

## Open versus laparoscopic cholecystectomy in acute cholecystitis

Niranjan Moharana<sup>1</sup>, Rajat Kumar Patra<sup>2</sup>, Samit Kumar Badhai<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of General Surgery, Kalinga Institute of Medical Sciences, KIIT, Patia, Bhubaneswar, India

<sup>2</sup>Assistant Professor, Department of General Surgery, Kalinga Institute of Medical Sciences, KIIT, Patia, Bhubaneswar, India

<sup>3</sup>Senior Resident, Department of General surgery, Kalinga Institute of Medical Sciences, KIIT, Patia, Bhubaneswar, India

Received: 03-02-2021 / Revised: 23-03-2021 / Accepted: 10-04-2021

### Abstract

**Introduction:** Gallstone disease (GSD or Cholelithiasis) is a significant health problem both worlds over (in both developing and developed nations). Earlier open cholecystectomy was the gold standard for treatment of stones in the gall bladder. The classical open cholecystectomy (OC) and the minimally invasive laparoscopic cholecystectomy (LC) are two alternative operations for removal of the gallbladder. **Material and Methods:** This study included a total of 90 patients of 20-80 years of age with sonographically detected symptomatic gallstones. The present study was conducted on above patients admitted in the surgical wards of Kalinga Institute of Medical Sciences, from September 2018 to August 2020 and who underwent laparoscopic cholecystectomy (LC) or open cholecystectomy (OC) for their condition. **Results:** Duration of the operation time ranged from 50-135 min in Laparoscopic cholecystectomy (Mean±SD 87.32±7.3) and 35 to 90 min (Mean±SD: 56.2±5.7) in Open cholecystectomy. There was <100 ml blood loss in 88.8% of Laparoscopic cholecystectomy; however, in Open cholecystectomy, 91.1% had blood loss ≥100 ml. 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). The mean duration of hospital stays 2.03±0.12 days in Laparoscopic cholecystectomy and 5.23±0.57 days in Open cholecystectomy (p <0.001). **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 gall stone disease.

**Keywords:** Laparoscopic cholecystectomy, Cholecystitis, Cholelithiasis.

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Gallstone disease (GSD or Cholelithiasis) is a significant health problem both worlds over (in both developing and developed nations). Earlier open cholecystectomy was the gold standard for treatment of stones in the gall bladder. The classical open cholecystectomy (OC) and the minimally invasive laparoscopic cholecystectomy (LC) are two alternative operations for removal of the gallbladder. Laparoscopic cholecystectomy was introduced in 1985 and in very short time became the procedure of choice for surgical removal of the gallbladder.

Prevalence of gallstone ranges from 10 to 20% in India. It affects nearly 4.3% of the population. In India gallstone disease (GSD) is most prevalent in northern and north-eastern states of Uttar Pradesh, Bihar, Orissa, West Bengal and Assam [5].

Accepting early surgery for cholecystitis and moving to technical aspects, laparoscopic should be compared to open surgery. While laparoscopic cholecystectomy (LC) has become the approach of choice for elective cholecystectomy, 48.7% of acute cholecystitis are nowadays still operated with the open technique. Some authors consider the presence of inflammation, edema, and necrosis as

unfavorable conditions for safe dissection. As a consequence, the suspected increased rate of complications leads numerous surgeons, in the laparoscopic era to postpone cholecystectomy after resolution of acute inflammation. [6].

In 2013 a new edition of the Tokyo Guidelines (TG 2013) has been produced with the aim to define the best surgical treatment for cholecystitis according to the grade of severity, the timing, and the procedure [7]. Cholecystitis has been classified as mild, moderate and severe based principally on the grade of inflammation of the gallbladder rather than on the patients' conditions. This classification, mainly coming from committee agreement, leads to different treatment options for the three grades of cholecystitis and into each class. In general, the literature, including the TG 2013 in some aspects, shows concerns about supposedly higher morbidity rates in Laparoscopic cholecystectomy performed as an emergency procedure and the higher conversion rate to open procedure during the acute phase [8].

No data of high grade evidence on hospitalization, morbidity and mortality comparison between Laparoscopic cholecystectomy and open cholecystectomy in cholecystitis have been produced. No systematic review or meta-analysis have been published on which is the better treatment between Laparoscopic cholecystectomy and open cholecystectomy for cholecystitis.

The aim of the present study is to analyze the comparing Laparoscopic cholecystectomy and open cholecystectomy for cholecystitis in terms of morbidity, mortality, length of hospital stay, operative times and severe intraoperative hemorrhage.

