

A comparative study between laparoscopic and open cholecystectomy with early post-operative course and complication

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Abstract

Background and objectives: Although laparoscopic cholecystectomy has quickly gained popularity as a viable alternative to open cholecystectomy, it should have a safety profile that is comparable to or better than that of open surgery. The purpose of this study was to compare open cholecystectomy versus laparoscopic cholecystectomy in terms of surgical time, blood loss during surgery, early post-operative course and complication, antibiotic and analgesic requirements, and patient satisfaction after the procedure. **Methods:** A total of 40 consecutive individuals under the age of 70 who presented with calculous cholecystitis but no evidence of CBD stones were randomised to either open or laparoscopic treatment. Cholecystectomy is a surgical procedure that removes the gallbladder. The information was gathered and examined. **Results:** Statistically, the two groups were comparable in terms of demographic and clinical characteristics. Complications and blood loss were not significantly different across the groups. In the laparoscopic group, the median duration of pain was 2 days, with a visual analogue scale for pain of grade 2 in the laparoscopic group, but it was 5 days and grade 3 in the open group. The median length of hospitalisation was much lower in the laparoscopic group (median 4 days vs to 7 days in the open-chest group). **Conclusion:** Most important were the reduced post-operative discomfort and shorter period of analgesia intake, as well as the more quick recovery and shorter hospital stay that resulted from LC.

Keywords: Cholelithiasis; laparoscopic cholecystectomy; open cholecystectomy; post operative pain.

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Introduction

Traditionally, conventional or open cholecystectomy was used to treat cholelithiasis, which is still one of the most common digestive disorders encountered. However, with the introduction of laparoscopic cholecystectomy, the surgical community witnessed a revolution in basic ideology, and the importance of minimal access surgery has been emphasised more prominently [1,2]. Because of advances in magnification, laparoscopic cholecystectomy (LC) has become increasingly safe and simple, and it may now be performed with greater simplicity and safety.

Even though laparoscopic cholecystectomy (LC) has demonstrated significant advantages in terms of shorter hospital stays, lower morbidity and mortality, a quicker return to work, and a cosmetic advantage, many questions about this procedure remain unanswered, particularly when compared to the gold standard procedure of open cholecystectomy [3-5]. The incidence of serious complications, notably bile duct injury, have been indicated to be much greater in laparoscopic surgeries, resulting in significant morbidity and even mortality in some cases, according to some surgeons. Beyond the expensive expense of the equipment and specific training that is required for this treatment, there are inherent dangers and risks to performing the process [6]. Would the laparoscopic approach of cholecystectomy be able to establish itself as a safe and cost-effective alternative to the open method in a developing country such as ours, where medical costs and lost working days are key concerns?

In this study, we attempted to assess the advantages and disadvantages of both treatments in a rural Indian setting, to determine which was superior

Aim & objectives

The aim of this study is to compare conventional cholecystectomy and laparoscopic cholecystectomy with respect to:

1. Duration of the procedure.
2. Blood loss during surgery.
3. Early post-operative period (first 48 hours) and to recognize the special problems arising during this period.
4. Antibiotic and analgesic requirement
5. Complications encountered (early post-operative and delayed).
6. Patients satisfaction.

Materials and methods

Source of data

The study subjects consisted of 40 patients with a diagnosis of calculous cholecystitis that underwent cholecystectomy at ESI Medical College Hospital and Research Centre, Hyderabad.

Inclusion Criteria

- Patients with cholelithiasis proven by USG with at least one attack of upper abdominal pain and considered fit for elective cholecystectomy were included in the study.
- Mucocele / pycocele of gall bladder.

Exclusion Criteria

- The patients with following conditions were excluded from the study: History or investigations suggesting CBD stones.
- Generalized peritonitis
- History of prior abdominal surgery. Patient's age above 70 years.
- Pregnancy.
- Major bleeding disorder Suspected carcinoma gall bladder
- Lap converted to open cholecystectomy since it is randomized prospective study.

