

A retrospective cohort study on laparoscopic cholecystectomy in cirrhosis patients

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ABSTRACT

Background: The advanced instruments like harmonic shears have made laparoscopic cholecystectomy (LC) a safe option. The present study determined two year experience of patients after laparoscopic cholecystectomy in cirrhosis patients.

Methods: A total of 50 cirrhotic patients underwent LC from August 2020 to February 2022. The type of surgery performed was laparoscopic cholecystectomy. The parameters recorded were, presence of adhesions, use of harmonic devices, amount of bleeding during surgery, rate of conversion to open surgery and the reasons thereof, operative time in minutes, plasma and platelet transfusion postoperatively and duration of hospital stay.

Results: Majority of the patients were of Child-Pugh class A. The cause of cirrhosis was hepatitis C virus (HCV) in most of the patients. Biliary colic was found to be the most common presentation. Higher CTP, model for end-stage liver disease (MELD) scores, higher mean international normalization ratio (INR) value, lower mean platelet count, higher operative bleeding, higher blood, and plasma transfusion rates, longer mean operative time and postoperative hospital stays were found to be statistically significant and correlated well with 30-day morbidities and mortalities.

Conclusion: LC could be a better surgery performed in patients with cirrhosis. However, higher CTP and MELD scores, greater operative blood loss, larger amount of blood and plasma transfusion in units, longer operative time, lower platelet count, and higher INR values can be considered factors resulting in poor outcome.

Keywords: Laparoscopic Cholecystectomy, Cirrhosis, Mortality, Morbidity.

Introduction: Cholelithiasis has a higher prevalence in cirrhotic patients in comparison to general population. Intravascular hemolysis from hypersplenism, poor emptying time, reduced gallbladder motility because of high estrogen levels due to their poor metabolism in liver is the reason behind increase incidence of cholelithiasis in cirrhotic patients.^{1,2}

Laparoscopic cholecystectomy (LC) is a safe, gold-standard surgery in patients with cirrhosis especially with CTP score A and B patients. The pre-operative management of the patient is however crucial which involves careful investigations and improvement of the liver functions before performing the surgery. This has further reduced morbidity and mortality rates following the LC surgical procedure.³

However, LC still remains a difficult procedure that should be performed by an experienced surgeon². The increased rates of morbidities, mortalities and conversion to open surgeries is high in cirrhotic patients in comparison to general population.^{4,5} This poor outcome is due to the factors like operative bleeding, need of transfusion², CTP score, MELD score. Patient selection, control of ascites, correction of coagulopathy, nutritional support and improvement of liver functions are required to get better outcome in these patients. Intraoperatively hemostasis should be maintained with oxidized cellulose (Gelfoam), surgical techniques and harmonic scalpel device.^{5,6}

In cirrhotic patients, the liver becomes stiff and fibrotic, gallbladder also becomes woody and fibrotic if the patient presents late. In such cases, meticulous gall bladder dissection with the help of harmonic scalpel is required to prevent bleeding.⁶ Very few evidences are available to predict the outcomes of LC in cirrhotic patients, our study aims to retrospectively study the outcomes of laparoscopic cholecystectomy (LC) in cirrhotic patients, performed at our centre in a period of two years.

Materials and methods: The present retrospective cohort study was conducted at 50 cirrhotic patients who were operated in Department of General Surgery at National Capital Region Institute of Medical Sciences, Meerut during August 2020 to February 2022 excluding the patients that missed the follow-up, patients with lost data and the patients who denied consent for study.

Patient's demography, co-morbidities, and pre-operative liver status were recorded. The diagnosis of liver cirrhosis was established clinically, along with biochemistry, abdominal ultrasound (US) and computed tomography (CT) findings. The diagnosis of cholelithiasis was made clinically and was confirmed on abdominal US. History or presence of encephalopathy, history or presence of ascites, liver function tests (LFT), coagulation profile, creatinine level, platelet count, CTP and MELD scores were also recorded.

Laparoscopic cholecystectomy (LC) was done, presence of adhesions, use of harmonic devices, amount of bleeding during surgery, operative time in minutes, rate of conversion to open surgery and the reason of conversion were all recorded. Need of plasma and platelet transfusion and duration of hospital stay postoperatively in days were also recorded.

Intervention

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.

In CTP class late B and C, the choice is conservative treatment. Control of ascites is done along with nutritional support and improvement in other liver functions. If the treatment fails emergency LC with PC is done under anesthesia.

