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A prospective comparative study between laparoscopic and open cholecystectomy: Our experience

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Abstract
Introduction: Gall stones disease is the commonest biliary pathology, predominantly affecting females all over the world. Open cholecystectomy was once the gold standard surgery for gallbladder diseases. Most studies now suggest that laparoscopic cholecystectomy is the gold standard surgery for symptomatic gall stone disease.
Aims and Objectives: This study aimed to compare Open Cholecystectomy (OC) and Laparoscopic Cholecystectomy (LC) about: 1. Duration of procedure. 2. Blood loss during surgery. 3. Rate of conversion of laparoscopic to open surgery. 4. Return of bowel function. 5. Post-operative pain. 6. Complications like surgical site infection and paralytic ileus. 7. Duration of hospital stay. 8. Return to normal activities. 9. Cost effectiveness. 10. Patient satisfaction.
Materials and Methods: This was a single centre, randomized, prospective, comparative study conducted from July 2022 to June 2023. It was carried out on 50 patients and were randomly divided into two groups, group A (OC) and group B (LC) each consisting of 25 patients.
Results: The most common age group in group A (OC) was 41-50 yrs and in group B (LC) was 31-40 yrs. Conversion from laparoscopic to open cholecystectomy was done in 03 cases (12%). In Group A (OC), mean time taken for surgery was 76±12.16 mins and in Group B (LC), it was 96±11.72 mins. In Group A (OC), mean duration of post-operative pain was 5.24±0.66 days and in Group B (LC), it was 2.16±0.55 days. Post-operative return of bowel function, time taken for first oral feed and duration of hospital stay was less in group B (LC). Patient satisfaction was better in group B (LC).
Conclusion: This comparative study concludes that laparoscopic cholecystectomy is a better surgical option compared to open cholecystectomy for symptomatic cholelithiasis.

Keywords: Open cholecystectomy, laparoscopic cholecystectomy, cholelithiasis

Introduction
Gall stones disease is the commonest biliary pathology, predominantly affecting females, all over the world [1]. Gall stones are a leading cause of morbidity among Indian patients with prevalence ranging from 10-20% [2]. Cholecystectomy is considered to be the treatment for symptomatic gall stones because it removes the organ that contributes to both gall stone formation and subsequent complications [3]. Carl Langebuch, in Berlin, Germany in 1882, performed the first open cholecystectomy and quoted that gall bladder should be removed, not because it contains stones, but because it forms them [4, 5, 6]. Open cholecystectomy was once the gold standard surgery for gallbladder diseases. The morbidity associated with open surgery can be attributed to injury to the abdominal wall in the process of gaining access to gall bladder or its dissection and surgical site infection. Most studies now suggest that laparoscopic cholecystectomy is the gold standard surgery for symptomatic gall stone disease. It has improved patient satisfaction in terms of early post-operative pain relief, need for post-operative analgesia, hospital stay and return to normal activity when compared to open cholecystectomy [7]. However, there are certain limitations of laparoscopic cholecystectomy. Three-dimensional depth perception is limited by the two-dimensional monocular image. It is more difficult to control significant haemorrhage in the surgical field [8]. There is less discrimination of structures using laparoscopic instruments as compared to direct digital palpation during open cholecystectomy [9]. Hence, this study was conducted to compare open cholecystectomy and laparoscopic cholecystectomy in treating gall stone diseases.

Aim of the Study: The aim of this study was to compare open cholecystectomy and

laparoscopic cholecystectomy with regard to: 1. Duration of procedure. 2. Blood loss during surgery. 3. Rate of conversion of laparoscopic to open surgery. 4. Return of bowel function. 5. Post-operative pain. 6. Complications like surgical site infection and paralytic ileus. 7. Duration of hospital stay. 8. Return to normal activities. 9. Cost effectiveness. 10. Patient satisfaction.

Materials and Methods

This was a single centre, randomized, prospective, comparative study conducted from July 2022 to June 2023 for a period of 12 months. It was carried out on 50 patients with gallstone diseases admitted in surgical wards of Mamata General Hospital, Khammam. This Study was approved by institutional ethics committee and written informed consent was obtained from all patients participating in the study.