Patients were randomly distributed into two groups of (laparoscopic cholecystectomy and open cholecystectomy) 20 each by sealed

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envelope method .one group was subjected to laparoscopic cholecystectomy and the other to open cholecystectomy. All patients were kept nil by mouth overnight prior to surgery and received antibiotics prophylaxis. nasogastric tube was inserted depending on individual basis and all patients were asked to empty the bladder prior to entering the operating room .

Surgical procedure

All operations were performed by the consulting surgeon. All operations were under general anaesthesia.

Open cholecystectomy

A sub costal incision was used for open cholecystectomy; the length of incision was tailored to the individual patient and kept to minimum necessary to allow safe and adequate access to the gall bladder. dissection was started at the calot's triangle and proceeded antegradely towards the fundus. -fundus first method " was used in case of dense adhesions where anatomy of calot's triangle was not clear.

Laparoscopic cholecystectomy

Laparoscopic cholecystectomy was performed with the operating surgeon on left side of the table. pneumoperitoneum was created using veress needle and by hassan's technique in some cases .It involved two 10 mm and two 5 mm trocars. Peritoneal cavity was visualized and dissection was carried out by means of electrocautery

and cystic duct and cystic artery were secured with titanium clips.

At the completion of operation, a sub hepatic drain was inserted as required in both the groups .All wounds were infiltrated with local anaesthetic. Once the patients were reserved from anaesthesia ,they were shifted to recovery room for observation for an hour and then shifted to post operative ward.

All patients were administered NSAID's and anti-emetics as required patients were allowed liquids once bowel sounds returned. Patients were discharged from the hospital once they were fully mobilized and able to tolerate a normal diet and pain relief was adequate .pain in the post op period was rated by each patient using a visual analogue scale(from 0 to 5)

.patients were encouraged to resume work and normal daily activity as soon as possible.evaluation of return to normal work and post op complications was made during an OPD appointment 4 weeks after surgery. Data was collected prospectively and included patient's demographics, laboratory results,operative findings , requirement for conversion to open is not included since it is randomized and comparative study ,operating time (from incision to closure),peri-operativebleeding Operative complications, duration of post operative pain, analgesicadministration and length of hospital stay along with post- operative complications if any. The patients were also asked to grade their perception to cosmetic results on a scale of 1 to5.The histopathology of specimen was also noted.

Results

Twenty patients were randomized to each group. The results were,

➤ Patients demographics

Table 1: Sex distribution

Sex	LC	OC
Male	8	12
Female	12	18

12 patients of OC and 8 patients of LC were males. Among OC group 18 were females and among LC group 12 were females.

Table 2: Age distribution

Age in years	LC	OC
<30	4	3
31-40	6	8
41-50	5	5
51-60	3	7
61-70	2	7

The median age (range) of patients were 38 (18-62) and 40(20-65) years in LC and OC groups respectively. The difference was not found to be statistically significant.

Table 3: Presenting complaints

Complaints	LC	OC
Pain RUQ	20	30
Vomiting	9	8
Fever	8	5
Dyspepsia	6	7
Similar history	14	11

All patients in both the groups (100%)presented with pain in the right upper quadrant.The other complaints seen were fever (8 in OC and 5 LC), vomiting (9 in OC and 8 in LC) and dyspepsia (7 in OC and 7 LC). None of the patients had jaundice or previous history of jaundice. 14 patients in OC and 11 patients in LC group had similar history of pain abdomen in the past.

Table 4: Sonographic findings

USG Findings	LC	OC
Solitary stone	7	8
Multiple stones	18	16
Pericholecystic fluid	6	7

All patients in both groups underwent abdominal sonography. Solitary stone was found in 6 patients of OC group and 7 patients of LC group. Multiple stones were seen in 16 and 18 patients of OC and LC group respectively. 7 patients in OC group and 6 patients in LC group had pericholecystic fluid collection suggestive of acute cholecystitis. The difference was not found to be significant.

