

Laparoscopic Cholecystectomy in Cirrhosis Patients: 2 years' Experience in a Tertiary Centre. A Retrospective Cohort Study

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Abstract: Background: Laparoscopic cholecystectomy (LC) is the best option among patients suffering from gallbladder lithiasis and hepatic cirrhosis. The advanced instruments like harmonic shears has made laparoscopic cholecystectomy (LC) a safe option. The present study determined the 2 years' experience of patients after laparoscopic cholecystectomy in cirrhosis patients. **Materials and Methods:** A total of 60 cirrhotic subjects underwent LC from 2019 to 2021. The type of surgery performed was laparoscopic cholecystectomy. The occurrence of adhesions using Harmonic devices, amount of bleeding during operation was recorded. Plasma and platelet transfusion, converted cases to open surgery and its reasons, operative time in minutes and hospital stay (days) after the surgery were also recorded. **Results:** A was the most common Child-Pugh score. Cirrhosis was caused most commonly by the hepatitis C virus (HCV). The most prevalent symptom was found to be biliary colic. The 30-day morbidity and mortality were recorded to be 25% and 5% respectively while overall survival was recorded as 93.3%. Higher CTP, MELD scores, mean international normalisation ratio (INR) values, lower mean platelet count, higher operative bleeding, blood, and plasma transfusion rates, longer mean operative time, and postoperative hospital stays were all found to be statistically significant predictors of 30-day morbidity and mortality. **Conclusion:** LC could be a better surgery performed in patients with cirrhosis. However, higher CTP and MELD scores, operative bleeding, more blood and plasma transfusion units, longer operative time, lower platelet count, and higher INR values can be considered independent of poor outcome.

INTRODUCTION

Cholelithiasis has a higher prevalence in patients with cirrhosis comparing to the general population due to intravascular hemolysis from hypersplenism, emptying because of high estrogen levels, reduced gallbladder motility and metabolic liver failure^{1,2}.

Laparoscopic cholecystectomy (LC) can be safe and best option for surgery in patients with cirrhosis. Pre-operative management of the patient is crucial which involve careful investigations and improvement of the liver functions before performing the surgery. This affirms lower morbidity and mortality rates following the LC surgical procedure³.

However, LC remained a difficult procedure that should be performed by an expert and experienced surgeon². The increased rates of morbidities, mortalities and conversion to opens surgeries is high in cirrhosis patients where LC surgery has been performed in comparison to the general population^{4,5}. These consequences are subjected to many risk factors like operative bleeding, CTP score, MELD score, need of transfusion². Thus, patient selection is the most important step where in special attention should be paid at controlling the ascites, correction of coagulopathy, nutritional support and improving the liver conditions. During the surgery intra-operative good hemostasis should be maintained with the help of oxidized cellulose (Gelfoam), surgical and Harmonic Scalpel device^{5,6}.

In cirrhosis patient, the liver becomes very stiff and fibrotic. Moreover, the tissues of gallbladder become woody and fibrotic when the patient presents in later disease. In such cases, careful gall bladder dissection with the help of harmonic scalpel is needed to prevent the bleeding for good results⁶. There is very little evidences determining LC in patients with cirrhosis in relation to predicting the outcomes. Thus, the present study purposed to evaluate the 2 years' experience of patients after laparoscopic cholecystectomy in cirrhosis patients.

MATERIAL and METHODS

The present cohort retrospective study was conducted in the general surgery department, TMU, Moradabad during 2019 to 2021 among 60 cirrhotic patients after excluding those that missed the follow-up, patients with lost data and the patients who denied undergoing researches. The study was

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conducted after taking approval from ethical committee of the institute. The patients were observed for a time line of 24 months. Every patient was asked to sign a consent for enrolling in the study.

Patient demographics, co-morbidities, and the pre-operative diagnosis of liver cirrhosis were all recorded. The diagnosis of liver cirrhosis was established with the help of clinical, laboratory, abdominal ultrasound (US) and computed tomography data (CT). The diagnosis of cholelithiasis was made clinically and finalised by abdominal US, history or presence of encephalopathy, ascites, liver function tests (LFT), coagulation profile, creatinine level, platelet count, CTP and MELD scores.

The type of surgery was performed by laparoscopic cholecystectomy (LSC). The occurrence of adhesions due to operations using Harmonic devices, amount of bleeding during operation was recorded. Plasma and platelet transfusion, open surgery conversion and its causes, operative time per minutes and hospital stay after the surgery per days were also recorded.

Intervention of the study

Vitamin K and fresh frozen plasma is given to patients pre operatively when INR was increased. Platelet infusion is done when the platelet count is less than 50,000/ μ L.