\*Correspondence

Dr. Rajat Kumar Patra

Assistant Professor, Department of General Surgery, Kalinga Institute of Medical Sciences, KIIT, Patia, Bhubaneswar, India

E-mail: [rajatpatra1980@gmail.com](mailto:rajatpatra1980@gmail.com)

### Material and Methods

This study included a total of 90 patients of 20-80 years of age with sonographically detected symptomatic gallstones. The present study was conducted on above patients admitted in the surgical wards of Kalinga Institute of Medical Sciences, from September 2018 to August 2020 and who underwent laparoscopic cholecystectomy (LC) or open cholecystectomy (OC) for their condition.

### Inclusion criteria

- Patients more than 20 years with either gender
- With one or multiple gallstones diagnosed on ultrasonography.

### Exclusion criteria

- Patient's age below 20 years
- History or investigations suggesting jaundice, gall bladder mass, mucocele, empyema, portal hypertension, cirrhosis of the liver, coagulopathy and pregnancy.

Patients were admitted a day prior to surgery in case of elective cholecystectomy from OPD. Some patients were admitted from emergency department of hospital as they had presented with acute abdominal pain. A detailed clinical history was taken from all patients. Physical examination was done with the help of a common proforma. Full range of investigations like chest X-ray, ECG, CBC (Complete Blood Count), LFT (Liver Function Test), KFT (Kidney Function Test), serum electrolytes and viral markers were done on all patients. Medical and anesthetic fitness were assessed preop. Gas and

relaxant general anesthesia were used on all. Patients were randomly allocated into two groups. Laparoscopic cholecystectomy (LA) group n=45 and being patients who underwent open cholecystectomy (OC) n=45. Patients were randomized in the operating theatre and standard anesthetic technique and pain-control measures were taken.

The open cholecystectomy was performed through a 10 to 15 cm right sub costal incision. In laparoscopic cholecystectomy, a standard 4 baseball diamond port technique was used in all patients. Endocautery was used for haemostasis and Liga clips (LT-300) were used on cystic duct and cystic artery.

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

### Statistical Analysis

The statistical analysis was done using Statistical Package for Social Sciences, Version 22.0 statistical analysis software.

### Results

In our study, the most of the patients the age group of 41-60 years i.e., 23 out of 45 (51.1%), followed by 21-40 years, i.e., 12 out of 45 (26.6%) in Laparoscopic cholecystectomy. In Open cholecystectomy group the most of the patients the age group of 41-60 years i.e., 22 out of 45 (48.8%), followed by 21-40 years, i.e., 10 out of 45 (22.2%).

**Table 1: Distribution of different age groups between two groups**

Age in years	Laparoscopic cholecystectomy	Open cholecystectomy
21-40	12 (26.6%)	10 (22.2%)
41-60	23 (51.1%)	22 (48.8%)
>61	10 (22.2%)	13 (28.8%)
Total	45 (100%)	45 (%)

**Table 2: Distribution of gender between two groups**

Gender	Laparoscopic cholecystectomy	Open cholecystectomy
Male	16 (35.5%)	17 (37.7%)
Female	29 (64.4%)	28 (62.2%)
Total	45 (100%)	45 (100%)

In table 2, maximum number of patients were female 29 (64.4%) and male 16 (35.5%) in Laparoscopic cholecystectomy. In Open

cholecystectomy group, maximum number of patients were female 28 (62.2%) and male 17 (37.7%) in Laparoscopic cholecystectomy.

**Table 3: Comparison of operation time between two groups**

Operation	Operation time (minutes)	Mean±SD operation time (minutes)
Laparoscopic cholecystectomy	50-135	87.3±7.3
Open cholecystectomy	35-90	56.2±5.7

Duration of the operation time ranged from 50-135 min in Laparoscopic cholecystectomy (Mean±SD 87.32±7.3) and 35 to 90 min (Mean±SD: 56.2±5.7) in Open cholecystectomy.

**Table 4: Comparison of Blood loss between two groups**

Operation	Blood loss (<100 ml)	Blood loss (>100 ml)
Laparoscopic cholecystectomy	40 (88.8%)	8 (11.1%)
Open cholecystectomy	4 (8.8%)	41 (91.1%)

There was <100 ml blood loss in 88.8% of Laparoscopic cholecystectomy; however, in Open cholecystectomy, 91.1% had blood loss ≥100 ml.

**Table 5: Comparison of outcome variables between the two groups**

Outcome variables	Laparoscopic cholecystectomy (Mean±SD)	Open cholecystectomy (Mean±SD)	p-value
Post- op pain (hours)	17.48±3.4	30.54±3.54	<0.001
Duration of hospital stay (days)	2.03±0.12	5.23±0.57	<0.001
Return to work (days)	3.01±0.35	5.45±0.63	<0.001

Mean duration of post-operative pain was  $17.48 \pm 3.4$  hours in Laparoscopic cholecystectomy and  $30.54 \pm 3.45$  hours in Open cholecystectomy. ( $p < 0.001$ ). The mean duration of hospital stays  $2.03 \pm 0.12$  days in Laparoscopic cholecystectomy and  $5.23 \pm 0.57$  days in Open cholecystectomy ( $p < 0.001$ ).

