

Research Article

A Comparative Study of Open Cholecystectomy versus Laparoscopic Cholecystectomy in a Selected Hospital in Guwahati, Assam

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ABSTRACT

Background: Cholelithiasis is a major cause of morbidity among Indians with a female preponderance. Open cholecystectomy (OC) used to be the surgical treatment for cholelithiasis. However, with the advent of laparoscopic cholecystectomy (LC), there has been a gradual shift in the treatment with most surgeons preferring LC over OC. Apart from the benefits of decreased hospital stay, lesser post-operative pain LC is also cosmetically better. Longer operative time and increased incidence of biliary leakage are some pitfalls of LC in initial phase of surgical practice. **Aim:** This study aims to compare OC with LC in selected hospitals in Guwahati, Assam. **Objectives:** The objective of the study was to evaluate the outcomes of with OC in relation to safety, efficacy, complications, cost, and satisfaction. **Materials and Methods:** It is a prospective randomized study of patients (500 each from LC and OC) having cholecystectomy aged between 13 and 81 years. Structured questionnaire was prepared for data collection. “Statistical analysis done in Excel Window 2010.” **Results:** The mean operation time for LC is 59.32 min and 69.22 min for OC ($P < 0.001$). The use of injectable analgesics in case of LC (mean number of days = 3.37) is considerably less than OC (mean number of days = 6.19). The conversion rate is 4.8%. Complication rate is higher in OC (17.9%) and in LC, it is 8.19%. Post-operative infection is 3.3% in LC and 7.5% in OC. **Conclusion:** LC is found to be better than OC in terms of post-operative pain, analgesic requirement, and early return to work.

Keywords: Bile duct injury, Cholelithiasis, Laparoscopic cholecystectomy, Open cholecystectomy

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Introduction

Gallstone (GS) disease continues to be one of the most common digestive disorders worldwide. The prevalence of GS formation increases with age.^[1] In the past few

years, ultrasound data on GS prevalence have been reported.^[2] In the United States, the reported incidence of GSs is approximately 10–15%, with another 1 million new cases diagnosed annually.^[3]

GSs are a common occurrence in Northern India. However, this trend is now showing Pan India presence probably due to migration and blending of cultures and lifestyle. As many as, 16% and 29% of women above the age of 40–49 years and 50–59 years, respectively, had GS.^[4] For every patient with symptomatic GS disease, there are many more with asymptomatic GS. Various studies performed on mortals suggest that most of the GS are asymptomatic. In a study of 9332 postmortem reports performed over 10 years, only 14% of those with GS had undergone cholecystectomy, indicating that up to 86% was asymptomatic. Karl Langenbuch in 1882 quoted that “The gallbladder should be removed, not because it

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contains stones, but because it forms them.”^[5] Many alternative methods for the treatment of GS have been developed, but these have not been satisfactory so far. Since ages, cholecystectomy has been the gold standard surgical treatment of cholelithiasis. With the advent of laparoscopic cholecystectomy (LC), the scenario of surgical management of cholelithiasis has changed drastically. It has opened new horizons in the management of GS. Theoretical benefits of laparoscopic approach include reduced hospitalization and cost, decreased pain, avoidance of large incision with improved cosmesis, and reduced post-operative recovery time with an early return to work. Although it showed early promising results, recent trials show an increase in the incidence of operative complications, especially common bile duct (CBD) injury.^[6] Expensive instruments, specialized training, and long learning curve also limit the use of laparoscopy. This has led to a lot of soul searching and numerous attempts at comparing the merits and demerits of laparoscopic versus open cholecystectomy (OC).

Various series available, given conflicting results, some claim LC to be superior while others claim OC to be better. Some even equate them as interchangeable with no edge of one over the other. The aim of this study was to compare the outcomes of OC and LC with respect to pre-operative, intraoperative, and post-operative variables in the Northeastern part of India, i.e. in Guwahati, Assam.