Study Population

A total of 50 patients presenting with gallstone diseases, meeting the inclusion and exclusion criteria were included in the study. They were randomly divided into two groups, group A (open cholecystectomy) consisting of 25 patients and group B (laparoscopic cholecystectomy) consisting of 25 patients.

Inclusion Criteria

1. Patients with symptomatic gall stone diseases. 2. Age between 20 to 70 years. 3. Patients willing to participate in the study.

Exclusion Criteria

1. Cholelithiasis with CBD Stones. 2. Previous history of abdominal surgeries. 3. Age less than 20 years and more than 70 years. 4. Patients with gall bladder malignancies. 5. Patients not fit for surgery. 6. Patients not willing to participate in the study.

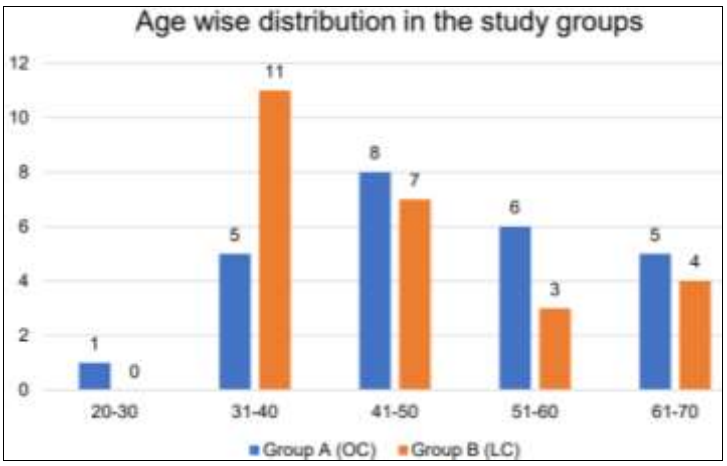
Method of Collection of Data

All the patients were evaluated with a detailed history, clinical findings and relevant investigations confirming the diagnosis of gallstone diseases. The findings were recorded in the proforma for individual patients. Informed written consent was obtained from the patients after full explanation of the details of the disease process, options of treatment, ultimate outcome, possible side effects and complications in either procedure. Group A patients underwent open cholecystectomy (OC) and group B were treated with laparoscopic cholecystectomy (LC). Blood loss during surgery, rate of conversion of laparoscopic to open surgery, duration of procedure, post-operative pain, return of bowel function, complications like surgical site infection, paralytic ileus and duration of hospital stay were recorded and compared in both the groups. All the patients were followed up for a period of 03 months for any complications like surgical site infections.

Statistical Analysis

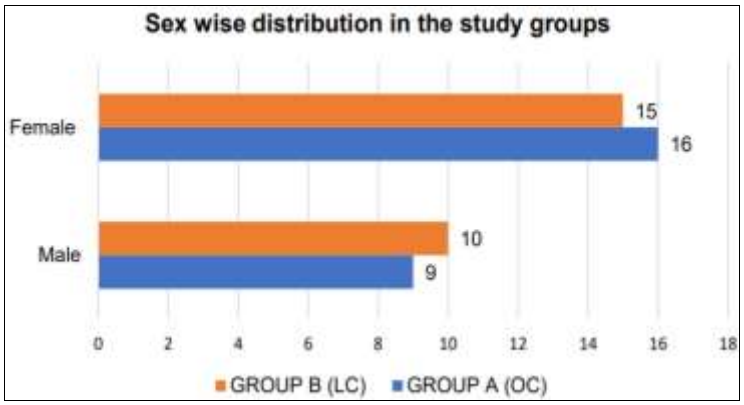
The outcomes were recorded and analysed at the end of the study using paired and unpaired t test. Pearson's chi square test was used for analysis of categorical data. Differences were considered significant if p value < 0.001. IBM SPSS Statistics for Windows, version 24 was used for statistical calculations.

