OUTCOME FOLLOWING OPEN AND LAPAROSCOPIC CHOLECYSTECTOMY
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ABSTRACT: Laparoscopic cholecystectomy has rapidly become established as the popular alternative to open cholecystectomy, but it should have a safety profile similar to or better than that of open procedure. The aim of this study was to compare conventional cholecystectomy and laparoscopic cholecystectomy with respect to duration of procedure, complications, postoperative pain, analgesic requirement, antibiotic requirement, resumption of normal diet and period of hospital stay. 50 patients with symptoms and signs of acute acalculous/calculous cholecystitis, selected randomly, were included in this study. Clinical profile, investigations, treatments, outcomes were analyzed. The highest age incidence was in the 5th decade, more common in females. Pain in the RUQ of abdomen was the most common symptom. Ultrasonography showed gallbladder stones in almost all patients. The duration of LC (120min) was more than for OC (90min). The conversion rate of LC to OC was 8%. Post-operative morbidity was more in case of LC. The antibiotic and analgesic requirements were less in LC group. The resumption of normal diet was 2 days earlier in LC compared to OC group, and the hospital stay was 4 days less in LC group. The result showed the incidence of acute calculous/acalculous cholecystitis more in females, 5th decade, presented more commonly with pain abdomen. Ultrasonography was the most common investigation. Laparoscopic cholecystectomy reduces the number of antibiotic and analgesic requirement, hospital days, pain disability, wound infection, and with better cosmesis, except for the prolonged operative time, which can be minimized in due course of time as the learning curve progresses.

KEYWORDS: Acute calculous/acalculous cholecystitis, Ultrasonography, Open cholecystectomy, Laparoscopic cholecystectomy

INTRODUCTION:
• Gastro-intestinal surgery has undergone a revolution in the recent years by the introduction of laparoscopic techniques.
• Acute acalculous/calculous cholecystitis, which continues to be one of the most common digestive disorders encountered, was traditionally being dealt by conventional (open) cholecystectomy. With the introduction of laparoscopic cholecystectomy, the surgical community witnessed a revolution in post-operative recovery of the patient.
• Laparoscopic cholecystectomy (LC) is safe and easy, which can be performed with much ease and safety because of the better magnification.
• LC has shown clear benefits in terms of shortened hospital stay, less morbidity, a quicker return to work and with cosmetic advantage.
• Some surgeons have suggested that the rates of serious complications, particularly bile duct injury might be significantly higher in laparoscopic procedure.
• The high costs of the laparoscopic equipment and the specialized training that is mandatory for mastery of the technique, the procedure inherently carries hazards and risks.
• Could laparoscopic cholecystectomy establish itself as a safe and cost effective alternative to the open method?
• In our study, we have planned an attempt to compare the advantages and drawbacks of both the procedures.

**OBJECTIVES:** The aim of this study is to compare conventional cholecystectomy and laparoscopic cholecystectomy with respect to:
1. Duration of the procedure.
2. Post-operative recovery.
3. Analgesic requirement.
4. Complications encountered.
5. Period of hospitalization.
6. Patient satisfaction.

**METHODOLOGY:** The study subjects were patients, admitted with diagnosis of acute acalculous/calculous cholecystitis, who subsequently underwent cholecystectomy at Adichunchanagiri institute of medical sciences, BG nagara, between November 2010 and April 2012.

All the patients were selected randomly, and as per the proforma, all the patients were interviewed for detailed clinical history and examined. They were then subjected to routine blood, urine and other investigations and an abdominal ultrasound was performed in all cases.

**INCLUSION CRITERIA:** Patients with acute calculous/acalculous cholecystitis, proven by USG with at least one attack of upper abdominal pain and considered fit for elective cholecystectomy were included in the study.

**EXCLUSION CRITERIA:** The patients with following conditions were excluded from the study:
• History or investigations suggesting CBD stones.
• History of prior abdominal surgery.
• Patient’s age above 70 years.
• Patients of coagulopathy and those on Anti-Coagulant therapy.

**METHOD OF COLLECTION OF DATA:** A written informed consent was taken from all patients before their inclusion in the study. The study was approved by the ethical committee of the hospital.

Patients were randomly allocated to the two study groups using simple lots (25 in each group). Patients in one group underwent laparoscopic cholecystectomy while those in the other group underwent open cholecystectomy.