Justification of the proposed research work

Cholecystitis, both calculus and acalculus, is one of the most common surgical problems, which is more prevalent in this part of the country. Since the past two decades, LC has become the gold standard of treatment. There is a belief that LC is costlier and a high gadget surgery. Many poor people are not able to get this standard treatment due to their financial constraint. Is LC actually costlier than open surgery? A question needs to be addressed with a comparative study in fair groups of patients. This type of study has not been done in this region of our country. Many studies have confirmed the safety and feasibility of LC and have shown that it is comparable with regard to complications. The aim of this study is to evaluate the safety, feasibility, and outcomes of LC with those of OC.

Materials and Methods

Research approach

This was a prospective, comparative, and survey approach.

Research design

This was a descriptive study design.

Setting of the study

This study was conducted in Gauhati Medical College and Hospital (GMCH) and Mahendra Mohan Choudhury Hospital (MMCH) in tertiary care hospital.

Study population

The target population of the study was male and female patients admitted in surgical units of GMCH and MMCH with the age group of 13–80 years of age for cholecystectomy operation either by LC or OC.

Sample size

The sample size consists of 1000 patients, 500 patients from the OC group and 500 from the LC group.

Data collection tools

1. Bed-head tickets
2. Self-prepared questionnaire
3. Visual analog scale (VAS).

Study technique

The study included all the patients in the age group from 13 to 80 years diagnosed with cholelithiasis, who subsequently underwent cholecystectomy either by laparoscopic or OC at GMCH and MMCH from May 2014 to December 2016. Hospital stay, duration of operation, post-operative analgesia, morbidity due to wound infection, bile leak, CBD injury, missed (CBD) stone, and bleeding were assessed and compared between the two groups. Their medical records were analyzed and day-to-day recovery was assessed.

All the patients were interviewed for detailed clinical history and other relevant data of the patient's. This study was approved by the Institutional Ethical Committee.

Statistical analysis was made using z-test with a significant level of 1%. Statistical analysis was performed using Microsoft Excel Window 10.

Observations and Results

In this study, there were 39.8% of male and 60.2% of female samples in OC population, whereas the LC group consisted of 48.2% of male and 51.8% of female patients. It is significant at <0.01 . The mean age in the patients opting for LC is 41.25 years, whereas it is 41.65 years in the OC group, which is not significant at $P < 0.01$. There is no significant difference in body weight and H/O of the previous surgery of the patients in both the groups. Table 1 summarizes the comorbid factors in LC and OC. There are marked differences in comorbid condition between the patient groups, being significantly higher in the OC group (43.6%) as compared to the LC group (28.4%).

In pre-operative parameters as shown in Table 2, the pre-operative hospital stay (mean days) is 2.78 days and 2.34 days for LC and OC, respectively. About 14.8% of patients received pre-operative antibiotics in LC, whereas it is 43.2% in OC. Pre-operative analgesic required for

14.8% of patients while 18% of patients for OC which is statistically significant at $P < 0.01$.

Table 3 shows that significant differences exist in the amount of blood loss in LC (2.6%) and OC (6.6%) groups. Other intraoperative complications do not have significant differences between the LC and OC groups. Intraoperative bile leakage was 1.8% in LC and 3.6% in OC. Bile duct injury is 4.2% in LC and 5.4% in OC. About 4.6% of patients had intraoperative stone spillage in LC and 3% in OC. Organ injury is 1.8% in LC and 2% in OC, as mentioned in Table 3. The mean operating time is 59.32 min for LC and 66.22 min for OC. Group mean for the length of the procedure is 62.94 min. Z-score depicted in Table 4. It is statistically significant as $P < 0.01$.

