



LAP V/S Open Cholecystectomy: A Prospective Study of 800 Patients

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Abstract

As the number of surgeons performing laparoscopic cholecystectomy (LC), a rigorous evaluation of the safety of LC is warranted. It is essential to determine the extent of the difference in morbidity and mortality when compared with open cholecystectomy (OC). To compare the complications occurring in the patients undergoing LC as compared to those undergoing open cholecystectomy. In a study conducted over a period of 8 years, 400 patients who underwent LC were compared to 400 patients who had undergone OC. The two groups were compared with respect to complication (severity grade 1-4), hospital stay and time required to return to work. (using the student 't' test). The overall complication rate in both the groups was 4.8%. In LC group, the rate of grade 1, grade 2a and grade 2b complications were 2.3%, 0.3% and 2.3% respectively and in OC group it was 4%, 0% and 0.8% respectively. It means that grade 1 complications were 1.89 times higher in open cholecystectomy group as compared to LC group and grade 2b complications are 3.04 times higher in LC group as compared to OC group, though the variations are insignificant statistically. There was 0% mortality in both the groups. Postoperative hospital stay and time taken to return to work were less with LC group. Laparoscopic and open cholecystectomy were found to be comparable procedures in terms of complication for the treatment of gall stone disease and LC has not been associated with any increase in untoward events.

Key Words

Cholecystectomy, Laproscopy, Surgery

Introduction

Open cholecystectomy has been the gold standard of treatment for cholelithiasis for more than 100 years. Laparoscopic cholecystectomy has revolutionized our approach to a number of problems and caused a re-evaluation of clinical strategies. Now it has become the standard therapy for symptomatic gall stone disease, particularly in elective setting. The advantages of LC over traditional OC in terms of limited postoperative pain, shorter hospitalization, early resumption of activity, and improved cosmesis have been readily apparent.

In the past there have been a few prospective trials to evaluate the safety of LC, mostly burdened with the problem of recruitment. This means that it is difficult to state whether LC is truly superior to standard cholecystectomy, particularly in terms of safety. Indeed this is only possible within the frame-work of a comparison of defined complications relating to an equal number of open cholecystectomies performed. The aim of this study, therefore, was to evaluate, in a large, heterogeneous population the outcome of LC and its comparison with

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open cholecystectomy in terms of outcome and complication rate.

Material and Methods

The study was conducted over a period of 8 years from Jan 1996 to Jan 2004. All the patients who underwent laparoscopic operation for symptomatic gall stone disease during this period were taken as subjects for study. To create a necessary basis for comparison, an equal number of patients undergoing open cholecystectomy were chosen randomly. Thus it was possible to analyse a total of 800 cholecystectomies, 400 LCs (Group A) and 400 OCs (Group B) in the same manner. Distribution of age and sex was similar in both groups. Patients who had undergone upper abdominal surgery previously, or were too obese or patients having any other associated pathology like jaundice, malignancy, choledocholithiasis, cardiovascular or pulmonary disease, major bleeding disorders and pregnant patients were excluded from the study. All the patients were operated under general anaesthesia. A single shot of broad spectrum antibiotic prophylaxis was administered for both the procedures at the time of induction of anaesthesia. Intraoperatively careful note was made, i) time taken for the procedure; ii) documentation of any complications encountered during the procedure; iii) if the laparoscopic procedure was converted to open cholecystectomy, the reason for the same. Postoperative period was divided into immediate or in-hospital stay and the follow up period. During the in-hospital stay the following data was collected; i) drain removal; ii) postoperative hospital stay and iii) any complication if occurred. Any patient requiring re-exploration and reasons for it were analysed. Patients of both the groups were followed regularly upto 3 months. Note was made of any complications, time taken to return to work and patient satisfaction. Results were evaluated by classifying surgical complications on a severity scale graded 1 to 4.

Grade 1: Deviation from the ideal postoperative course, non-life threatening with no lasting disability e.g. prolonged stay due to ileus, fever, wound infection, urinary tract infection, pulmonary infection and costochondritis.

Grade 2a: Potentially life threatening but without residual disability e.g., cholangitis, retroperitoneal hematoma, subhepatic collection, pancreatitis.

Grade 2b : Potentially life threatening but without residual disability, but surgery was necessary to restore health e.g., bile duct injury, duodenal perforation, retained stones, bile leak, bleeding, gastrointestinal injury, bladder injury.

Grade 3: Uncontrolled bleeding or shock; laceration of aorta, hepatic artery, mesenteric vein, portal vein injury, perforated iliac artery or vein.

Grade 4: Death due to complications

Statistical Analysis

Analysis of the results were done statistically using unpaired student 't' test (two side) for comparing the hospital stay and return to activity. For complications Chi-square test was employed to evaluate significance. A P value of <0.5 was considered significant.

Results

Out of 400 cases taken up for laparoscopic cholecystectomy, 30 cases were converted to open procedure, giving a conversion rate of 7.5%. The most common reason for conversion was obscure anatomy in Calot's triangle in 3.8% (n=15) cases. Second most common cause was dense adhesions in 3.3% (n=13) cases while 0.5% (n=2) cases had uncontrolled bleeding from aberrant vessels in gall bladder bed as reason for conversion (Table 1).