The patients with higher CTP grades, control of ascites, nutritional support and condition of liver is upgraded. In CTP class late B and C, the choice is conservative treatment. If the treatment fails emergency LC with PC is done under anesthesia.

Patients were followed-up regularly while stay at the hospital till the discharge of the patient. Then the patients are scheduled at the out-patient clinic till one month after the surgery. Clinical assessment, laboratory assessment and US is indicated when needed. 30 days morbidity and 30 days mortality is evaluated.

Statistical analysis

All data were tabulated and processed with SPSS software version 21. The significance of the categorical parameters was assessed with Chi square or Fisher exact test. The significance of the continuous parameters was assessed using standard t test or Mann Whitney U test.

30-day morbidities and mortalities were determined using Univariate and then multivariate analysis. In all tests, a P value of < 0.05 was considered significant.

RESULTS

60 participants suffering from cirrhosis were enrolled in the present study. Out of all, 38 were males and 22 patients were females. The mean of age of the study population was 43.5 \pm 8.6 years. Comorbidities affected 15 patients in the study population. HCV was found to be the most common reason of cirrhosis (85%). Biliary colic was found to be the most common presentation in 68.3% of the study population.

Ascites was absent in 100% population. The lab investigations are elaborated in (Table 1). The study subjects were classified based on CTP scoring. The CTP score A was present in 61.6% population. 31.7% and 6.7% study population were classified under CTP score B and C respectively. The mean MELD score and CTP score in the study group was found to be 9.7 \pm 3.5 and 6.2 \pm 1.6 respectively.

Harmonic device is used in 41.7% of the study population. Operative adhesion was found in 20% patients. Blood transfusion was needed in 8.3% of the study population. The plasma transfusion was needed in 35% of the study population. 5% patients were converted to open surgeries. The mean operative time was found to be 110.2 \pm 52.1 min. The mean hospital stay of the study population was found to be 2.7 \pm 2.9 days. (Table 1)

Outcomes of patients

15 patients were found to show complications in the first post-operative month. 3 and 2 patients were found to show biliary injury and gastric injury respectively. They were classified under Clavien grade III and were converted to open surgeries for the primary repair of these injuries. 6.7% patients were found to show post-operative infections. 3.3%, 1.7% and 1.7% patients were found to have chest infections, wound infections and UTI.

Complications viz. liver decompensation, GIT bleeding and patients (Clavien III) and patient died due to multisystem organ failure (Clavien V) was reported in 6.7%, 2 and 1 patients respectively. Ascites was a consequence in 4 patients (3 bettered with the help of prescriptions and 1 patient died of liver failure (Clavien V).

1 patient was found to have Encephalopathy. The patient improved with medications. Post-operative cholestasis affected 1 patient and the patient improved with liver support. Operative site hematoma affected 1 patient which were treated by conservative treatment (Clavien II). 30 days mortality affected 3 patients (5%) where in 1 patient due to liver failure and 2 patient due to GIT bleeding. The survival during the follow up was 93.3%. (Table 2)

30 days morbidity predictors

On univariate analysis, factors found to be significantly related with 30 days morbidity were higher CTP score, CTP mean, INR, platelet count, MELD score, operative adhesion, bleeding, blood transfusion, plasma transfusion, lesser operative time, post-operative stay in hospital and less harmonic use (Table 3).

30 days mortality predictors

When assessed with univariate analysis, 30 days mortality were found to be associated with Ac as presentation of the disease increasing CTP score, CTP No, MELD score, INR, platelet count, operative bleeding, length of stay in hospital after surgery and decreasing harmonic use. On multivariate analysis, no parameters were found to independently affect the 30 days mortality of the patients. (Table 4)

Table 1: Characteristics of the patient

Parameters	Mean \pm SD or No of patients (N=60)	% distribution
Age (years) (Mean \pm SD)	43.5 \pm 8.6	
Gender		
Male	38	63.3
female	22	36.7
Co morbidity	15	25
Cause of cirrhosis		
HCV	51	85
HBV	5	8.3
Cryptogenic	3	5
BCS	1	1.6

