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Comparative Study between Laparoscopic and open Cholecystectomy in Cirrhotic Patients

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ABSTRACT

Background: Gallstones are twice as common in cirrhotic patients as in the normal population. When gallbladder stones are symptomatic in cirrhotic people , they are linked to higher rates of morbidity and death than in non-cirrhotic people.

Aim of the work: To compare open cholecystectomy versus laparoscopic cholecystectomy in cirrhotic patients.

Patients and methods: This study has been conducted from March 2021 to October 2021 at Al-Azhar University Hospitals Department of General Surgery in Cairo, Egypt. It included 50 hepatic patients with symptomatic gall bladder stones that were randomized blindly into two equal groups . One was subjected to open cholecystectomy (OC) as a control group , while the other group was subjected to laparoscopic cholecystectomy (LC).

Results: Four patients (16%) in the LC group have been converted to open cholecystectomy. In the LC (Group A) , the average surgery time was significantly reduced. The average ±SD (in mins) of OC (Group B) and LC (Group A) were 96.6 ± 32 and 58.7 ± 23.8, respectively ($p<0.05$), with OC having significantly more intraoperative haemorrhage ($p<0.05$). Group B had a significantly longer hospital stay (days) than group A, with an average hospital stay of 2.7±1.9 days compared to an average hospital stay of 2 ±1.32 days for group A, with little post-surgical morbidity and no surgical death.

Conclusion: Laparoscopic Cholecystectomy is safe and effective operative therapy for cirrhotic patients with Child class A and early B experiencing gallstone diseases, since it has reduced morbidity, lower surgical time, and shorter hospital stays than open cholecystectomy.

Keywords: *Laparoscopic cholecystectomy (LC); Open cholecystectomy (OC); Cirrhosis.*

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INTRODUCTION

Cirrhotic patients are twice as likely as the general population to have gallstones. Hypersplenism, elevated estrogen levels, and enhanced intravascular hemolysis with reduced gall bladder emptying and mobility have all been linked to a higher risk of gall stone development**.** [6]

When gallbladder stones are symptomatic in people having liver cirrhosis, they are linked to a higher rate of morbidity and mortality than in people having non-cirrhotic livers. [8]

Cholecystectomy is also linked to a greater death rate in patients with liver cirrhosis as compared to non-cirrhotic liver patients. The intensity of underlying liver illness has been proven to have a significant impact on post-cholecystectomy death rates, which can be as high as 83% in people with end-stage liver disease. [3]

The intensity of cirrhosis, as determined by the Child-Pugh classification, is a crucial factor in determining which therapeutic option is best. [1]

The technical difficulties and risks associated with conducting open cholecystectomy (OC) in individuals having compensated cirrhosis as well as symptomatic gallstone illness were highlighted. Due to the magnification and availability of advanced instruments such as Ligasure and ultrasonic shears, LC might be a preferable alternative.[11]

The formation of a pneumo-peritoneum in laparoscopy causes a rise in intra-abdominal pressure that might lead to a reduction in liver flow. This could have a negative impact on postsurgical hepatic functions, especially in the case of cirrhosis of the liver. [13]

Since the stiff liver parenchyma in cirrhosis makes it difficult to retract the gallbladder fundus across the liver, a procedure typically used to get access to the cystic pedicle and Calot's triangle, LC is technically more difficult in people having liver cirrhosis. [4]

Due to these causes, cirrhosis of the liver, especially in the case of portal hypertension, was initially regarded as an absolute contraindication to LC. [2]

In accordance with this, OC is frequently regarded as the optimal treatment for symptomatic cholecystolithiasis in individuals having hepatic cirrhosis. In spite of the popular assumption, certain prospective studies and small randomized clinical trials have demonstrated that LC in individuals with liver cirrhosis has positive outcomes. [7]

PATIENTS AND METHODS

This randomized prospective trial was carried out from March 2021 to October 2021 at the Department of General Surgery, Al-Azhar University Hospitals, Egypt. It included 50 hepatic patients with symptomatic gall bladder stones. They were randomized blindly into two equal groups. One group underwent open cholecystectomy (OC) as a control group, while the other group was subjected to laparoscopic cholecystectomy (LC).

