

Original Research Article

A comparative study of laparoscopic (LC) vs. open cholecystectomy (OC) in a medical school of Bihar, India

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ABSTRACT

Background: Gallstone disease is a significant health problem world over (in both developing and developed nations). The incidence of gallstone disease increases after age of 40 years and it becomes 4-10 times more common in old age. As many as 16% and 29% of women above the age of 40-49 years and 50-59 years, respectively, had gall stones. Laparoscopic cholecystectomy introduced in 1985 has become the procedure of choice for surgical removal of the gallbladder. The aim is to compare laparoscopic cholecystectomy and open cholecystectomy in patients of cholelithiasis by measuring parameters such as use of post-operative analgesia, operative time, post-operative hospital stays, morbidity, mortality and patient satisfaction.

Methods: It is a prospective randomized study of 120 patients of cholelithiasis aged between 20 years to 80 years operated during 2015-2018 at Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India. They were divided into open and laparoscopic Cholecystectomy groups by drawing a lottery.

Results: The median (range) operation time for laparoscopic cholecystectomy was 55-155 min (mean=102 min) and 40-105 min (mean=72 min) for open cholecystectomy ($p < 0.001$). From LC group 5 cases had to be converted to OC. Rate of conversion was $5/60 = 8.3\%$ which is within limits of worldwide laparoscopic cholecystectomy conversion rate of 5% to 10%. LC was found to be superior to OC.

Conclusions: Laparoscopic cholecystectomy is better than open cholecystectomy. However, open cholecystectomy is preferable in cases of complicated cholecystectomy.

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

INTRODUCTION

Gallstone disease (GSD or Cholelithiasis) is a significant health problem both worlds over (in both developing and developed nations). It affects 10 to 15% of the adult population in western countries. They are asymptomatic in the majority of cases (>80 per cent). Approximately, 1-2 per cent of asymptomatic patients will develop symptoms requiring surgery per year, making cholecystectomy one of the most common operations performed by general surgeons.¹

It is seven times more common in north than south India.² The incidence of gallstone disease increases after age of 40 years and it becomes 4-10 times more common in old age.³ As many as 16% and 29% of women above the age of 40-49 years and 50-59 years, respectively, had gall stones.⁴

Prevalence of gallstone ranges from 10 to 20% in India.⁵ It affects nearly 4.3% of the population.⁶ In India gallstone disease (GSD) is most prevalent in northern and

northeastern states of Uttar Pradesh, Bihar, Orissa, West Bengal and Assam.

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. This rising popularity was based on many outcomes, including lower morbidity and complication rate, and a quicker postoperative recovery compared to open cholecystectomy, despite a rise in bile duct injury. It has improved patient satisfaction in terms of both primary and secondary outcome measures. Although it showed early promising results, recent trials show an increase in the incidence of operative complications, especially common bile duct injury.⁷

The limitations of minimally invasive technique are expensive instruments, specialized training and long learning curve. This has led to a lot of debate and numerous works comparing the merits and demerits of laparoscopic vis-à-vis open cholecystectomy.

The conservative methods for the treatment of gallstones like oral bile acid (chenodexychoic acid and ursodexychoic acid) therapy and Extracorporeal Shock Wave Lithotripsy (ESWL) have not shown encouraging results.

Karl Langenbuch in 1882 quoted, the gallbladder should be removed, not because it contains stones, but because it forms them.^{8,9}

The aims and objectives of the present study were to evaluate the beneficial and harmful effects of laparoscopic and open cholecystectomy for patients with symptomatic gall stones. 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). When data were present, differences in other secondary outcomes like analgesic use, postoperative pain, pulmonary function, and costs were compared as well. But 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, post-operative discomfort and pain, period of hospitalization, cost effectiveness and patient satisfaction

METHODS

This study included a total of 120 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 Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India from July 2015 to June 2018 and who underwent laparoscopic cholecystectomy (LC) or open cholecystectomy (OC) for their condition. The statistical analysis was done using Statistical Package for Social Sciences, Version 22.0 statistical analysis software. Informed consent was taken from all the participants. Age and sex distribution of participants is given in Table 1.

Table 1: Age and sex distribution of patients.

Age group in years	L C	O C	Male	Female
20-39	11	13	05	19
40-59	41	36	11	66
60-80	08	11	03	16
Total	60	60	19	101
F to M ratio			5.3	

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. Group I (n = 100) who underwent laparoscopic cholecystectomy (LA) and group II (n = 100) being patients who underwent open cholecystectomy (OC). Patients were informed and detailed about both the procedures in native language. Patients were randomized in the operating theatre and standard anesthetic technique and pain-control measures were taken.

The OC was performed through a 10 to 15 cm right sub costal incision. In LC 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.

Inclusion criteria

- Symptomatic patients, male and female both,

- With one or multiple gallstones diagnosed on ultrasonography, in the age group 20 to 80 years.