Mean operating time in patients undergoing LC was 66.26 ± 9.08 min as compared to 41.89 ± 5.75 min in patients who underwent OC. In group A, 2.3% (n=9) of cases developed grade I complications as compared to 4% (n=16) in group B and the difference between the two groups is statistically insignificant (Table 2). Prolonged drainage of blood stained fluid through drain was observed in 4 cases each in group A and group B. In group A, sub umbilical port site infection developed in 0.5% (n=2) cases while in group B, 2.3% (n=9) cases developed wound infection. In the study, it was observed that the likelihood of the wound infection in the open cholecystectomy is 4.58 times more than in the LC and is highly significant ($p < 0.05$). One patient each had prolonged paralytic ileus, respiratory tract infection and fever in group A while in group B it was 0.3% (n=1), 0.5% (n=2) and 0% (n=0) respectively. No case of urinary tract infection or costochondritis was reported in both the groups.

Cholangitis was seen in 0.3% (n=1) cases in group A, while no case of cholangitis was reported in group B. No case of retroperitoneal hematoma or subhepatic



collection or pancreatitis was reported in either of the groups in the study. Bile duct injuries (BDI) were reported in 0.75% (n=3) cases in group A, out of which one was Strassburg type A managed by papillotomy and stent placement, second was Strassburg type E1 which needed a choledochojejunostomy and third was Strassburg type E3 in which hepaticojejunostomy was done. In group B only one patient (0.25%) was reported to have bile duct injury. Cholecystectomy was completed in the conventional manner and CBD was repaired over 12F T-tube. It was observed that incidence of bile duct injury was 3.015 times higher in laparoscopic cholecystectomy group as compared to open cholecystectomy group. Bile leak was reported in, 1% (n=4) cases in group A but none in group B. The other grade 2b complication observed in our study was bleeding and it carries a 0.5% (n=2) incidence in both laparoscopic and open cholecystectomy group. There was no case of retained stone, gastrointestinal or bladder injury due to trocar insertion.

There was no case of grade 3 complications in either the groups, and none of the patients died in our study. In group A the rate of grade 1, grade 2a and grade 2b complications were 2.3% (n=9), 0.3% (n=1) and 2.3% (n=9) respectively and in group B the rate was 4% (n=16), 0% and 0.8% (n=3) respectively. It means that grade I complications are 1.89 times higher in open cholecystectomy group as compared to laparoscopic cholecystectomy group and grade 2b complications are 3.04 times higher in laparoscopic cholecystectomy group as compared to open cholecystectomy group (Table 2). No pneumoperitoneum related complications like CO₂ embolism, hypercarbia, respiratory acidosis, subcutaneous emphysema, pneumothorax or pneumomediastinum was observed in our study. The mean postoperative hospital stay for patients who underwent laparoscopic cholecystectomy was 3.12 days as compared to 3.98 days in open cholecystectomy group (Table 3). The patients who had undergone LC return to work slightly earlier with mean of 2.19 weeks as compared to 4.05 weeks in patients who had undergone open cholecystectomy and the difference between the two is statistically significant (p<0.05) (Table 4).

Discussion

Open cholecystectomy has been the gold standard of treatment for cholelithiasis for more than 100 years with the mortality rate that have declined to 0-1% in most recent reports and the rate of major complications of

Table 1: Distribution of Cases According to Reasons of Conversion in Laparoscopic Cholecystectomy

Reason for conversion	No. of cases	% age within group
Unclear anatomy	15	3.8%
Dense adhesions	13	3.3%
Uncontrolled bleeding	2	0.5%
Diaphragmatic injury	Nil	-
Right hepatic duct injury	Nil	-
Common bile duct injury	Nil	-
Retroperitoneal hematoma	Nil	-
Total	30	7.5%

Table 2: Overall Complications For Both Groups

Groups	Complications			
	G1	G2a	G2b	Total
Group A (n=400)	9 (2.3%)	1 (0.3%)	9 (2.3%)	19 (4.8%)
Group B (n=400)	16 (4.0%)	-	3 (0.8%)	19 (4.8%)

Chi-Square (1) 5.72 P 0.01 Significant

For purpose of analysis G1a & 2b have been clubbed together

No Patient in G3&G4 had complication

Table 3: Mean Postoperative Hospital Stay

Group	n	Min	Max	Mean±SD	p value	Remarks
Group A (LC)	400	2	5	3.12±0.54	0.0001 t=22.94	Highly Significant
Group B (OC)	400	3	9	3.98±0.52		

Table 4: Mean Return to Activity in Weeks

Group	n	Min	Max	Mean±SD	p value	Remarks
Group A (LC)	400	1	12	2.19±0.85	0.0001 t=33.97	Highly Significant
Group B (OC)	400	3	12	4.05±0.52		

approximately 4.5%. Despite these favourable data for OC, LC has become the popular and standard method for removing the gallbladder. Limited postoperative pain, shorter hospitalization, early resumption of activity, reduction in hospital costs and improved cosmesis are the major advantages of this method.