In post-operative parameters, there are significant differences found in both LC and OC cases regarding post-operative hospital stay (3.97 days for LC and 7.66 days for OC), post-operative pain (mean VAS score is 4.97 in LC and 8.14 in OC), and post-operative duration of antibiotics (mean) (3.37 days for LC and 6.19 days for OC). The duration of administration of analgesics after operation is 2.21 mean days in LC and 3.60 mean days in OC. Significant differences are

also seen in the rate of post-operative complications 8.10% in LC and 17.9% in OC, average duration of post-operative drain is 2.63 days in LC and 3.38% in OC, average duration of nasogastric tube is 2.59 days in LC and 3.10 days in OC, and the average days of resumption of oral diet after operation are 2.29 days in LC and 2.75 days in OC. A total of 3.3% had post-operative wound infection in LC and 7.5% in OC. Post-operative ambulation started on 2.26 mean days for LC and 3.37 mean days for OC. The total number of hospital stay is 6.76 mean days for LC and 10.01 mean days for OC, as stated in Table 5.

Discussion

The present study compared the pre- and post-operative variables of LC and OC. The mean age of the LC is 41.25 years, whereas it is 41.65 years in the OC group. The main sufferers of gallbladder disease in the present study were female (56%) as compared to males (44%). These findings are consistent with the results of similar studies by Otibi *et al.* and Shukla *et al.*^[7] No age group is said to immune to gallbladder disease; however, they were more common in

Table 1: Patients characteristics

Demographic variables	LC (n=500)	OC (n=500)	Z-score	P-value
Sex (M)	241 (48.2%)	199 (39.8%)	2.6756	0.00 (S)
Sex (F)	259 (51.8%)	301 (60.2%)	-2.6756	0.00 (S)
Mean age (years)	41.25 years	41.65 years	-0.4901	0.624061 (NS)
Body weight (mean) kg	62.37 kg	60.42 kg	154.064	0.312031 (NS)
Dietary habit (non-vegetarian)	465 (93.0%)	477 (95.4%)	-1.6235	0.10524 (NS)
Previous surgery	12 (2.4%)	18 (3.6%)	-1.1123	0.1335 (NS)
Comorbidity	142 (28.4%)	218 (43.6%)	-5.0059	0.00 (S)

Significant at $P < 0.01$. LC: Laparoscopic cholecystectomy

Table 2: Comparison of pre-operative parameters

Pre-operative parameters	LC/n=500	OC/n=500	Z-score	P-value
Pre-operative hospital stay (mean days)	2.78	2.34	4.40656	0.000 (S)
Pre-operative antibiotics administration (%)	14.8	43.2	9.896	0.0001 (S)
Pre-operative analgesics administration (%)	14.8	18.0	1.7103	0.0001 (S)

LC: Laparoscopic cholecystectomy, OC: Open cholecystectomy

Table 3: Intraoperative complications

Intra operative complications	LC (n=500) (%)	OC (n=500) (%)	Z-score	P-value
Blood loss	13 (2.6)	33 (6.6)	-3.091	0.000 (S)
Bile leakage	9 (1.8)	19 (3.6)	-0.3834	0.070 (NS)
Bile duct injury	21 (4.2)	27 (5.4)	-1.0459	0.293 (NS)
Stone spillage	23 (4.6)	15 (3)	1.1434	0.254 (NS)
Organ injury	09 (1.8)	10 (2)	-1.9168	0.054 (NS)

LC: Laparoscopic cholecystectomy, OC: Open cholecystectomy

Table 4: Operating time

Operation	Mean	Standard deviation	Mini.	Max.	Group mean	Group standard deviation	Z-test	P-value
LC (476)	59.32	11.46	35	100	62.94	15.379	-83.156	0.0001
OC (524)	66.22	17.54	40	130				

