

# A Comparative Analysis between Laparoscopic and Open Cholecystectomy at a Tertiary Care Hospital in Patients with Acute Cholecystitis

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## Abstract

**Background:** Acute cholecystitis is clinically characterized as an episode of acute biliary pain; fever and right hypochondrial tenderness with symptoms persistence exceeding 24 hours.

**Aims & Objectives:** We compared and analyzed open and laparoscopic cholecystectomy in the current study on the basis of the duration of the operation, intra and postoperative complications and the length of hospital stay & return to work.

**Material and Methods:** This was a prospective comparative, randomized hospital-based study performed in patients of 20 - 80 years of age with acute cholecystitis in the Department of General Surgery from July 2019 to January 2021 at SMH&RC, Datta Meghe Medical College Nagpur. Patients were divided randomly into two classes as Open cholecystectomy (60 patients) and laparoscopic cholecystectomy (60 patients). The key assessed outcome was death, peri-operative & post-operative complications; length of hospital stay and wound infection, return to work. The gathered data was statistically analyzed.

**Results:** In both categories, the most common age group was 40-59 years old. The female population (78%) was greater than the male population (22 percent). 1: 3.6 was the male to female ratio. The mean time needed for open cholecystectomy was  $53.18 \pm 12.74$  minutes, while  $38.37 \pm 6.21$  minutes for laparoscopic cholecystectomy, and the difference was statistically important. 2 (3.3 percent) laparoscopic procedures involved conversion to open surgery due to difficult dissection, bleeding & blurred vision. In terms of post-operative pain (VAS > 4), hospital stay period and return to work, laparoscopic cholecystectomy had better outcomes than open cholecystectomy and the difference was statistically important. In Open Cholecystectomy patients, wound infection, post-operative paralytic ileus was substantially greater. There were 2 patients with wound dehiscence from open cholecystectomy. No significant morbidity or any mortality during the study period was reported.

**Conclusion:** Laparoscopic cholecystectomy provides decisive advantages over open cholecystectomy in acute cholecystitis (e.g. shorter time of surgery, fewer post-operative complications, less paralytic ileus, less analgesic use, early discharge and mobilization).

**Key Words:** Acute Cholecystitis, Laparoscopic Cholecystectomy, Open Cholecystectomy.

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## Introduction

Acute cholecystitis is clinically characterized as an episode of acute biliary pain, fever and right hypochondrial tenderness with symptoms persistence

exceeding 24 hours. It is normally caused by a gallstone's constant impaction on the neck of the gallbladder<sup>1,2</sup>. It is estimated that 20 to 40 percent of people with gallstones will experience related symptoms and 12 percent will develop after cholecystitis. The standard (initial) treatment of acute cholecystitis calculus involves bowel rest, intravenous hydration, electrolyte abnormality correction, analgesia, and intravenous antibiotics followed by open or laparoscopic cholecystectomy<sup>3,4</sup>. The use of laparoscopic cholecystectomy has been controversial for acute cholecystitis until recently, due to concerns about the potential risks of complications, especially common bile duct injury and a high rate of conversion to open cholecystectomy. Later studies, however, have shown that early laparoscopic cholecystectomy may be performed during acute cholecystitis. In fact, the total hospital stay and costs were reduced by early cholecystectomy<sup>5,6</sup>. Early cholecystectomy often reduces the risk of failure of conservative management and repeated bouts of acute cholecystitis in the waiting period. The tissue planes are also separable in the first 72 hours, and bleeding is lower compared to the later period. While safe and successful, laparoscopic cholecystectomy can be difficult at times<sup>7,8</sup>. Different difficulties encountered are difficulty in forming pneumoperitoneum, entering the peritoneal cavity, releasing adhesions, anatomy recognition, anatomical variation, and gall bladder extraction. The opaque view; difficult dissection of Callot's triangle; bleeding is the key explanation for conversion to open in early cholecystectomy.

**Aims & objectives:** In this study, we compared open and laparoscopic cholecystectomy on the basis of the length of the operation, intra and post-operative complications, and the duration of hospital stay at our tertiary care hospital.