The following workup has been conducted:

A complete picture of blood.

Tests of liver function (INR, SGOT, SGPT, prothrombine time, serum albumin)

Serum creatinine, urine and stool analysis.

Markers of HCV and HBV.

Ultrasound of the abdomen to assess the liver, portal vein, gallbladder, and CBD.

The cirrhosis diagnosis was confirmed by an ultrasound result. Cirrhosis severity was evaluated using the Child-Pugh classification system. Each patient provided informed consent for the

surgery and involvement in the study.

Inclusion criteria: Compensated cirrhotic patients with symptomatic gallstone of Child-pugh A and early child B.

Exclusion criteria: Patients with acute cholecystitis, common bile duct stones, child C cirrhosis or active hepatitis, patients with blood diseases or drug allergy and patients with absolute contraindications for laparoscopic operations.

Surgical Techniques: Under general anesthesia, a standard four-port laparoscopic surgery was conducted on all LC patients, employing two 5mm ports and two 10mm ports following an open technique for the creation of pneumoperitoneum through a transverse supraumbilical incision. A right subcostal incision has been performed for the OC. Ligature, electrocautary, and ligasure have been used to achieve hemostasis. For all patients, an abdominal drain has been put in the surgical field. The follow-up of the patients in both groups consisted of measurement of liver transaminases, Albumin and total bilirubin levels 24 hours and 1 week after surgery, postoperative pain and hospital stay were recorded. After one month, the procedure's outcome and general condition of the patients were evaluated.

Statistical Methods: SPSS version 15 was used to analyze the data gathered (SPSS Inc., Chicago, IL, USA). Numbers and percentages (%) have been employed to represent qualitative data, while mean ± SD has been employed to represent quantitative data. The independent student test has been employed to test the significance of the difference for quantitative data, whereas the Chi square or Fisher's exact test has been employed to test the significance of the difference for qualitative data. A probability value (P value) of < 0.05 has been defined as statistical significance.

RESULTS

The prevalence of HCV infection is more common among males (Table 1).

Parameters	Laparoscopic group		Open group	
Age	Range	22 – 50	Range	27 – 62
	Mean	(40.44) +/- 9.07	Mean	(47.68) +/- 10.93
Sex	Male	13 (52%)	Male	16 (64%)
	Females	12 (48%)	Females	9 (36%)
Gall stones	Single	8 (32%)	Single	10 (40%)
	Multiple	17 (68%)	Multiple	15 (60%)

Table 1: Age, sex, gall stone types distribution

HCV infected patients account for the majority of cases (47) rather than Bilharzial infected patients (3) the demographic factor among patients can interpret this as the majority were from urban areas (Table 2) .

Factors implicated in elevating stage of the patient from class A to class B were prolonged INR not more than 1.9 (they had pre-operative 4 unites FFPs and fresh blood were listed for them) and decreased albumin level not less than 3.2 (g/dl) .

Parameters	Laparoscopic group		Open group	
Cause of cirrhosis	HCV	25 (100%)	HCV	22 (88%)
			Combined HCV + Bilharzial	3 (12%)
Child class	Child A	22 (88%)	Child A	21 (84%)
	Child B	3 (12%)	Child B	4 (16%)

Table 2: cause of Liver disease and the Child class distribution

The mean operative time for Laparoscopic group (58.7 +/- 23.8) is much less than that for Open group (96.6 +/- 32) and in comparison between the different classes of intra-operative bleeding, Laparoscopic group patients showed less percentage of class 2 (20 %) and class 3 (12 %) than that for Open group in whom class 2 (36 %) and class 3 (20 %) respectively . Intra-operative bleeding in both groups were up to 1.2 L (Table 3) .