LC: Laparoscopic cholecystectomy, OC: Open cholecystectomy

Table 5: Post-operative parameters

Post-operative parameters	LC (n=476)	OC (n=524)	Z-score	P-value
Post-operative days (mean) after operation	3.97	7.66	16.7512	0.0001 (S)
Post-operative pain (mean score)	4.97	8.14	12.933	0.000 (S)
Post-operative antibiotics (mean days)	3.37	6.192	21.488	0.000 (S)
Post-operative analgesics (mean days)	2.21	3.60	-8.2017	0.000 (S)
Post-operative complications (%)	39 (8.10)	94 (17.9)	-4.5326	0.000 (S)
Duration of post-operative drain (mean)	2.63	3.38	-14.2919	0.000 (S)
Nasogastric tube (mean days)	2.59	3.10	-4.1926	0.00001 (S)
Resumption of oral diet (mean days)	2.29	2.75	0.5925	0.00001 (S)
Duration of urinary catheter (mean days)	2.34	3.23	-3.8458	0.000 (S)
Wound infection (%)	16 (3.3)	40 (7.5)	-2.9346	0.00338 (S)
Ambulation (mean days)	2.26	3.37	-13.6502	0.00001 (S)
Total number of hospital stay	6.76	10.01	24.5074	0.00001 (S)

LC: Laparoscopic cholecystectomy, OC: Open cholecystectomy

the third, fourth, and fifth decades of life as majority of them were between 35 and 55 years age group. Studies by Hugh^[8] and Schmitz *et al.*^[9] have reported a similar peak incidence in the fourth and fifth decades.

Post-operative pain was assessed with VAS. Pain course was experienced by both the groups with variable intensity, higher in OC. Early relief from post-operative pain was seen in LC as compared to OC in the present study. The findings are consistent with the results of similar studies which were also noted by Doke *et al.*,^[10] Agarwal *et al.*, and Karim and Kadyal.^[11]

The need for analgesics was less in (up to 3 days) LC and more than 3 days in OC. Studies with similar results were observed by Doke *et al.*^[10] and Dhaigude *et al.*

According to this study, the conversion rate is 4.8% due to intraoperative hemorrhage and CBD injury. The frequency of CBD injury is 15%. Rate of conversion and reasons for conversion are similar with the studies done by Strasberg *et al.* and Kumar *et al.* It can be inferred that the common reasons for conversion are adhesions, bleeding, organ injury, and CBD injury.

The mean duration of the procedure was shorter in LC (66.22 min) as compared to OC (59.32 min); other studies quoted Shukla *et al.*^[7] and Talpur. The study contrast to our results is done by Karim and Kadyal and Supe *et al.*

Post-operative wound infection was 3.4% in LC and in OC 7.2% in this present study. Siddiqui *et al.*, Karim and Kadyal, Agarwal *et al.*, and Doke *et al.* observed similar findings.

The present study revealed that the mean period of hospital stay is 3.96 days in LC and 7.65 days in OC. In a study by Anmol *et al.*, the median duration of hospital stay was 3 days in LC and 7 days in OC which is in concordance with the present study.

Patient with OC needs antibiotics coverage for more than 7 days which is more as compared to LC. The observation of the present study collaborates with the study by Doke *et al.*, Shaikh *et al.*, and Waldner *et al.* that reported a longer period of antibiotics in OC as compared to LC.

The overall post-operative complications were more (17.9%) in the OC group as compared to the LC group (8.10%).

There was no perioperative and post-operative mortality in this study. The complications observed were bile leakage, wound infection, and CBD injury. Similar studies were reported by Dhaigude *et al.*, Shaikh *et al.*,^[12] Karim and Kadyal, and Lujan *et al.*

The present study depicted that the mean cost of treatment was significantly higher in OC compared to LC. Fajardo *et al.* and Solanki *et al.* in their study found LC to be more cost effective. The variability in the cost-effectiveness in different studies might be attributed to differences in the structure of indirect cost. These indirect costs include per day bed cost, investigation cost, cost of attendant or caregiver, and cost of absenteeism from job. These costs vary substantially in different environment.

The level of satisfaction was significantly higher in LC which is attributed to shorter duration of hospital, less post-operative pain, less complications, and early return to work and routine activities.

Conclusion

From the results of the present study, it can be concluded that LC can be recommended as the first choice of operative treatment for patients with cholelithiasis as compared to OC. The advantages of this procedure over the conventional approach relate primarily to patient satisfaction, reduction in hospitalization, ease of recovery, earlier return to work, and cosmetic considerations. The results of the present study support the view that LC is a safe and justified replacement for OC in northeast region of India.

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