Exclusion criteria

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

Outcomes measured

- The primary outcome measured were mortality, major complications (intra-operative bleeding, bile duct injuries), and relief of symptoms.
- The secondary outcome measured were all other outcomes assessed in comparing the two operative techniques e.g. operative time, hospital stay, convalescence, analgesic use, postoperative pain, respiratory complications and cost-effectiveness.

RESULTS

In this study equal number of patients (60) underwent LC and OC. Majority of the cases were females (F: M=5.3) and in the age group 40 to 60 years. The operating time for LC was more as compared to OC in most cases and more than 2 hours in 19 cases due to various reasons like dense tough adhesion around Calott's triangle (in 6 patients), bleeding (in 3 cases), perforation of GB (in 6 cases), CBD injury (in 1 case) and technical hardware challenges (in 3 cases). The mean operation time for laparoscopic cholecystectomy was more than for open cholecystectomy. The operative time for laparoscopic cholecystectomy was 55-155min (mean: 102.50min) and 40-105min (mean: 72.50min) for open cholecystectomy ($p < 0.001$). The operation time for laparoscopic cholecystectomy became shorter as the period of study elapsed and the team became more experienced. The following table shows the operation duration for both the groups (Table 2).

Table 2: The operation time for LC and OC.

Operation	Operation time	Mean operation time	Standard deviation
Laparoscopic	55-155 min	102.50 min	31.2251
Open	40-105 min	72.50 min	18.1115

Form LC group 5 cases had to be converted to OC. Out of these 5 cases 3 cases were due to bleeding from the cystic artery due to inadvertent dislodgment of clips, in 2 cases there was biliary leakage from short thick cystic duct and in one case the CBD was injured from diathermy during the hook dissection. Rate of conversion

was $5/60=8.3\%$ which is within limits of worldwide laparoscopic cholecystectomy conversion rate of 5% to 10%.

Peritoneal drain was given in 26 cases for various reasons and for varying duration of 24 to 72 hours. The average analgesic dosage administered on demand was used as an index of postoperative pain. The average dosage and duration of tramadol and diclofenac sodium were less after LC than in OC. The mean post-operative hospital stay was 3.6 days after laparoscopic cholecystectomy and 6.2 days after open cholecystectomy.

The 't' test applied to number of days (duration) of post-operative hospital stay required to type of surgery. Result shows rejection of null hypothesis. Therefore, open cholecystectomy patients had significantly less hospital stay than laparoscopic cholecystectomy patients.

Table 3: Complications in open and laparoscopic surgery in present study.

Complications during hospital stay	Laparoscopic cholecystectomy	Open cholecystectomy
Wound infection	5	11
Intra operative bleeding	3	2
Wound dehiscence	0	0
Abdominal infection	0	3
Bile duct injury	1	0
Postoperative ileus	3	6
Pulmonary problems	2	5 (in asthmatics/older patients)
Cardiac problems	0	0
Death	0	0

The post-operative pain and use of analgesics in case of laparoscopic cholecystectomy (Mean=1.8 days) was considerably less than open cholecystectomy (Mean=4.1 days).

In open cholecystectomy group most of the complications were due to wound infections (11 nos.) which significantly higher as compared with laparoscopic cholecystectomy (No. 05).

Postoperative ileus was present in 6 patients of open cholecystectomy group and required continuation of nasogastric decompression and NPO regime. Post op chest infection and atelectasis was seen in 5 patients in OC group and in 2 patients in LC group (Table 3). No cardiac events or death encountered in any patient.

DISCUSSION

In the present study, the mean age of the patients was 48.2 years and the majority of the patients were females (84%) from rural areas (88%). The higher proportion of rural patients was there in the present study because our hospital is located in rural population.

A majority of cases in the laparoscopic surgery group had <100 ml blood loss (90%), whereas a majority of cases in the open surgery group had blood loss ≥ 150 ml (91%). These findings are also consistent with the study conducted by Poggio JL 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.¹⁰

In the present study duration of post-operative pain was 15.24 ± 5.21 hours in group I and 28.12 ± 6.15 hours in group II, 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.

In present study, postoperative duration of hospital stay was 3.6 days in group I as compared to 6.2 days in group II. Again, LC scoring over OC. Shorter hospital stay remains the main advantage of the laparoscopic cholecystectomy. Anmol N et al, also showed the same results.¹⁰ In this study the median duration of hospital stay was three days for laparoscopic cholecystectomy group and seven days for open cholecystectomy group.

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 Coccolini 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.¹¹

Early return to normal as well as occupational activities is a key feature of laparoscopic surgery. Present studies were similar to studies conducted by Antoniou SA, et al, and Saeed T et al, who found that patients who underwent laparoscopic cholecystectomy could return to their routine faster (3.12 ± 0.48 days) when compared to the open procedure (6.86 ± 1.62 days).^{7,12}

No cost benefit analysis was done in this study as authors' institute is government run hospital where no patient is charged for any procedure.

CONCLUSION

The present study was carried out with an aim to examine which of the two procedures laparoscopic

cholecystectomy or open cholecystectomy is more advantageous in the treatment of calculous cholecystitis. On the basis of the above results, authors concluded that 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.

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