Results



X-Axis - Age in years, Y-Axis - Number of patients

Fig 1: Showing the age wise distribution in the study groups



X-Axis – Number of patients, Y-Axis - Sex

Fig 2: Showing the sex wise distribution in the study groups

Table 1: Showing the clinical presentation in the study groups

Clinical Presentation	Group A (OC) (n=25)		Group B (LC) (n=25)	
	No.	(%)	No.	(%)
Pain in RUQ	25	100%	25	100%
Vomiting	10	40%	04	16%
Fever	08	32%	03	12%
Similar history	15	75%	19	76%

Table 1 in this study is showing Right Upper Quadrant (RUQ) pain was seen in all the patients in both group A and group B (100%), followed by vomiting and fever.

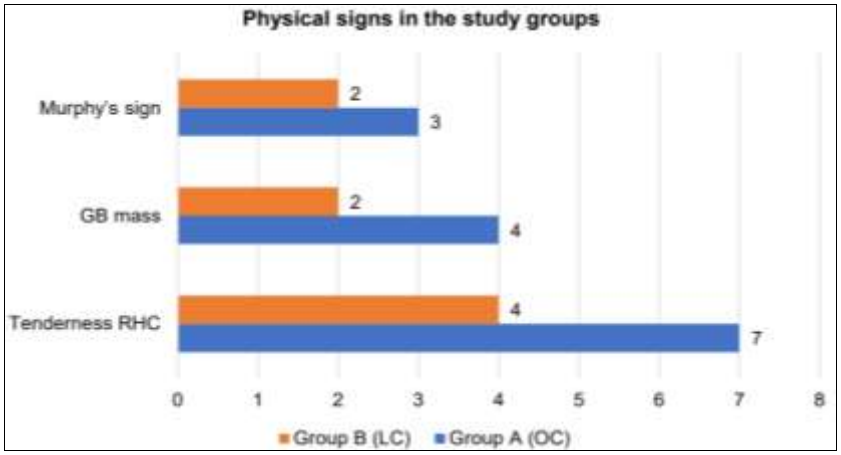


Fig 3: Sowing the physical signs in the study groups

Graph 3 in this study is showing tenderness in the right hypochondrium is the most common physical sign observed in group A (28%) and group B (16%) followed by GB mass and Murphys sign.

Table 2: Showing the USG findings in the study groups

USG Findings	Group A (OC) (n=25)		Group B (LC) (n=25)	
	No.	(%)	No.	(%)
Single stone	12	48%	10	40%
Multiple stones	13	52%	15	60%
Thickened Gb wall	06	24%	04	16%
Pericholecystic Collection	03	12%	02	8%
Shrunken Gb	03	12%	02	8%
Gb perforation	01	4%	0	0%

Table 2 in this study is showing multiple stones is the most common usg finding seen in group A (52%) and group B (60%) followed by single stone.

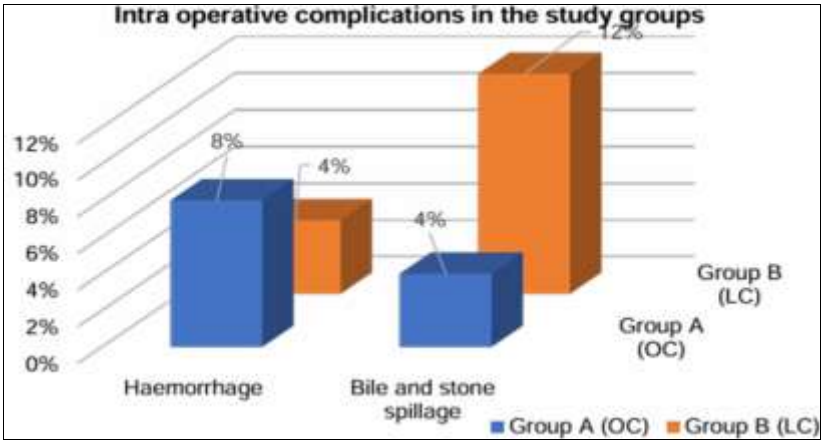


Fig 4: showing the intraoperative complications in the study groups

Graph 4 in this study is showing most common intra operative complication in group A was haemorrhage (8%) and in group B it was bile and stone spillage (12%). No CBD injuries were seen in both the groups.