Table 5: Operative findings

Operative findings	LC	OC	P value
Operating time (in min) (range)	105mn (60-160mn)	70mn (40-135mn)	p=0.001* (S)
Blood loss			p=0.05* (NS)
< 100 ml	17	16	
>100 ml	4	3	

Complications	Bile leak	9	6	P=0.05+ (NS)
	Stone spillage	4	2	
	CBD Injury	0	1	
	Adj. Organ injury	2	2	
	Drains used	19	21	P=0.05+(NS)

All patients were operated under general anaesthesia. The intra operative blood loss was < 100 ml in 16 patients and > 100 ml in 5 patients who underwent OC and was < 100 ml in 17 patients and > 100 ml in 2 patients who underwent LC.

The main reason for blood loss in LC group was the slippage of the clip applied to the cystic artery and from the gall bladder bed.

The median duration of operative procedure was 70mm (40-13 5mm) for OC and 105mm (60-160mm) for LC. The difference was found to be significant (p=0.001).The more time required in LC was due to intra- operative gas leak, Calot’s triangle dissection, slippage of clip and delivery of gall bladder through the port site.

The main complications noted were bile leak (9 patients in LC and 6 patients in OC group) and stone spillage (3 in LC and 1 in OC). There was no instance of CBD injury in either group. Injury to liver during retraction was seen in 1 patient who underwent OC.

The sub-hepatic drains were required in 19 patients in OC group and 21 patients in LC group. In other cases, drains were not kept as the haemostasis was found to be adequate.

Two patients were converted from laparoscopy to open surgery due to:

1. Slippage of the clip applied to the cystic artery.
2. Dense adhesions in the Calot’s triangle in a case of acute cholecystitis

Table 6: Early post-operative period (first 48 hours)

Pain score (Average)	LC		OC
	1 st 14 hr	1	3
2 nd 24 hr	0	2	
Nausea	17 (80%)	18 (90%)	
Flatus	Day 0	Day 1	
Mobility	Day 0	Day 2	
Cough & chest pain	2 (10%)	4 (20%)	
Analgesic used Average	Tramadol(Day zero)	Tramadol & Diclofenac (Day zero) (100%) (Day 1) (50%) (Day 2) (25%)	

In the LC group, the average pain score in the first 24 hr was 1 and in the second 24 hr it was zero. In the open group, the score was 3 and 2 respectively. Early nausea was present in 80% of patients in LC group versus 90% in the open group.

All patients with LC pass flatus and start mobilization on day zero, while patients who had OC pass flatus and start moving after 24 hr. All patients with LC were given analgesic on day zero only (Tramadol). Tramadol & Diclofenac were given to all patients with OC in day 0 and...to 50% of patients on day 1 and 25% on day 2. Early cough with chest pain was present in 2 (10% with LC and in 4 patients (20%) with OC. Patient with LC needed admission and intensive care unit and two in the OC group.

Table 7: Pain score and medication

	LC	OC	P value
VAS (Grades 0-5) (Range)	Grade 2 (0-3)	Grade 3 (1-5)	P=0.023 (S)
Duration of pain (days) (Range)	2 (1-6)	5 (2-10)	P=0.001 (S)
Analgesic used for (days) (Range)	3 (2-6)	7 (2-10)	P=0.018 (S)

The VAS was median Grade 3 in OC group as compared to median Grade 2 in LC group, p=0.023. The pain was more in the initial 2 days in both groups and it lasted for a median duration of 4 days in OC group compared to 2 days in LC group, p=0.001. The NSAID’s were used for more days in OC group (median-5days) compared to LC group (median- 3days), p=0.018.

