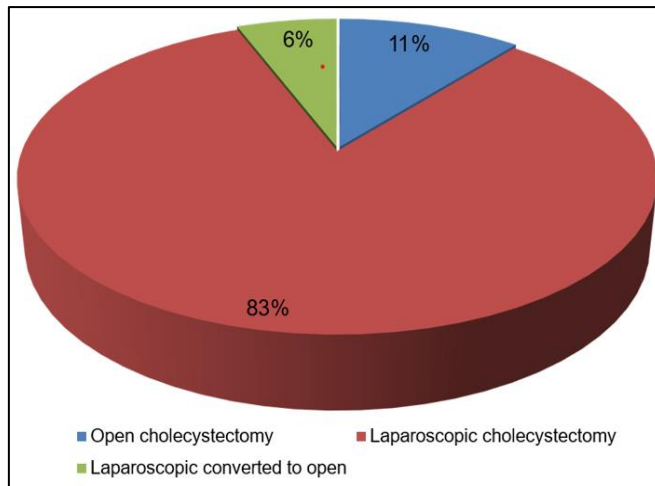


Fig. 1: Procedure performed

Table 4: Cause for conversion

Cause for conversion	No. of patients	% of patients
Diffiucult calot's trianglec	5	41.66
Dense adhesion	3	25
CBD injury	2	16.66
Excessive Bleeding	2	16.66
Total	12	100

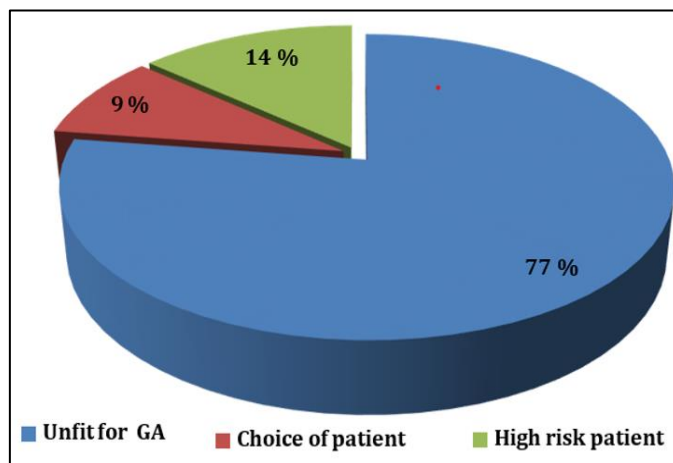


Fig. 2: Cause of open procedure

Table 5: Complications

Complications	No. of patients	% of patients
Nil	166	83
Excessive bleeding intra operartive	12	6
CBD injury	2	1
Fever	14	7
Wound infection	6	3
Total	200	100%

Table 6: Mean hospital stays (Days)

Type of surgery	Mean hospital stay (Days)	SD
Laparoscopic cholecystectomy	2.8	0.86
Open cholecystectomy	5.1	0.61

DISCUSSION

This prospective observational study was performed in Surgery Department of SOMANI Hospital, Jaipur, over a period of 1 y from August 2021 to September 2023. Patients were taken from both sexes and all age. A total of 200 patients were taken for study who had undergone cholecystectomy.

In our study, the age pattern revealed that the patients were of age group of 10-70 y. Maximum patients 63 (31.5%) were from age 41-50 y. The mean age of patients in our study was 43.36 y. The average age in study by Goel KS *et al.* [16] was 36.84 y. There is no significant difference in mean age in our study as compared to the above-mentioned study.

In our study, 46 (23%) patients were males, and 154 (77%) were female patients. Our study is comparable to Ranjan R *et al.* [17], where there were 19 (15.83%) male and 101 (84.17%) female patients. Most of the patients in our study were averagely built or mildly obese.

In our study procedure adopted was open cholecystectomy in 22 (11%) patients laparoscopic cholecystectomy in 166 (83%) patients. Conversion from laparoscopic to open was done in 12 (6%) patients. The reasons for conversion were like this, difficult Calot's triangle was found in 5 patients, dense adhesion was found in 3 patients. In two patients, the procedure was converted because of injury to gut. It has been well mentioned by Bhat that problems occurs in lap cholecystectomy due to difficult Calot's triangle, dense adhesions, bleeding, and anomalies of cystic duct cystic artery. (Bhat SM. SRB's Manual of Surgery, 5th edition, New Delhi: Jaypee Brothers Medical Publishers; 2016).

The conversion rate in our study is 6%. Conversion rate of studies by the rate of conversion of laparoscopic cholecystectomy to open cholecystectomy in the study of T Narayanaswamy *et al.* [18] is 20%. Open cholecystectomy was done in 22 (11%) patients. The reasons for performing open cholecystectomy were like this; in 17 (77.27%) patients were unfit for general anaesthesia, choice of patient 2 (9.09%) and high risk patient 3 (13.63%). In the study of Singh P Open cholecystectomy was done in 50 (50%) patients.

Average hospital stay for lap cholecystectomy was 2.8 d. Average hospital stay for open cholecystectomy was 5.1 d. Average hospital stay in study by Ranjan R *et al.* [17] is postoperative duration of hospital stay was 3.6 d in group I as compared to 6.2 d in group II.

After the advent of laparoscopic cholecystectomy, most of the surgeons are performing more and more of laparoscopic cholecystectomy. We have seen that the incision is small, pain is less, and hospitalization is shorter. Even in acute cholecystitis, in experienced hand, lap cholecystectomy can be performed safely. The author's inclination is totally in favour of lap cholecystectomy, except the cases where lap cholecystectomy is contraindicated e. g. patient unfit for general anesthesia, patient having severe chronic obstructive airway disease, congestive heart failure, end-stage liver disease with portal hypertension, coagulopathy and severe acute cholecystitis.

CONCLUSION

Laparoscopic cholecystectomy is an easy-to-perform, less time-consuming procedure with low complication rates as compared to open cholecystectomy. It also gives an advantage of a shorter hospital stay and early return to work as compared to the open cholecystectomy.

Hence, laparoscopic cholecystectomy as a surgical procedure to remove gall bladder can be recommended over open cholecystectomy operation in carefully selected patients of symptomatic gallstone disease.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally

CONFLICTS OF INTERESTS

Declared none

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