Conversion from laparoscopic to open cholecystectomy was done in 03 cases (12%). It was done a) Due to difficult Calot's

Table 3: Showing the mean duration of surgery in the study groups

	Group A (OC) (n=25)	Group B (LC) (n=25)
Mean Duration of Surgery	76±12.16 mins	96±11.72 mins

Table 4: Showing the mean duration of post-operative pain and analgesics in the study groups

Post-operative pain	Group a (OC) (n=25)	Group b (LC) (n=25)	*p*< value
Duration of pain	5.24±0.66 days	2.16±0.37 days	< 0.001
Duration of analgesics	5.24±0.66 days	2.16±0.37 days	< 0.001

dissection from dense adhesions in 02 cases. b) Due to haemorrhage in 01 case. Table 3 In this study is showing open cholecystectomy had taken lesser time compared to laparoscopic cholecystectomy. Table 4 in this study is showing mean duration of post-operative pain was more in Group A (OC) than Group B (LC) and mean duration of post-operative analgesics was more in Group A (OC) than Group B (LC).

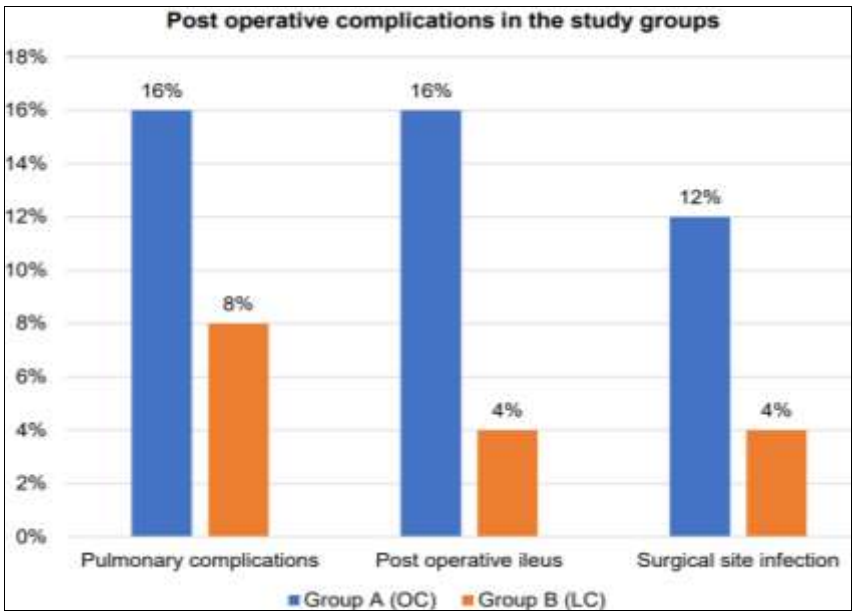


Fig 5: Showing the post-operative complications in the study groups

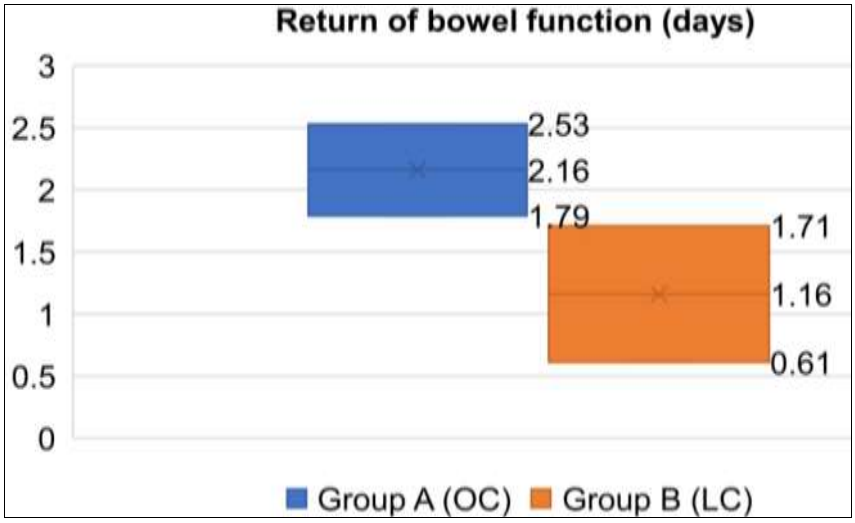


Fig 6: Showing the return of bowel function following surgery in the study groups

Graph 5 in this study is showing post-operative complications were more in Group A (OC) than Group B (LC).

Graph 6 in this study is showing post-operative return of bowel function was earlier in Group B (LC) compared to Group A (OC). This was statistically significant with p value <0.001. Post-operative return of bowel function was assessed by appearance of bowel sounds and passage of flatus.

Table 5: showing the time to start first oral intake following surgery in the study groups

	Group a (OC) (n=25)	Group b (LC) (n=25)
Time to start first oral intake	2.16±0.37 days	1.16±0.55 days

Table 5 in this study is showing time to first oral intake was earlier in Group B (LC) compared to Group A (OC). This was statistically significant with p value <0.001.

Table 6: showing the length of hospital stay following surgery in the study groups

	Group A (OC) (n=25)	Group B (LC) (n=25)
Length of hospital stay	8.44±2.12 days	2.68±0.47 days

Table 6 in this study is showing length of hospital stay was shorter in Group B (LC) compared to Group A (OC).