Patients were followed-up regularly during stay at the hospital till the discharge. Then the patients were scheduled at the out-patient clinic till one month after the surgery. Clinical assessment, laboratory assessment and US was done when needed. Patients were kept under follow up for thirty days for any morbidity and mortalities.

Statistical analysis: All data were tabulated and processed with SPSS software version 24. Categorical data were elaborated in frequency and percentage. The significance of the categorical parameters was assessed with Chi square or Fisher exact test. The continuous data was interpreted as mean and SD. The significance of the continuous parameters was assessed using standard t test or Mann Whitney U test.

Results: A total of 50 participants suffering from cirrhosis were enrolled in the study. Out of all, 34 were males and 16 patients were females. The mean age of the study population was

43.2±8.3years. Comorbidities were present on 12 patients in the study population. HCV was found to be the most common reason of cirrhosis (84%). Ascites was absent in 100% population. The lab investigations are elaborated in Table 1.

Table 1: Characteristics of the patient

Parameters	Mean±SD or No of patients (N=50)	%
Age (years) (Mean±SD)	43.2±8.3	
Gender		
Male	34	78
Female	16	32
Co morbidity	12	24
Cause of cirrhosis		
HCV	42	84
HBV	4	8
Cryptogenic	3	6
BCS	1	2
Presentation		
AC	14	28
Biliary colic	33	66
Gall stone pancreatitis	3	6
Ascites	0	0
Encephalopathy	0	0
Lab investigation		
AST (U/L) (Mean±SD)	31.6±11.4	
ALT (U/L) (Mean±SD)	33.5±10.8	
AP (U/L), (Mean±SD)	85.1±42.8	
GGT (U/L) (Mean±SD)	42.7±13.3	
Alb (g/dL) (Mean±SD)	3.22±0.71	
INR (Mean±SD)	1.3±0.4	
Creatinine (mg/dL) (Mean±SD)	0.84±0.2	
Platelet count (1000/ μ L), (Mean±SD)	253.78±94.41	
CTP score		
A	30	60
B	16	32
C	4	8
MELD Score	9.4±3.3	
Pre-operative upper endoscopy	38	63.3
Operative adhesion	12	20
Using harmonic device	21	42
Operative bleeding	18	36
Blood transfusion	5	10
Plasma transfusion	17	34
Conversion to open	4	8
Operative time (min), Mean±SD	108.6±51.4	
Hospital stay (post-operative) (days) (Mean±SD)	2.9±2.6	

The study subjects were classified based on CTP scoring. The CTP score A was present in 60% population. 32% and 8% of the 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 9.4±3.3 and 6.1±1.4 respectively. Harmonic device is used in 42% of the study population. Operative adhesions were found in 18% patients. Blood transfusion was needed in 10% of the study population. Plasma transfusion was needed in 34% of the study population. Eight

percent of cases were converted to open surgeries. The mean operative time was found to be 108.6 ± 51.4 min. The mean hospital stay of the study population was found to be 2.9 ± 2.6 days. (Table 1)

Thirteen patients were found to have complications in the first post-operative month. One patient had biliary injury and one had gastric injury. They were classified under Clavien grade III and were converted to open surgeries for the primary repair of these injuries. 8% patients were found to have post-operative infections. 6% patients were complicated with post-operative liver decompensation. GI bleeding affected 2 patients (Clavien III) and one patient died due to multisystem organ failure (Clavien V). Ascites developed in three patients out of which two improved with the help of medications but one patient died of liver failure (Clavien V). One patient was found to have encephalopathy, the patient improved with medications. Post-operative cholestasis affected one patient and the patient improved with liver support. Operative site hematoma was found in one patient which was managed conservatively (Clavien II). Total of three mortalities (6%) were recorded in thirty days, one was due to liver failure and two were due to GIT bleeding. (Table 2)

Table 2: Outcome of patients

Parameters	No (N=50)	%	Clavien grade of complications
30 day complications	13	26	
Biliary injury	2	4	III
Gastric injury	2	4	III
Post-operative infection	4	8	
Chest infection	2	4	II, V
Wound infection	1	2	II
UTI	1	2	II
Post-operative decompensation	3	6	
GIT bleeding	2	4	III, V
Ascites	3	6	II, V
Encephalopathy	1	2	II, V
Cholestasis	1	2	II, V
Operative site hematoma	1	2	II
Port site bleeding	1	2	II
30- day mortality	3	6	
Causes			
Liver failure	1	2	
GIT bleeding	2	4	