All the patients were kept nil by mouth overnight, prior to surgery and were given a dose of prophylactic antibiotic. All the patients were asked to evacuate bladder prior to surgery and a nasogastric tube was passed if thought to be necessary. All the surgeries were performed under general anesthesia, by the surgical team, consisting of consultants and residents.

Intra operative findings and post-operative data were all recorded and analyzed, using simple statistical tests like Chi square test and Z-test, to compare the results.
RESULTS:

DURATION OF SURGERY:

| Duration    | Open cholecystectomy | Laparoscopic cholecystectomy |
|-------------|-----------------------|------------------------------|
| 60 – 90 min | 9                     | 0                            |
| 90 – 120 min| 11                    | 8                            |
| 120 – 150 min| 5                     | 14                           |
| > 150 min   | 0                     | 3                            |

Minimum time for open method: 70 min
Maximum time for open method: 130 min
Average time for open method: 90 min
Minimum time for laparoscopic method: 105 min
Maximum time for laparoscopic method: 170 min
Average time for laparoscopic method: 120 min

DURATION OF SURGERY:

Average operating time for Open = 90 min
Average operating Time for Lap = 120 min

COMPLICATIONS:

INTRA OPERATIVE COMPLICATIONS:

| Complications     | Open | Laparoscopic |
|-------------------|------|--------------|
| Bleeding          | 1    | 2            |
| Bile duct injury  | Nil  | Nil          |
| Bowel injury      | Nil  | Nil          |
| Others            | Nil  | Nil          |

TABLE 2A
### POST OPERATIVE COMPLICATIONS:

| Complications                              | Open  | Laparoscopic |
|--------------------------------------------|-------|--------------|
| Bleeding                                   | Nil   | Nil          |
| Bile leak through drain                    | Nil   | 3            |
| Wound infection                            | 2     | Nil          |
| Jaundice                                   | Nil   | Nil          |
| Post cholecystectomy syndrome              | Nil   | 2            |
| Pulmonary complications                    | Nil   | Nil          |

**TABLE 2B**

### INTRA OPERATIVE COMPLICATIONS:

| Complications       | Open (n = 25) | (%) | Lap (n = 25) | (%) |
|---------------------|---------------|-----|--------------|-----|
| Bleeding            | 1             | 4%  | 2            | 8%  |
| Bile duct injury    | 0             | 0%  | 0            | 0%  |
| Bowel injury        | 0             | 0%  | 0            | 0%  |
| Others              | 0             | 0%  | 0            | 0%  |
| **Total**           | **1**         | **4%** | **2**     | **8%** |

**TABLE 2C**

### POST OPERATIVE COMPLICATIONS:

| Complications                              | Open (n = 25) | (%) | Lap (n = 25) | (%) |
|--------------------------------------------|---------------|-----|--------------|-----|
| Bleeding                                   | 0             | 0%  | 0            | 0%  |
| Bile leak through drain                    | 0             | 0%  | 3            | 12% |
| Wound infection                            | 2             | 8%  | 0            | 0%  |
| Jaundice                                   | 0             | 0%  | 0            | 0%  |
| Post cholecystectomy syndrome              | 0             | 0%  | 2            | 8%  |
| Pulmonary complications                    | 0             | 0%  | 0            | 0%  |
| **Total**                                   | **2**         | **8%** | **5**     | **20%** |

**TABLE 2D**

### CHI – SQUARE TEST:

| Complications [n=50] | Open cholecystectomy | Lap cholecystectomy | Total |
|----------------------|-----------------------|---------------------|-------|
| Intra operative      | 1                     | 2                   | 3     |
| Post-operative       | 2                     | 5                   | 7     |
| **Total**            | **3 [6%]**            | **7 [14%]**         | **10** |

P = 0.023 significance between the variables
Chi-dist = 0.7822

**TABLE 2E**
DURATION OF ANTIBIOTICS GIVEN:

|               | Open cholecystectomy | Lap cholecystectomy |
|---------------|-----------------------|---------------------|
| < 4 days      | 0                     | 19                  |
| 4 – 6 days    | 8                     | 4                   |
| >6 days       | 17                    | 2                   |

**TABLE 3**

Minimum days of antibiotic for open method: 5 days  
Maximum days of antibiotic for open method: 10 days  
Average days of antibiotic for open method: 7 days  

Minimum days of antibiotic for lap method: 3 days  
Maximum days of antibiotic for lap method: 7 days  
Average days of antibiotic for lap method: 4 days

DURATION OF ANTIBIOTICS GIVEN:

Average Post op antibiotics given for Open Method – 7 Days  
Average Post op antibiotics given for Lap Method – 4 Days