During the follow up period of 3 months, there were no complications in both the groups. 100% patient compliance was seen in both the groups. Total cost during entire hospital stay in Group A (OC) was similar to that in Group B (LC). However, considering the shorter hospital stay and early return to work usually compensated the more cost of LC to that of OC.

In Group A (OC), larger skin incision of size 10 cm was given. Surgical site infection was seen in 03 cases (12%) in which pigmented, hypertrophic scar with was seen. In Group B (LC), port site skin incisions were 0.5- 01 cm in length. Surgical site infection was seen in 01 case (4%) in which pigmented, hypertrophic scar was seen. Rest of the cases in Group B (LC) had good cosmesis. The mean duration of post-operative pain was lesser in Group B (LC) (2.16±0.37 days) than that of Group A (OC) (5.24±0.66 days). Length of hospital stay was shorter in Group B (LC) (2.68±0.47 days) than that of Group A (OC) (8.44±2.12 days). Therefore, patient satisfaction was more in Group B (LC) than Group A (OC).

Discussion

In this study, the outcome of two surgical treatment modalities of cholelithiasis surgery open and laparoscopic cholecystectomy was compared based upon a follow up period of three months. In a study conducted by Vishnu Kumar Sharma *et al.*, the rate of conversion from laparoscopic to open cholecystectomy was 15.8% which was comparable to the present study, in which it was observed that the conversion from laparoscopic to open cholecystectomy was seen in 03 cases (12%) [10]. The reasons for conversion being difficult Calot's dissection from dense adhesions, and uncontrolled haemorrhage. In a study by J. Morales-Mazaa *et al.*, the conversion rate from laparoscopic to open cholecystectomy was 12.14% [11].

In the present study, in Group A (OC), the mean time taken for surgery was 76±12.16 mins. In Group B (LC), the mean time taken for surgery was 96±11.72 mins. This was statistically significant with p value <0.001. In a study conducted by Rajiv Ranjan *et al*, the mean operation time for laparoscopic cholecystectomy was more than that for open cholecystectomy. The operative time for laparoscopic cholecystectomy was 55-155min (mean: 102.50 min) and 40-105 min (mean: 72.50 min) for open cholecystectomy ($p< 0.001$) [12].