Table 8: Early postoperative complications

	LC	OC
Delayed recovery	1	2
Need for ICU/RCU	1	3
DVT	0	0
Pulmonary embolism	0	0
Early jaundice	0	0
Wound infection	1	7
Bile leak	9	5

Table 9: Specific complication - Hemorrhage

Site	LC	OC	P value*
Organ (liver)	1	1	
Trocar site	0	0	
Vascular	0	0	

Table 10: Specific complication

	LC	OC	
Biliary complication	Common bile duct...injury	0	0
	Postoperative bile leak	2	1

Bowel injury	Caused byverres needle	0	0
	During dissection	0	0
Spillage of gall stone...		3	1

No patient with LC and OC had venous thrombosis with embolism. Delayed recovery from anesthesia noted in one patient with LC and two patients with OC and no patient had early jaundice. There were one patient had wound infection in LC and five patients with OC had wound infection. There were no specific complications with trocars, and vascular injury, one patient had organ (liver) injury in LC and one patient in OC. In the LC and OC there were no common bile duct injury. Two patients with LC and one patient with OC noted with post-operative bile leak. No patient with LC and OC had bowel injury and its related complications. There was spillage of gall stones in three patients in LC and one patient in OC.

Table 11: Post operative outcome and antibiotics used

Post operative outcome	LC	OC	p Value*
Wound infection			
Nil	21	17	p>0.05 (NS)
Moderate	1	3	
Severe	0	2	
Duration of Antibiotics used in days (Range)	6 (3-7)	9 (5-14)	P=0.1 (NS)
Incisional hernia	0	1	

There was a difference in wound infection rate, 5 patients in the OC group compared to only 1 patient in the LC group, p>0.05. One patient in the OC group had wound dehiscence which was sutured later under anesthesia.

Due to this, the antibiotics were used for 7 days in the OC group compared to 5 days in the LC group.

One patient who underwent OC developed incisional hernia at 6 months follow-up which was repaired by only mesh repair.

The drains were kept for an average of 3 days in the OC group compared to 2 days in the LC group. They were removed once the drainage was <10 ml in 24 hours.

Table 12: Post operative recovery

Postoperative recovery	LC	OC	P Value*
Time taken to return of bowel sounds (in hours)+	10 (6-12)	22 (12-30)	P=0.23(NS)
Time to resumption of oral feeds (in hours)+	9 (6-18)	21 (12-36)	P=0.325(NS)
Duration of hospital stay (in days)+	6 (2-7)	7 (4-10)	P=0.001(S)
Time taken to return to normal work (in days)+	5 (3-10)	8 (5-14)	P=0.018(S)

The LC group patients were started on oral feeds at an average of 9 hours (6-8 hours) while in the OC group patients it took an average of 21 hours (12-36 hours). The duration of hospital stay was for a median period of 4 days (2-7 days) in the LC group and 7 days (4-10 days) in the OC group. The difference was statistically significant, p=0.001. It was more in the OC group due to increased pain, wound infection, injectable antibiotics used and less mobilization due to pain. All patients who underwent LC were able to return to normal work on an average of 5 days compared to 8 days in the OC group. The difference was statistically significant, p=0.018.

Table 13: Cosmesis

Cosmetic result	LC	OC
Unacceptable	0	16
Acceptable	5	7
Good	17	0

17 patients who underwent LC felt that they had a good cosmetic end result while only 7 patients of the open group were acceptable, p>0.05.

The length of the incisional scar in the open group ranged from 5-10 cm and was visible as a thick scar.

Discussion

Traditional cholecystectomy is an integral part of every surgical training programme and is performed by most general surgeons. The advent of laparoscopic cholecystectomy has created excitement and a flurry of activity in the medical community.

This study showed that the morbidity rate is more with open cholecystectomy than laparoscopic cholecystectomy. The open procedure was associated with a shorter operating time (LC 60-160mm and OC 40-135mm)[7,8]. As experience is gained, an operating time of about 50 min can be achieved, but this increases as other surgeons are trained or more challenging cases are performed. This "learning curve" represents adapting to operating in the 2-D screen, becoming familiar with the instrumentation and becoming accustomed to the technique.