In this study both LC and OC were comparable in terms of morbidity and mortality rates. In both the groups overall morbidity rate was 4.8% and mortality was 0%. Jatzko *et al* (1) reported an overall complication rate of 8.3% and 1.5% in open and laparoscopic cholecystectomy respectively. Orlando *et al* (2) Deziel *et al* (3) reported



overall complication rate of 8.6% and 2% in laparoscopic cholecystectomy respectively.

Jatzko and others (1) in their study reported mortality rate of 0% and 0.2% in open and laparoscopic cholecystectomy group respectively. During their study on laparoscopic cholecystectomy Paulino-Netto (4), Orlando *et al* (2), Cushieri *et al* (5, 6) reported mortality rate of 0.3% each, Deziel *et al* (3) of 0.04 %, while no mortality was reported by Dubois F, Rubio, Vovyles *et al* and Flower *et al* (7,8,9,10).

In LC group, rate of conversion to OC was 7.5% which is consistent with the world literature where 5-10% conversion rate is very acceptable in unselected series (Table 5). Conversion from LC to OC is considered neither a failure nor a complication of laparoscopic operation but an attempt to avoid serious complication by the surgeon, who acted judiciously, reverting to a 'safe' 100 year old, established technique.

Bile duct injuries (BDI) (Table-6) are one of the most dreaded complications of cholecystectomy and the study revealed that in LC rate of BDI was 0.75% as compared to 0.25% in case of OC. In this study incidence of BDI is 3.015 times higher in LC group. This is consistent with the various studies conducted in the past which shows that contemporary rate of BDI during OC vary from 0% to 0.5% as compared to 0% to 2.4% in LC which is 2-6 times higher than in OC (Table 6). Rate of BDI is more during early part of ones career when surgeon start doing LC which has been called as "learning curve effect"(11). BDI during LC are best avoided by maintaining a low threshold for conversion to laparotomy in any case during which the anatomy cannot be precisely identified and by proper training of surgeons thereby reducing the learning curve effect.

Minor complications like wound infection are more common in OC group (2.3%) as compared to LC group (0.5%), which means, the wound infection in OC is 4.58 times more than in LC. Jatzko *et al* (1) in their study observed that grade I complications rate is lower in LC group (0.3%) as compared to OC group (5.1%). Barkun JS *et al* (12) in Toronto group study also observed that LC complications were significantly less than OC complication. Siddiqui *et al* (13) in their study observed that frequency of wound infection was three times (6%)

Table 5: Showing Conversion Rate In LC

Authors	% Conversion
1. Cuschieri <i>et al</i> (5, 6)	3.6%
2. Voyles <i>et al</i> (9)	5%
3. Grace PA(19)	14%
4. Southern Surgeons club(20)	4.7%
5. Orlando <i>et al</i> (2)	6.9%
6. Zucker <i>et al</i> (21)	5%
7. Rubio PA(8)	2.3%
8. Dubois F(7)	7.7%
9. Our series	7.5%

Table 6: Rate of Bile Duct Injuries in Various Studies

	Bile Duct Injuries (%)	
	LC	OC
Deziel DJ(3)	0.58%	0.1-0.25%
Salheim K(22)	1.1%	0.51%
Sawyers JL (23)	0.3-.0.5%	0.125%
Our series	0.75%	0.25%

common in OC as compared to LC (2%) in acute cholecystitis.

This study also revealed that postoperative recovery was more smooth and uneventful in LC group with shorter mean postoperative hospital stay and early return to work than in OC group. In the study conducted by Kani *et al* (14), mean hospital stay was 1.6 days in L.C and it was 4.3 day in O.C. Barkun JS (12) reported mean hospital stay of 2±2 days in L.C and 6±4 day in O.C.

Iqbal *et al* (15) in their study observed that morbidity due to pain, fever, nausea and vomiting, respiratory and wound complications were significantly less in LC group as compared to OCgroup. Mean duration for tolerating oral feeding and postoperative hospital stay were found to be shorter in LC group than in OC group.

Barken JS (12) in Toronto study reported a mean duration of return to normal work as 6 ± 3 weeks in OC group and 1±2 weeks in LC group. Kane *et al* reported mean duration of 28 days in OC group and 10 days in L.C group (P<0.001).

Keus *et al* (16) in their study found no significant difference in mortality, complications & operative time. However the LC was associated with the shorter hospital stay and quicker recovery as compared to OC.

Mufti *et al* (17) also found LC to be safe and effective treatment for gall stone disease. Cawich *et al* (18) found that minor complications to be common after OC (11%) VS LC (4%)



Conclusion

It can be concluded that LC and OC are comparable procedures for the treatment of gall stone disease in terms of complications, although hospital stay and time taken to return to work were less in LC group. Results of this study demonstrate that LC is essentially a safe procedure with low morbidity and mortality rate. Guidelines for prevention of operative injury are similar to those of any operative procedure, namely, adequate training and experience, proper execution of appropriate technique and accurate identification of the anatomy.

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