### **Material and Methods**

This was a prospective comparative, randomized hospital-based study performed at a tertiary healthcare centre in the Department of General Surgery SM Hospital & RC; Datta Meghe Medical College Nagpur. The study period was 2 years. Prior to conducting the report, the approval of the Institutional Ethical Committee was taken. Patient presenting to our hospital with symptoms and signs of acute cholecystitis and diagnosis

was made on Ultrasonography of abdomen, they were entered into the trial as judged by clinical history, physical signs of acute cholecystitis and sonological evidence of acute cholecystitis. Patients of biliary colic without acute cholecystitis, associated choledocolithiasis, emphysematous cholecystitis, perforation of gall bladder, elderly patients with significant medical conditions with compromised cardiopulmonary function and unwilling patients were excluded from the study. Performa noted patient's information including history, detailed physical examination, consent obtained, and pre-anesthetic check-up. Both the group of patients underwent a wide range of investigation such as chest X-rays, Ultrasonography, ECG, complete blood count, liver function tests, kidney function tests, serum electrolytes, and viral markers. The patient's preoperative testing for anesthetic fitness was completed. These patients were split into two classes at random: 60 for open cholecystectomy & 60 laparoscopic cholecystectomy.

The patients selected were then told in local language about the procedure and written informed consent was obtained. The surgeries were carried out by a team of consultant surgeons. Both operations were conducted in compliance with normal surgical procedures. Intraoperative findings and difficulties recorded. The postoperative course was monitored. Mortality, major complications (intra-operative bleeding, bile duct injuries), duration of surgery, post operative recovery, wound infection, length of hospital stay and return to work & symptoms relief were the primary outcomes assessed. All other findings evaluated in comparing the two operative methods, e.g. convalescence, analgesic use, postoperative pain, respiratory complications and cost-effectiveness, were the secondary outcome measured. The gathered data was statistically analyzed. Using SPSS 24, statistical analysis was performed. Quantitative variables were expressed as mean  $\pm$  SD (standard deviation), while relative frequency and percentage were expressed as qualitative variables. Using the Chi square test, comparative data was analysed. The P-value  $<0.05$  as the limit of statistical significance.

### **Results**

A total of 120 patients were divided randomly into two groups: open cholecystectomy (60 patients) and laparoscopic cholecystectomy (60 patients). In both

groups, the most observed age group was 40-59 years old. The female population (78 %) was greater than the male population (22 percent). 1:3.6 was the male to female ratio. There was no substantial statistical difference between these groups in terms of mean age.

**Table 1: Age and sex distribution of patients**

Age group in years	Laparoscopic cholecystectomy (n= 60)	Open cholecystectomy (n= 60)	Male	Female
20-39	14 (23%)	12 (20%)	8 (7%)	18 (15%)
40-59	38 (63%)	42 (70%)	14 (12%)	66 (55%)
60-80	8 (13%)	6 (10%)	4 (3%)	10 (8%)
Total	60	60	26 (22%)	94 (78%)
Age (Mean $\pm$ SD)	41.42 $\pm$ 12.14	39.38 $\pm$ 11.67	Statistical Significance p= 0.063	

The mean time needed for open cholecystectomy was 53.18  $\pm$  12.74 minutes, while it was 38.37  $\pm$  6.21 minutes for laparoscopic cholecystectomy, and the difference was statistically important.

**Table 2: Comparison of duration of procedure in the two groups**

Group	Minimum	Maximum	Mean $\pm$ SD (minutes)	Statistical Significance
Open cholecystectomy (n= 60)	38min	67 min	53.18 $\pm$ 12.74	p = 0.036
Laparoscopic cholecystectomy (n= 60)	34 min	56 min	38.37 $\pm$ 6.21	

2 (3.3 percent) laparoscopic procedures involved conversion due to blurred vision due to difficult dissection and bleeding. In terms of post-operative pain (VAS > 4), hospital stay period and return to work, laparoscopic cholecystectomy had better outcomes than open cholecystectomy and the difference was statistically important.

**Table 3: Comparison of outcome variables between the two groups**

Outcome variables	Laparoscopic cholecystectomy (n=60)	Open cholecystectomy (n= 60)	Statistical significance (p value)
Post- op pain (hours) (VAS > 4)	12.18 $\pm$ 3.46	23.84 $\pm$ 5.73	<0.001
Conversion to open approach	2 (3.3 %)	---	----
Duration of hospital stay (days)	2.17 $\pm$ 1.46	4.65 $\pm$ 2.43	<0.001
Return to work (days)	3.12 $\pm$ 0.87	6.42 $\pm$ 2.71	<0.001

In Open Cholecystectomy patients, wound infection was significant. Both groups were noted for postoperative paralytic ileus and intraoperative bleeding. There were 2 patients with wound dehiscence from open cholecystectomy. No significant serious morbidity or any mortality during the study period was reported.