POST OPERATIVE PAIN: Number of patients in whom analgesics required:

| Post Operative Day | Open cholecystectomy | Lap cholecystectomy |
|--------------------|-----------------------|---------------------|
| 1                  | 25                    | 25                  |
| 11                 | 25                    | 5                   |
| 111                | 20                    | 3                   |
| 1V                 | 15                    | -                   |
| V                  | 10                    | -                   |
| V1                 | 5                     | -                   |

**TABLE 4**
POST OPERATIVE PAIN:

Maximum days of analgesic for open method: 6 days
Maximum days of analgesic for lap method: 3 days

RESUMPTION OF NORMAL DIET:

|                | Open cholecystectomy | Lap cholecystectomy |
|----------------|----------------------|---------------------|
| < 3 days       | 0                    | 19                  |
| 3 – 4 days     | 10                   | 4                   |
| > 4 days       | 15                   | 2                   |

Minimum resumption of normal diet for open: 3 days
Maximum resumption of normal diet for open: 7 days
Average resumption of normal diet for open: 5 days

Minimum resumption of normal diet for lap: 2 days
Maximum resumption of normal diet for lap: 5 days
Average resumption of normal diet for lap: 3 days

RESUMPTION OF NORMAL DIET:

Average Post op resumption of normal diet for Open–5 Days
Average Post op resumption of normal diet for Lap–3 Days
HOSPITAL STAY:

|                  | Open cholecystectomy | Lap cholecystectomy |
|------------------|-----------------------|----------------------|
| < 3 days         | 0                     | 20                   |
| 3 – 5 days       | 7                     | 3                    |
| > 5 days         | 18                    | 2                    |

TABLE 6

Minimum post-op hospital stay for open: 4 days
Maximum post-op hospital stay for open: 10 days
Average post-op hospital stay for open: 7 days

Minimum post-op hospital stay for lap: 2 days
Maximum post-op hospital stay for lap: 7 days
Average post-op hospital stay for lap: 3 days

HOSPITAL STAY:

Average Post op hospital stay for open – 10 Days
Average Post op hospital stay for open – 5 Days

CONVERSION RATE: Conversion rate: Lap to Open [n = 25]

Conversion rate: 8 %
CONVERSION TO OPEN METHOD: Procedure was converted to open method in two cases out of 25 patients due to the following reasons:

1. In one case there were plenty of thick adhesions between gallbladder and surrounding structures.
2. In another case there was excessive fat in the calot’s triangle and cystic pedicle could not be identified.

Clinical details of patients subjected to laparoscopic or conventional cholecystectomy:

| Variables                  | Lap cholecystectomy (n = 25) | Open cholecystectomy (n = 25) |
|----------------------------|------------------------------|------------------------------|
| Age (years)                | 42.76 +/- 12.09              | 39.12 +/- 13.79              |
| Sex ratio (M/F) nos.       | 7/ 18                        | 11/ 14                       |
| Duration of surgery (min)  | 120 +/- 10.80                | 90 +/- 13.84                 |
| Analgesic requirement (days)| 3.12 +/- 0.33                | 6.08 +/- 0.40                |
| Antibiotic requirement (days)| 4.28 +/- 0.46               | 7.40 +/- 1.58                |
| Complications (%) [N=50]   | 14 %                         | 6 %                          |
| Resumption of normal diet (days)| 3.16 +/- 0.85      | 5.24 +/- 1.23                |
| Post-operative hospital stay (days)| 3.04 +/- 1.34 | 7.76 +/- 1.23                |

Values are mean +/- S.D
P < 0.005

STATISTICAL ANALYSIS:
- The data are reported as the mean +/- SD or the median (25th to 75th percentile), depending on their distribution.
- The differences in quantitative variables between groups were assessed by means of the unpaired t test or the Mann-Whitney test.
- The chi-square test was used to assess differences in categorical variables between groups.
- Values of P < 0.005 were considered to be significant.
- All statistical analyses were performed using the SAS software.

DISCUSSION: A study of 25 open cholecystectomy patients of which 18 female and 7 male patients were compared with that of 25 cases of laparoscopic cholecystectomy of which 14 female and 11 male patients.

Duration of Procedure: In this study, the laparoscopic procedure was found to be associated with a longer operating time than open procedure (Median of 120 minutes for laparoscopic method against 90 minutes for open method). The more time required in LC was due to intra-operative gas leak, difficult adhesions, slippage of clips and delivery of gall bladder through the port site.