Parameters	Laparoscopic group		Open group	
Operative time	Range Mean	47 – 116 58.7 ± 23.8	Range Mean	50 – 140 96.6 ± 32 (P value < 0.05)
Intra-Operative bleeding	Class 1 Class 2 Class 3	17 (68%) 5 (20%) 3 (12%)	Class 1 Class 2 Class 3	11 (44%) 9 (36%) 5 (20%) (P value < 0.05)
	3 patients (class 3) were had bl., and FFPs transfusion (1-2 unites)		5 patients (class 3) were had bl., and FFPs transfusion (1-2 unites)	
Hospital stay	Range Mean	1 – 5 2 ± 1.32	Range Mean	1 – 7 2.7 ± 1.9
Post-operative pain (visual analogue scale VAS)	Range Mean	0 – 3 1.4 +/- 0.88	Range Mean	1– 5 2.8 +/- 1

Table 3: operative time, intra-operative bleeding, hospital stay, and post-operative pain distribution

Twenty-four hours after the procedure, ALT and AST increased statistically significantly (P value < 0.05)in the Laparoscopic group (ALTLC24 64 +/- 27.2) & (ASTLC24 58.72 +/- 20.2) in comparison with pre-operative levels (ALTLCpre 27.92 +/- 11.38) & (ASTLCpre 24.08 +/- 6.74). One week samples showed that ALT and AST decreased below levels shown that for twenty-four hours samples (ALTLC1week 48.4 +/- 18.72) & (ASTLC1week 46.2 +/- 19.17) but it is still markedly elevated than levels shown pre-operatively. while in the Open group, there is non-significant changes in the three samples (P value > 0.05). Both Albumin and Bilirubin levels showed non-significant changes between both groups in the three samples (Table 4) .

Changes in LFTs mean in Laparoscopic group

Item	**Pre-operative (mean +/- SD)**	**24 h_s Post. (mean +/- SD)**	**1 Week Post (mean +/- SD)**	**P *value***
ALT	27.92 +/- 11.38	64 +/- 27.2	48.4 +/- 18.72	< 0.05
AST	24.08 +/- 6.74	58.72 +/- 20.2	46.2 +/- 19.17	< 0.05
ALB.	4.12 +/- 0.47	3.9 +/- 0.48	3.9 +/- 0.44	> 0.05
BIL.	0.67 +/- 0.42	1.2 +/- 0.23	1.01 +/- 0.16	0.05>

Changes in LFTs mean in Open group

Item	**Pre-operative (mean +/- SD)**	**24 h_s Post. (mean +/- SD)**	**1 Week Post (mean +/- SD)**	**P *value***
ALT	33.27 +/- 3.45	35.33 +/- 7.85	32.07 +/- 2.52	0.05>
AST	34.73 +/- 3.24	36.6 +/- 5.95	34.87 +/- 3.02	0.05>
ALB.	4.09 +/- 0.52	4.01 +/- 0.47	4.04 +/- 0.49	> 0.05
BIL.	0.65 +/- 0.53	0.72 +/- 0.32	0.68 +/- 0.29	0.05>

Table 4: Changes in LFTs mean in Laparoscopic and Open groups

Post-operative morbidities are shown in the following table :

Complications	Laparoscopic group		Open group	
1- Fever	3	12%	7	28%
2- wound infection	2 (converted)	8%	5	20%
3- Chest infection	2	8%	4	16%
4- Bile leakage	3 (12%) treated conservatively for 3 days		1 (4%) treated conservatively for 2 days	
5- Ascitic leak	1 (4%) treated conservatively for 3days		3 (12%) treated conservatively for 5 days	

Table 5: post-operative morbidity in both groups

DISCUSSION

Cholethiases are twice as common in cirrhotic patients as they are in the general population. This is due to an increase in intravascular hemolysis, hypersplenism, and estrogen levels, as well as a decrease in gallbladder evacuation and motility. [5]

The topic of whether cirrhotic patients will benefit from this less invasive technique has been raised since the advent of LC. When compared to open cholecystectomy, LC provides for reduced hospital stays and surgical periods, quicker surgical rehabilitation, fewer wound complications, and lower overall expenses for noncirrhotic patients. [10]