**Table 6: Complications in open and laparoscopic surgery in present study**

Complications during hospital stay	Laparoscopic cholecystectomy	Open cholecystectomy
Intra operative bleeding	1	4
Wound infection	2	5
Abdominal infection	1	2
Postoperative ileus	2	4
Pulmonary complication	1	3

### Discussion

Laparoscopic cholecystectomy (LC) causes less pain after surgery, shorter hospital stays, faster return to work activities and a lower metabolic-endocrine-immune response to trauma (REMIT) [9]. This procedure has been the gold standard for elective cholecystectomy for the general population in the last two decades [10]. Elderly patients with biliary tract disease have higher rates of complications, which explains their higher mortality. Although Behrman et al. have not shown a higher incidence of hypotension and hypercarbia during the procedure in their series, they still recommend that LC be performed with caution in the elderly population, with a low threshold for conversion and considering open cholecystectomy (OC) as the initial indication. [11]

In the present study, the mean age of the patients was 53.7 years and the majority of the patients were females (64.4%) and male (35.5%) in Laparoscopic cholecystectomy. On the other hand, Open cholecystectomy, majority of the patients were females (62.2%) and male (37.7%). Madni T et al, also showed the same results. [12] In our study, a majority of cases in the laparoscopic surgery group had  $< 100$  ml blood loss (88.8%), whereas a majority of cases in the open surgery group had blood loss  $> 100$ ml (91.1%). These findings are also consistent with the study conducted by Hernandez M et al, on 100 patients who underwent cholecystectomy for treatment of symptomatic gallstones by either of the two methods, Intra-operative bleeding was higher in the open group when compared with the laparoscopic group. [13]

In the present study duration of post-operative pain was  $17.48 \pm 3.4$  hours in Laparoscopic cholecystectomy and  $30.54 \pm 3.54$  hours in Open cholecystectomy, clearly it was significantly less in laparoscopic cholecystectomy as it is a minimally invasive procedure affecting a limited tissue area. Most studies reported lesser pain in laparoscopic surgery as compared to open surgery. Many publications have reported that Laparoscopic cholecystectomy is associated with shorter hospital stay [14]. We also observed this result, with average length of stay of 2.03 days for Laparoscopic cholecystectomy, versus 5.23 days for Open cholecystectomy. Shorter hospital stay remains the main advantage of the laparoscopic cholecystectomy. Ogola G et al, also showed the same results. [15] Early return to normal as well as occupational activities is a key feature of laparoscopic surgery. Present studies were similar to studies conducted by Guan G, et al, who found that patients who underwent laparoscopic cholecystectomy could return to their routine faster ( $3.12 \pm 0.48$  days) when compared to the open procedure ( $6.86 \pm 1.62$  days). [16]

Proportion of patients with wound infection and abdominal distension was significantly higher in open surgery as compared to laparoscopic surgery. In a large series by Pan L, et al, on over 1248 patients 677 of laparoscopic and 697 of open cholecystectomy reported that the post-operative morbidity rate was half for laparoscopic cholecystectomy compared to open cholecystectomy. [17]

However, LC has demonstrated results superior to OC in patients with symptomatic cholelithiasis in terms of morbidity and hospital stay. There is variability in global practices for the treatment of this

disease in the elderly, and social, physiological and pathological characteristics of the elderly population also differ greatly between regions. In Brazil, there are few studies on the subject [18]. When one considers the population, we studied (patients from SUS - National Health System) and procedures performed in the public system teaching hospitals, researches are even scarcer. [19]

### Conclusion

Laparoscopic cholecystectomy is a safe procedure in elderly patients, with no increased risk of complications compared with the open procedure. The recovery is faster and the hospital stay, shorter. It is important to correctly assess the cardiovascular surgical risk, since this group of patients have lower vital reserve, being more sensitive to surgical trauma. In the era of laparoscopic surgery, with increasing experience of surgeons and the advent of new technologies, old age is not a contraindication for Laparoscopic cholecystectomy, and there are no major complications of this surgery when electively performed.