In the present study, out of 25 cases in Group A (OC), haemorrhage is seen in 02 cases (8%) and bile and stone spillage is seen in 01 case (4%). Out of 25 cases in Group B (LC), haemorrhage is seen in 01 case (4%) and bile and stone spillage is seen in 03 cases (12%). This was not statistically significant with p value >0.001. In a study conducted by Anindita Bhar *et al.*, in laparoscopic group, 05 cases had gall stone spillage, 03 cases had bleeding and only one patient had a CBD injury while in open group, 04 cases had gall stone spillage, 06 cases had bleeding and 02 cases had CBD injury [13].

In a study conducted by Niranjan Moharana *et al.*, mean duration of post-operative pain was 17.48±3.4 hours in Laparoscopic cholecystectomy and 30.54±3.45 hours in Open cholecystectomy ($p<0.001$) all these findings are similar to the present study [14]. In a study by Tanweer Karim *et al.*, mean duration of post-operative pain was 1.5 days in laparoscopic group as compared to mean duration of 3.36 days in open group patients [15].

In the present study, in Group A (OC), return of bowel function was seen in 2.16±0.37 days, whereas in Group B (LC), it was seen in 1.16±0.55 days. In this study, post-operative return of bowel function was earlier in Group B (LC), compared to Group A (OC). In a study conducted by Pramod Singh *et al*, post-operative resumption of normal diet was possible within 02 days (mean 1.2 days) in laparoscopic group while open group required longer time (mean 2.1 days) [16].

In a study by Sagheer Ahmed *et al.*, in laparoscopic group, out of 50 patients, postoperative wound infection was found in 03 (6%) patients and in open group, out of 50 patients, postoperative wound infection was found in 11 (22%) patients. Post-operative wound infection is significantly less in laparoscopic group when compared to open group with p=0.04 which was similar to the present study where surgical site infection was seen in 12% of cases in open cholecystectomy group and 4% of cases in laparoscopic group [17].

In present study, in Group A (OC), time to first oral intake was 2.16±0.37 days, whereas in Group B (LC), it was 1.16±0.55 days. In a study conducted by Pramod Singh *et al.*, in laparoscopic group post-operative resumption of normal diet was possible within 02 days (mean 1.2 days) while open group required longer time (mean 2.1 days) [16].

In a study conducted by Niranjan Moharana *et al.*, the duration of hospital stay was lesser in laparoscopic group (2.03±0.12 days) than that in open group (5.23±0.57 days) which was statistically significant ($p<0.001$) [14]. In the present study, in Group A (OC), length of hospital stay was 8.44±2.12 days, whereas in Group B (LC), it was 2.68±0.47 days. In this study, length of hospital stay was shorter in Group B (LC) compared to Group A (OC). Length of hospital stay is less in laparoscopic group compared to open group.

Total cost during entire hospital stay in Group A (OC) was similar to that in Group B (LC). However, considering the shorter hospital stay and early return to work usually compensated the more cost of LC to that of OC. In a study conducted by Anurag Pateriya, cumulative average cost of OC was lower with a value of ₹12,145 as compared to LC having an average cost of ₹14,230. This was statistically significant [18].

In Group A (OC), larger skin incision of size 10 cm was given. Surgical site infection was seen in 3 cases (12%) in which pigmented, hypertrophic scar with was seen. In Group B (LC), port site skin incisions were 0.5- 01 cm in length. Surgical site infection was seen in 01 case (4%) in which pigmented, hypertrophic scar was seen. In a study conducted by Anmol N, the OC group had larger wounds, which healed by primary intention with a big single scar. The LC group had port incisions of < 1.5 cm, which healed by primary intention without much visible scar [19].

Conclusion

In this comparative study which was done in 50 patients, the observations of short-term variables have shown that

laparoscopic cholecystectomy is a better surgical option compared to open cholecystectomy for symptomatic cholelithiasis. In the present scenario, laparoscopic cholecystectomy has become the gold standard in the treatment of gall stone diseases. Laparoscopic to open conversion is done in case of difficulty, complications, failure to progress in timely fashion, in view of patient safety. So, the surgeon should be well versed with the open procedure also for a better result.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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