Data from analyzed research suggests that morbidity in cirrhotic individuals undergoing LC varies greatly, ranging from 7.8 to 75%, owing primarily to infections and haemorrhage. A reduction in clotting factor production, a loss of vitamin K reserves, a longer prothrombin time, higher fibrinolytic activity, and thrombocytopenia all contribute to heightened perioperative blood loss in cirrhotic patients. Because of their impaired immune systems, cirrhotic patients are more prone to infections. [12]

Cirrhotic patients had significantly longer operating times, conversion rates, and morbidity rates than non-cirrhotic patients, although all investigations found that these factors were acceptable. Because conversion is intended to avoid more serious consequences, it ought to not be regarded as a failure to complete a difficult task, but rather as a reflection of surgical judgment. If laparoscopic dissection proves challenging, open surgery is always a choice. In the last eight years, the rate of conversion has dropped to less than 10%. Even if conversion results in greater morbidity (longer anesthesia, more bleeding, and longer surgical time) when compared with laparoscopy alone, this morbidity would remain lower than elective open surgery. Because postsurgical hemorrhage is likely in individuals with concomitant coagulopathy, an infrahepatic drain is usually inserted. Nevertheless, postoperative draining of the liver bed is debatable due to concerns regarding the development of ascites and subsequent infection in cirrhotic individuals. [9]

In this study, no mortality occurred in both laparoscopic as well as open cholecystectomy groups of patients. The most critical problem is patient selection based on liver reserve. Individuals having Child's Class A and B cirrhosis have been the only ones that were operated on. Factors implicated in elevating stage of the patient from class A to class B were prolonged INR not more than 1.9 (they had pre-operative 4 unites FFPs and fresh blood were listed for them) and decreased albumin level not less than 3.2 (g/dl).

As regards surgery time, hospital stay after surgery, and post-surgical pain , Laparoscopic group shows significant decrease in operative time and post-operative hospital stay (58.7 ± 23.8 min,) & (2 ± 1.32 day) in comparison with (96.6 ± 32 min,) & (2.7 ± 1.9 day) in open group. Laparoscopic group patients suffer low grade pain according to VAS of (1.4 +/- 0.88) versus (2.8 +/- 1) in open group.

As regard intra-operative bleeding Laparoscopic group patients had less percentage of class 2 (20 %) and class 3 (12 %) than that for Open group in whom class 2 (36 %) and class 3 (20 %) respectively . Intra-operative bleeding in both groups were up to 1.2 L and patients had blood and FFPs transfusion until controlled within average 3 days. Four patients undergoing laparoscopic cholecystectomy were converted to open cholecystectomy (owing to extensive vascular adhesions in one case, problematic dissection of the Calot triangle in another case, and unmanageable liver bed hemorrhage in two other cases) with a conversion rate of 16%, One of them could not be completed by Open cholecystectomy and partial cholecystectomy was done (Two of converted cases were Child B). One patient in Open group could not be completed and partial cholecystectomy was done, another patient had cholecystostomy. Both of them due to dense vascular adhesions and uncontrollable liver bed bleeding (Both were Child B).

As regard significant elevation of ALT and AST levels shown in Laparoscopic group in table 4 no patients shows clinical signs of decompensation (except occurrence of ascites in one patient controlled within 7 days by albumin infusion) in the period of follow up (2 weeks).

As regard post-operative morbidity Laparoscopic group patients shows decrease in percentage of complications related to the open wound (fever, infection) and general complications (chest infection). Bile leakage cases (3) mostly due to bladder perforation and difficult extraction.

As regard Child B patients (3) in Laparoscopic group, all had complications (two of them had intra-operative bleeding class III and conversion to open surgery occurred with difficult control and one patient class II controlled laparoscopically. Child B patients (4) in Open group also had similar complications. All patients in whom cholecystectomy could not be completed and partial cholecystectomy (2 patients) or cholecystostomy (one patient) were resorted to it, were Child class B.

CONCLUSION

Laparoscopic cholecystectomy was safe in Child's Class A cirrhotic. The procedure is linked to zero mortality, a lower incidence of postoperative complications, shorter operative time, postoperative hospital stay, less postsurgical pain, and a rate of conversion comparable to non-cirrhotic patients.

Conflict of interest : none

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