In this study, there were no major complications and several minor ones. There was no open-operative mortality and no CBD injury. The complications observed were bile leak, stone spillage and blood loss which were found to be comparable in both the groups. Fewer drains were used in the laparoscopic group but the difference was not found to be significant. Other studies also reported similar results[11].

The conversion was necessary in 2 patients out of 20. One patient (10%) required conversion due to difficult dissection given acute

cholecystitis and the other due to slippage of clip applied to cystic artery. The conversion rate was also found to be higher in acute cases in other studies (0-45%)[10].

The wound infection rate in this study was found to be less in the laparoscopic group being (5% in laparoscopic group versus 25% in open group). This was due to the reduced size of the incision and lesser wound. This also reduced the need for post-operative antibiotics in the laparoscopy group. Due to the severe wound infection and wound dehiscence 1 patient in the OC group developed incisional hernia in the follow-up period. Harris also noted 1 wound infection in 10 OC patients and 0 in LC group. Use of minimally invasive techniques in elective surgeries is associated with a reduced inflammatory stress response with improved pulmonary function and less hypoxia[10, 11]. The VAS was significantly less for LC group [Grade 2 (median) for LC and Grade 3 (median) for OC; p=0.0241]. The pain duration (median 2 days for LC and median 4 days for OC patients; p=0.001) and the duration of analgesics used (median 3 days for LC and median 5 days for OC patients; p=0.016) also were significantly less in laparoscopic group patients. This was due to the lesser incision size in LC. Other studies have also shown similar results[12].

In this study, patients who underwent LC were started with oral feeds

at the duration of 6-8 hours post-op compared to 12-36 hours in the OC group. The difference was not found to be statistically significant. The two most beneficial aspects of LC are the short hospital stay and the rapid recovery. In this study, the median duration of hospital stay was 4 days for the LC group and 7 days for the OC group. The difference was found to be statistically significant ($p=0.001$) [7].

The time taken to return to normal work was found to be more in OC (median 5 days) compared to LC (median 8 days). It was comparable to Schietroma [27] who found the time taken was 4.4 days for LC and 7.6 days for OC patients. Other studies found that the duration of sick leave was less in LC compared to OC [8].

The cosmetic outcome was found to be acceptable in 5 of LC patients and 7 of OC patients. While 17 of LC patients were satisfied with the scar of the operation, 16 of OC patients did not accept the surgical scar and deemed it ugly. The cost was found to be more in LC patients compared to OC patients, but the difference was not found to be statistically significant in this study.

The cost of laparoscopy operation was overcome by other costs of open procedure namely increased expenditure on the analgesics, antibiotics, number of dressing changes and the loss of working hours. This is in concordance with other studies [5].

Conclusion

The use of laparoscopic cholecystectomy in the treatment of gall bladder disease has made significant strides forward. There are various advantages to having a laparoscopic cholecystectomy:

There are fewer risks of wound infection and no risk of wound dehiscence with LC because of the precision with which the cystic artery and duct are dissected and the amount of blood lost during the procedure.

- LC has a lower antibiotic usage rate than OC, which is a significant difference.
- Pain following surgery is less severe and lasts for a shorter period of time.
- The amount of analgesic medication required is smaller in LC patients.
- LC patients tolerate oral feeds earlier and are more mobile as a result of this.
- The length of hospitalisation is shorter, and patients are able to be discharged from the hospital more promptly.
- Patients in the LC group can return to work sooner than those in the other groups.
- The cosmetic advantage of LC is self-explanatory.
- Lung cancer is associated with a substantial cost savings for the patient.

While the laparoscopic method is superior to the open method in terms of overall operating time, it does have one big disadvantage: it takes substantially longer to complete the treatment.

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