### References

1. Madni T, Leshikar D, Minshall C, Nakonezny P, Cornelius C, Imran J, Clark A, Williams B, Eastman A, Minei J, Phelan H. The Parkland grading scale for cholecystitis. *Am J Surg*. 2018;215(4):625–30.
2. Hernandez M, Murphy B, Aho J, Haddad N, Saleem H, Zeb M, Morris D, Jenkins D, Zielinski M. Validation of the AAST EGS acute cholecystitis grade and comparison with the Tokyo guidelines. *Surgery*. 2018; 163(4):739-46.
3. Griffiths E. Two operative grading systems to define the difficulty of cholecystectomy. Comment in response to: Sugrue M, Sahebally S, Ansaloni L, Zielinski M. Grading operative findings at laparoscopic cholecystectomy- a new scoring system. *World J Emerg Surg*. 2015;10:14.
4. Lombardo S, Rosenberg J, Kim J, Erdene S, Sergelen O, Nellermeoe J, Finlayson S, Price R. Cost and outcomes of open versus laparoscopic cholecystectomy in Mongolia. *J Surg Res*. 2018; 229:186-91.
5. van de Graaf F, van den Bos J, Stassen L, Lange J. Lacunar implementation of the critical view of safety technique for laparoscopic cholecystectomy: results of a nationwide survey. *Surgery*. 2018; 164(1):31-9.
6. Sugrue M, Maier R, Moore E, Boermeester M, Catena F, Coccolini F et al. Proceedings of resources for optimal care of acute care and emergency surgery consensus summit Donegal Ireland. *World J Emerg Surg*. 2017;12(1):47.
7. Wakabayashi G, Iwashita Y, Hibi T, Takada T, Strasberg S, Asbun H et al. Tokyo Guidelines 2018: surgical management of acute cholecystitis: safe steps in laparoscopic cholecystectomy for acute cholecystitis (with videos). *J Hepatobiliary Pancreat Sci*. 2018;25(1):73–86.
8. Vera K, Pei K, Schuster K, Davis K. Validation of a new American Association for the Surgery of Trauma (AAST) anatomic severity grading system for acute cholecystitis. *J Trauma Acute Care Surg*. 2018; 84(4):650-4.

9. Sugrue M, Sahebally S, Ansaloni L, Zielinski M. Grading operative findings at laparoscopic cholecystectomy- a new scoring system. *World J Emerg Surg.* 2015;10:14.
10. Bharamgoudar R, Sonsale A, Hodson J, Griffiths E, CholeS Study Group, West Midlands Research Collaborative. The development and validation of a scoring tool to predict the operative duration of elective laparoscopic cholecystectomy. *SurgEndosc* 2018; 32(7):3149–3157.
11. Sutcliffe R, Hollyman M, Hodson J, Bonney G, Vohra R, Griffiths E, et al. Preoperative risk factors for conversion from laparoscopic to open cholecystectomy: a validated risk score derived from a prospective UK database of 8820 patients. *J Hepatobiliary Pancreat Sci.* 2016; 18(11):922-8.
12. Madni T, Leshikar D, Minshall C, Nakonezny P, Cornelius C, Imran J, Clark A, Williams B, Eastman A, Minei J, Phelan H. The Parkland grading scale for cholecystitis. *Am J Surg.* 2018; 215(4):625-30.
13. Hernandez M, Murphy B, Aho J, Haddad N, Saleem H, Zeb M, Morris D et al. Validation of the AAST EGS acute cholecystitis grade and comparison with the Tokyo guidelines. *Surgery.* 2018; 163(4):739-46.
14. Ansaloni L, Pisano M, Coccolini F, Peitzmann A, Fingerhut A, Catena F, Agresta F, Allegri A, Bailey I, Balogh Z, Bendinelli C. WSES guidelines on acute calculous cholecystitis. *World J Emerg Surg.* 2016;11(1):25.
15. Ogola G, Crandall M, Shafi S. Variations in outcomes of emergency general surgery patients across hospitals: a call to establish emergency general surgery quality improvement program. *J Trauma Acute Care Surg.* 2018;84(2):280–6.
16. Guan G, Sun C, Ren Y, Zhao Z, Ning S. Comparing a single-staged laparoscopic cholecystectomy with common bile duct exploration versus a two-staged endoscopic sphincterotomy followed by laparoscopic cholecystectomy. *Surgery.* 2018;164(5):1030–4.
17. Pan L, Chen M, Ji L, Zheng L, Yan P, Fang J, Zhang B, Cai X. The safety and efficacy of laparoscopic common bile duct exploration combined with cholecystectomy for the management of cholecysto-choledocholithiasis: an up-to-date meta-analysis. *Ann Surg.* 2018;268(2):247–53.
18. Amirthalingam V, Low J, Woon W, Shelat V. Tokyo Guidelines 2013 may be too restrictive and patients with moderate and severe acute cholecystitis can be managed by early cholecystectomy too. *SurgEndosc.* 2017;31(7):2892–900.
19. Noel R, Arnelo U, Enochsson L, Lundell L, Nilsson M, Sandblom G. Regional variations in cholecystectomy rates in Sweden: impact on complications of gallstone disease. *Scand J Gastroenterol.* 2016;51(4):465–71.

**Conflict of Interest:** Nil

**Source of support:** Nil