This is comparable with that of studies of Trondsen and Porte. Trondsendid a prospective randomized study to compare LC with OC (35 patients each). The results were that, LC took twice as long as OC (100 min v/s 50 min, p<0.01). Porte compared the results of 100 LC and 100 OC for cholelithiasis in elective surgery in a prospective age and sex matched cohort study and found that...
Median operating time for LC [75, (40-180 min)] was significantly longer than for OC [55, (20-155 min); p<0.001]. As experience is gained, the operating time is decreased. This “learning curve” represents adapting to operating in the 2-D screen, becoming familiar with the instrumentation and becoming accustomed to the technique. The surgeon gets trained in dealing with challenging cases in the course of his/her learning curve.

**Analgesia Requirement:** Use of minimally invasive techniques in elective surgeries is associated with a reduced inflammatory stress response with improved pulmonary function and less hypoxia. The VAS was significantly less for LC group (median 2 days) compared to (median 4 days) for OC group; p<0.005. Kum et al. also found a mean VAS score of 3.8 v/s 7.7 between LC and OC. There was more pain and more analgesics were required in patients in the OC group, especially when the patient developed wound infection.

The pain duration (median 2 days for LC and median 4 days for OC patients) and the duration of analgesics used (median 2 days for LC and median 4 days for OC patients) also were significantly less in LC group patients. This was due to the lesser incision size in LC. Other studies have also shown similar results.6-11

**Complications Encountered:** In this study, there were no major complications and had several minor ones. There was no peri-operative mortality and no CBD injury. The complications observed were bile leak (OC-0, LC-3), blood loss (OC-1, LC-2), wound infection (OC-2, LC-0) and post cholecystectomy syndrome (OC-0, LC-2) which were found to be comparable in both the groups.

Bile leak through drain tube in LC group was because of injury to the gall bladder bed in the liver during dissection. All the three patients were treated conservatively, drains were kept for a period of 2 days and the leak subsided. 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.

There was no wound infection in LC group. 2 patients of OC group had wound infection, requiring regular dressing of the wounds, and the wounds healed over a period of 10 days. Wound infections were more commonly seen in the open group compared to laparoscopic group.

Harris in his study found similar results, Bile leak (LC-2%, OC-1%), bleeding requiring transfusion (LC-1%, OC-2%) and wound infection rate (LC-0%, OC-1%). Other studies also reported similar results.6-2

The conversion from laparoscopic procedure to open procedure was necessary in 2 patients out of 25. One patient required conversion due to difficult dissection in view of thick adhesions and the other due to excessive fat in Calot’s triangle. Conversion rate was 8%. Conversion rate was also found to be higher in acute cases in other studies (0-45%).13, 14, 15

**Post-operative recovery and Period of Hospitalization:** 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 3 days for LC group and 7 days for OC group. The difference was found to be statistically significant (p<0.005). Hospital stay was more in OC group due to increased pain, wound infection, injectable antibiotics used and less mobilization due to pain. Porte et al., Trondsen and Lujan14 also found similar results. This was also confirmed in various other series.6, 7, 15, 11, 18

The minimum resumption of normal diet for open method was 3 days compared to 2 days for laparoscopic method. The maximum resumption of normal diet for open method was 7 days due to
wound infection, compared to 5 days for laparoscopic method following conversion. The mean resumption of normal diet for open method was 5 days compared to 3 days for laparoscopic method, suggesting the LC group returning to normal life earlier.

**Patient Satisfaction:** The OC group had larger wounds, which healed by primary intention with a big single scar. The LC group had port incisions of <1.5cm, wound healed by primary intention without much visible scar. Thus the cosmesis is the greatest advantage after laparoscopic cholecystectomy compared to open cholecystectomy.

**CONCLUSION:** In our study the laparoscopic cholecystectomy surpasses the open cholecystectomy by the following:

1. Post-operative recovery with quicker ambulance, better compliance and rapid return to normal activity with rapid resumption of normal diet.
2. Shorter duration of analgesic requirements.
3. Decreased wound infection.
4. Shorter post-operative hospital stay.
5. Best cosmesis with patient satisfaction.

The disadvantages in the laparoscopic procedure are the prolonged operative time, and the complications which can be minimized in due course of time as the learning curve progresses.

We have also found that the conversion to open cholecystectomy should be done in proper time without any hesitation in case of complications that could not be managed by laparoscopic surgery and conversion in such case reflects sound judgment and should not be considered as a complication.

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