On univariate analysis, thirty days mortality was found to be associated with AC as presentation of the disease, higher CTP score, MELD score, INR, platelet count, operative bleeding, platelet transfusion, conversion to open surgery, operative time, length of postoperative hospital stay and lesser use of harmonic devices. On multivariate analysis, none of the parameter was found to independently affect the thirty days mortality of the patients. (Table 3)

Table 3: Predictors of 30- days mortality

Parameters	Univariate analysis (p value)	Multivariate analysis (p value)
Age (years), Mean±SD	0.07	
Gender Males Females	0.395	
Co morbidity	>0.05	
Presentation AC Biliary colic Gall stone pancreatitis	0.001*	0.541
CTP score A B C	0.001*	0.262
CTP Score, Mean±SD	0.003*	0.260
MELD score, Mean±SD	0.001*	0.322
INR	0.004*	0.411
Platelet count (1000/μL), Mean±SD	0.001*	0.07
Operative bleeding	0.005*	0.08
Blood transfusion	0.001*	0.07
Plasma transfusion	0.008*	0.13
Harmonic use	0.07	0.09
Conversion to open surgery	0.3	0.11
Operative time (min), Mean±SD	0.001*	0.32
Hospital stay (days), Mean±SD	0.001*	0.06

***P value of less than 0.05 is considered statistically significant**

Discussion: The surgical options in cirrhosis are limited and are controversial. The surgery has limited indications as there is risk of intraoperative accidents as well as post-operative complications. The surgery is done only in selective cases to avoid the liver failure and operative bleeding.

Mortality after open surgery is higher in cirrhotic patients(7-15%)⁷ in comparison to normal population(0.5-1%)⁸.

The previous data suggested higher rates of mortality and morbidity after the laparoscopic cholecystectomy, the data supports the selection of this surgical procedure in patients with Child A and B cirrhosis only because of operative bleeding, post operation hospitalization and operation time.^{9,10}

Thirteen 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.⁴ in their study stated that the patients who faced postoperative complications had a MELD score of more than 13. 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 covert pre operatively to child B. The surgery should be avoided in Child C patients and non-surgical protocols should be sought.¹¹

An overdeveloped collateral venous circulation is an important concern for surgery of biliary tract in cirrhotic patients. It is one of the most common reason of intra and post-operative

complications. In situation of complications, most authors have preferred open surgery.⁹ Cholecystectomy performed in cirrhotic patients is difficult whether it is performed by open surgery or laparoscopic surgery.¹²

Six percent of the patients were complicated with post-operative liver decompensation in our study and three patients were converted to open surgery. GIT bleeding occurred in two patients (clavien III) and one patient died due to multisystem organ failure (clavien V). Garrison RN et al. stated in their study that common post-operative complications for open surgery were haemorrhage, decompensation of cirrhosis, ascites and wound infections.¹³

In the present study, harmonic device was used in 42% patients. Catena F et al. showed that there was significantly less blood loss and lesser conversion to open surgery when compared to mono-polar diathermy.¹⁴

Nguyen et al.⁶ and Bessa et al.¹⁵ in their study interpreted that argon device lead to no use of harmonic device and was found to have 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 rate of 75% in child C patients and 50% of the child C patients encountered mortality that is similar to the present study.¹⁶

The factors including AC as presentation of the disease, CTP score, CTP mean, INR, platelet count, MELD score, operative adhesion, operative bleeding, blood transfusion, plasma transfusion, harmonic use, lesser operative time and less post-operative hospital stay were found to be significantly associated with 30 days morbidity in the present study.

Delis S. et al.⁴ in their study assessed an association of Child score and MELD score with the morbidity. They⁴ reported conversion rate of 5.45% in their study. Results in our study were concordant with this study with the conversion to open surgery seen in 5% of patients in the study. Garrison RN et al.¹³ in their study showed significant relation between open surgery and morbidity rates (5-20%).

Alhamidet al.³ showed mortality rate of 9.4% in their study among the patients undergoing LC. Six percent of cirrhosis related mortality was shown in the present study.

In our study thirty days mortality was found in 5.6% of child B patients and 50% of child C patients. In previous studies 30-day mortality of 10% for Child A, 30% for Child B and 76-82% for Child C was found.^{13,18} Ninety percent of post-operative mortality was found in association with MELD score higher than 26.¹⁸

Conclusion: The study suggests that higher CTP score and MELD score are strong predictors of complications and mortality rate in LC patients. It is necessary to improve liver status before performing LC in patients with higher scores. LC can be performed safely in cirrhotic patients provided certain factors are taken care of i.e. selection of patient, preoperative optimisation, meticulous surgical dissection by a skilled surgeon, use of harmonic devices and adequate care in postoperative period.

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