**Table 4: Complications in open and laparoscopic surgery in present study**

Complications during hospital stay	Laparoscopic cholecystectomy (n=60)	Open cholecystectomy (n=60)	Statistical significance (p value)
Wound infection	2 (3%)	8 (13%)	<0.001
Postoperative ileus	4(7%)	6 (10%)	0.053
Intra operative bleeding	6 (10%)	4(7%)	0.053
Wound dehiscence	0	2 (3%)	--

### Discussion

In many studies, it has been shown that early laparoscopic cholecystectomy in acute cholecystitis has several benefits over open procedure, such as decreased operating time, less intra and postoperative complications, less postoperative discomfort and a shorter hospital stay<sup>9,10,11</sup>. Many surgeons prefer early laparoscopic cholecystectomy. In a population-based study, De Mestral C et al. found that early laparoscopic cholecystectomy (ELC) for acute cholecystitis was associated with a shorter overall hospital stay and a comparable rate of postoperative complications compared to delayed laparoscopic cholecystectomy (DLC)<sup>12,13</sup>. A mean age of patients presenting with acute cholecystitis was 39.03 years found by Dhaigude et al. in their study. Parambil SM et al study showed a mean age of 44 ± 13.33 years. In the current analysis, the mean age in patient of acute cholecystitis posted for laparoscopic cholecystectomy was 41.42 ± 12.14 and the male to female ratio was 1:3.6. A shorter time of surgery was noted in the current study in laparoscopic cholecystectomy compared to open cholecystectomy. In study of Gangji A et al similar findings were noted<sup>14-16</sup>. In the Ranjan R et al report, the postoperative hospital stay period was 3.6 days in laparoscopic cholecystectomy compared to 6.2 days in open cholecystectomy and noted that shorter hospital stay remains the key benefit of laparoscopic cholecystectomy. Similar results were noted by Anmol N et al. Karim T et al, and Ajay Gangji et al, showed a higher complication risk in the open cholecystectomy group compared to the laparoscopic group, similar to the present study. Due to either complicated dissection; extreme inflammation; obscure anatomy; variation in bile duct anatomy, with

irregular laparoscopic intraoperative cholangiography; complications including bleeding, duodenal damage, and respiratory acidosis; or miscellaneous causes, including failure to protect the cystic duct, problems with the equipment; and unsuspected pathology, Laparoscopic Cholecystectomy may be difficult in some patients<sup>17-19</sup>. During Laparoscopic Cholecystectomy (LC), several complications related to anaesthesia, pneumoperitoneum, intra-operative bleeding, bile duct injury, extreme inflammation of callots triangle, difficult dissection, certain pathology viz; mirrizzi's syndrome type 3 causing dissection difficulties in a inexperienced hand have been documented, and these complications and several other factors may involve conversion from Laparoscopic Cholecystectomy (LC) to open cholecystectomy (OC). A study from a single university medical center recorded a 2.6 percent conversion rate, and among converted cases, the diagnosis of acute cholecystitis was more frequent. 2 (3.3 %) laparoscopic procedures involved conversion to open surgery due to blurred vision due to difficult dissection and bleeding in the current study<sup>20-22</sup>. The rate of performance of laparoscopic procedures is directly proportional to the operating surgeon's learning curve. Compared to open procedures, laparoscopic procedures often require a higher cost setup and demand specialized training and experience. The gold standard treatment of cholelethiasis is laparoscopic cholecystectomy, similarly early laparoscopic cholecystectomy in acute cholecystitis offer several advantages in experienced surgeons hand. Early laparoscopic cholecystectomy in acute cholecystitis in appropriate surgeons hand found to reduce intraoperative & post operative complications such as bleeding, bile duct injury. Early laparoscopic cholecystectomy also

advantages over open cholecystectomy in shorter operating time better post operative recovery reduced length of hospital stay, minimal wound infection, better patient compliance & early return to work<sup>23</sup>. Many prospective randomized trials have shown that early laparoscopic cholecystectomy avoids possible risk of late complications such as gangrenous or emphysematous cholecystitis & is the preferred technique for treating the acutely inflamed gallbladder within 7 days of the onset of symptoms without a rise in postoperative morbidity and mortality.

### Conclusion

Early laparoscopic cholecystectomy provides decisive advantages over open cholecystectomy in acute cholecystitis (e.g. shorter time of surgery, fewer intra- and post-operative complications, less analgesic use, early return to work). Laparoscopic cholecystectomy has a definitive learning curve and the rate of complications declines as surgeons become more and more familiar with this technique.

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