Presentation		
AC	15	25
Biliary colic	41	68.3
Gall stone pancreatitis	4	6.7
Ascites	0	0
Encephalopathy	0	0
Lab investigation		
AST (U/L) (Mean±SD)	32.4±12.7	
ALT (U/L) (Mean±SD)	35.2±12.9	
Alkaline phosphatase (U/L) (Mean±SD)	85.2±43.7	
GGT (U/L) (Mean±SD)	43.1±14.6	
Alb (g/dL) (Mean±SD)	3.1±0.9	
INR (Mean±SD)	1.4±0.2	
Creatinine (mg/dL) (Mean±SD)	0.6±0.3	
Platelet count (1000/ μ L) (Mean±SD)	255.6±99.8	
CTP score		
A	37	61.6
B	19	31.7
Early B*	12	20
Late B*	7	11.7
C	4	6.7
CTP No. (Mean±SD)	6.2±1.6	
MELD Score	9.7±3.6	
Pre-operative upper endoscopy	38	63.3
Operative adhesion	12	20
Using harmonic device	25	41.7
Operative bleeding	24	40
Blood transfusion	5	8.3
Plasma transfusion	21	35
Platelet transfusion	0	0
Conversion to open	3	5
Operative time (min) ((Mean±SD)	110.2±52.1	
Hospital stay (post-operative) (days) (Mean±SD)	2.7±2.9	

Table 2: Outcome of patients

Parameters	No (N=60)	%	Clavein grade of complications
30 day complications	15	25	
Biliary injury	1	1.7	III
Gastric injury	2	3.3	III
Post-operative infection	4	6.7	
Chest infection	2	3.3	II, V
Wound infection	1	1.7	II
UTI	1	1.7	II
Post-operative decompensation	4	6.7	
GIT bleeding	2	3.3	III,V
Ascites	4	6.7	II,V
Encephalopathy	1	1.7	II,V
Cholestasis	1	1.7	II,V
Operative site hematoma	1	1.7	II
Port site bleeding	1	1.7	II
30- day mortality	3	5	
Causes			
Liver failure	1	1.7	
GIT bleeding	2	3.3	
Long term mortality (cirrhosis related)	4	6.7	
Overall survival	56	93.3	
Mean±SD	49.8±25.4		

Table 3: Predictors of 30-days morbidity

Parameters	30-day morbidity (15)	No morbidity (45)	P value Univariate analysis
Age (years) (Mean±SD)	42.8±5.6	43.7±6.2	0.376
Gender			
Males	10 (66.7%)	28 (62.2%)	0.176
Females	5 (33.3%)	17 (37.7%)	
Co morbidity	6 (40%)	9 (20%)	0.211
Presentation			
AC	12 (80%)	3 (6.7%)	0.002*
Biliary colic	2 (13.3%)	39(86.7%)	
Gall stone pancreatitis	1 (6.7%)	3 (6.7%)	
CTP score			
A	1 (6.7%)	36 (80%)	0.001*
B	10 (66.7%)	9 (20%)	
C	4 (26.6%)	0	
CTP No. (Mean±SD)	8.1±1.5	5.6±1.1	0.001*
MELD score (Mean±SD)	13.9±2.6	8.2±2.4	<0.001*
INR	1.5±0.1	1.1±0.1	<0.001*
Platelet count(1000/μL) (Mean±SD)	147.8±79.4	283.7±81.2	<0.001*
Operative adhesions	5 (33.3%)	7(15.5%)	<0.001*
Operative bleeding	13 (86.7%)	11 (24.4%)	<0.001*
Blood transfusion	3 (20%)	2 (4.4%)	<0.001*
Plasma transfusion	13 (86.6%)	3 (6.7%)	<0.001*
Harmonic use	2 (13.3%)	23(51.1%)	<0.001*
Operative time- minutes (Mean±SD)	178.5±46.8	90.6±42.8	<0.001*
Hospital stay(days) (Mean±SD)	6.8±3.2	1.2±0.3	0.001*

*P value of less than 0.05 is considered statistically significant

Table 4: Predictors of 30- days mortality

Parameters	30-day mortality (No=3)	No mortality (No= 57)	Univariate analysis (p value)	Multivariate analysis (p value)
Age (years) (Mean±SD)	48.7±13.4	44.1±9.2	0.07	
Gender				
Males	2 (66.7%)	36 (63.2%)	0.395	
Females	1 (33.3%)	21(36.8%)		
Co morbidity	0	15 (26.3%)	>0.05	
Presentation				
AC	3 (100%)	12 (21.05%)	0.001*	0.541
Biliary colic	0	41 (71.9%)		
Gall stone pancreatitis	0	4 (7.0%)		
CTP score				
A	0	37 (64.9%)	0.001*	0.262
B	1 (33.3%)	18 (31.6%)		
C	2 (66.7%)	2 (3.5%)		
CTP No. (Mean±SD)	10.4±0.5	6.1±1.2	0.003*	0.260
MELD score (Mean±SD)	17.1±1.4	9.5±3.2	0.001*	0.322
INR	2.0±0.2	1.2±0.1	0.004*	0.411
Platelet count(1000/μL) (Mean±SD)	74±13.9	257.7±95.4	0.001*	0.07
Operative bleeding	3 (100%)	21(36.8%)	0.005*	0.08
Blood transfusion	2 (66.7%)	3 (5.3%)	0.001*	0.07
Plasma transfusion	2 (66.7%)	19 (33.3%)	0.008*	0.13
Harmonic use	0	25(43.8%)	0.07	0.09
Conversion to open surgery	1 (33.3%)	2 (3.6%)	0.3	0.11
Operative time- minutes (Mean±SD)	223±19.8	107.3±52	0.001*	0.32
Hospital stay(days) (Mean±SD)	10.6±2.4	2.1±2.4	0.001*	0.06

*P value of less than 0.05 is considered statistically significant

DISCUSSION

The surgical procedure in cirrhosis is controversial. The surgery has limited indications as there is risk of post-operative complications and intraoperative accidents. The surgery is very thoughtfully planned to avoid the liver failure and operative bleeding in selective cases.

Cirrhosis is one of the commonest cause of mortality in patients after open surgery in around 7 -1 5% patients in comparison to normal patients of 0.5-1%^{7,8}.

The previous data supports the selection of this surgical procedure in patients with Child A and B cirrhosis in terms of operative bleeding, post operation hospitalization and operation time^{9,10}.

15 patients were found to show complications in the first post-operative month. The MELD score of the patients who had faced complications were found to be 13.9±2.6. Delis S et al., in their study stated that the patients who faced postoperative complications had post-operative MELD score of more than 134. The results were found to be in accordance with the findings of the present study.

Child A and B score patients had been found to be good candidates for laparoscopic surgery. Child C patients also were tried to convert pre operatively to child B. The surgery should be avoided in Child C patients and non-surgical protocols should be sought¹¹. In selective situation of complications, most authors refer for open surgery.⁹ Cholecystectomy performed in cirrhotic patients is difficult whether it is performed by open surgery or laparoscopic surgery¹².

6.7% patients were complicated with post-operative liver decompensation. GIT bleeding occurred in 2 patients (clavien III) and one patient died due to multisystem organ failure (clavien V). 3 patients were converted to open surgery. Garrison RN et al., stated in their study that common post-operative complications for open surgery were haemorrhage, decompensation of cirrhosis, ascites and wound infections¹³.

In the present study, harmonic device was used in 41.7% patients. Catena F et al., showed that there was significantly low blood loss and lesser surgeries convert to open when compared to mono-polar diathermy¹⁴.

Nguyen et al⁶, and Bessa et al., in their study interpreted that argon device lead to no use of harmonic device¹⁵. It also caused higher conversion to open surgery and morbidity rates. Thus, we used harmonic scalpel in 41.7% patients.

100% of the child C patients in the present study encountered 30 days morbidity. 50% of the child C patients encountered 30 days mortality in our study. Curro et al., in their study depicted the morbidity of seventy-five percent in child C patients and 50% of the child patients encountered mortality that is similar to the present study¹⁶.

Delis S. et al., in their study assessed an association of Child score and MELD score with the morbidity⁴.

The reported conversion rate to open surgery was found to be 5% in the present study. Delis et al., reported conversion rate of 5.45% in their study⁴. Garrison RN et al., in their study showed significant relation between open surgery and higher morbidity rates (5-20%)¹³.

Alhamid et al., showed mortality rate of 9.4% in their study among the patients undergoing LC. (3) 6.7% of cirrhosis related mortality is shown in the present study. 30 days mortality were found to be associated with AC as presentation of the disease, increasing CTP score, CTP No, MELD score, INR, platelet count, operative bleeding, length of stay in hospital after surgery and decreasing harmonic use. On multivariate analysis, no parameters were found to independently affect the 30 days mortality of the patients¹⁷.

5.6% of child B patients and 50% of child C patients were found to show 30 days mortality in the present study. Previous studies show no significant benefits with time as the medical treatment progress. Mortality post 30 days was ten percent, thirty percent and seventy-six-eighty-two percent Child A, B and C respectively^{13,18}. 90% post-operative mortality was shown in association with MELD score higher than 26¹⁸.

CONCLUSION

It is clear from the present study that higher CTP score and MELD score are good predictors of complications and mortality rate in LC patients. It is important to upgrade the liver conditions before performing LC in patients with higher scores. LC can be safely conducted in cirrhosis patient but more important is selection of the right patient, meticulous pre-operative and peri-operative care by using expertise of the surgeon and harmonic shears.

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