

Assessment of Levels of Liver Enzymes in the Immediate and Delayed Postoperative Period Following Open Cholecystectomy and Laparoscopic Cholecystectomy at a Tertiary Centre

Brajkishor Kumar¹, Brajesh Kumar², Khursheed Alam³

^{1,2}Senior Resident, Department of surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India.

³Assistant Professor, Head of Department, Department of surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India.

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Corresponding Author: Dr. Brajesh Kumar

Conflict of interest: Nil

Abstract:

Background: Laparoscopic cholecystectomy is a minimally invasive surgical procedure used to remove the gallbladder, commonly performed to treat gallstones and other gallbladder-related conditions.

Aim: The present prospective study was conducted to compare the changes in the levels of liver enzymes in the immediate and delayed postoperative period following Open Cholecystectomy and laparoscopic cholecystectomy.

Materials & Methods: 70 patients with laparoscopic cholecystectomy of both genders were divided into 2 groups of 35 each. Group I underwent laparoscopic cholecystectomy and group II open cholecystectomy. Levels of alkaline phosphatase (ALP), aspartate transaminase (AST), alanine transaminase (ALT) and total bilirubin were noted in the preoperative period, 24 hours after the surgery and seven days after the surgery was determined.

Results: In group I, males were 21 and females were 14. In group II, males were 18 and females were 17. The mean ALP (IU/L) level, pre-operative, 24 hours and 1 week was 91.4 ± 20.13 and 85.32 ± 16.91 , 84.9 ± 19.50 and 87.3 ± 18.12 and 85.1 ± 15.91 and 84.2 ± 20.10 in group I and II respectively. The mean ALT (IU/L) level pre-operative, 24 hours and 1 week was 31.7 ± 9.50 and 31.5 ± 10.20 , 29.5 ± 9.17 and 26.7 ± 7.10 and 50.2 ± 14.39 and 25.6 ± 6.10 in group I and II respectively. The mean AST (IU/L) pre-operative, 24 hours and 1 week was 30.5 ± 7.90 and 32.1 ± 17 , 31.8 ± 10.1 and 27.5 ± 6.90 and 53.69 ± 19.91 and 26.7 ± 6.50 in group I and II respectively. The mean total bilirubin (mg/dL) level was 0.63 ± 0.21 and 0.61 ± 0.29 , 0.59 ± 0.19 and 0.61 ± 0.15 and 0.781 ± 0.259 and 0.52 ± 0.15 pre-operative, 24 hours and 1 week in group I and II respectively. The difference was significant ($P < 0.05$).

Conclusion: The levels of ALT, AST, and total bilirubin rose significantly but briefly after LC, whereas the levels of ALP did not change significantly in the first 24 hours after LC, which was not the case for OC.

Keywords: Gallbladder, Laparoscopic Cholecystectomy, Liver Enzymes.

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Introduction

Laparoscopic cholecystectomy is a minimally invasive surgical procedure used to remove the gallbladder, commonly performed to treat gallstones and other gallbladder-related conditions. This procedure has largely replaced the open cholecystectomy due to its advantages, including shorter recovery times, less postoperative pain, and smaller scars [1].

Indications for laparoscopic cholecystectomy is indicated for various gallbladder conditions, including cholelithiasis, cholecystitis, choledocholithiasis, biliary dyskinesia, gallbladder polyps and gallbladder cancer [2]. The LC is one of the most common procedures which is being performed by all general surgeons on a daily basis

for gallstone disease. The worldwide prevalence of the gallstone disease varies widely [3]. Even though laparoscopic surgery is the gold standard approach, there are still issues related to pneumoperitoneum that come with it. Air embolism, hypercarbia with acidosis, cardiac arrhythmia, and a marked alteration in liver enzymes have all been observed as consequences of pneumoperitoneum [4]. Hence, both the surgeons and the patients may become concerned if there is a notable alteration in the liver enzymes, specifically AST and ALT, following LC without any damage to the bile duct during the intraoperative phase [5].

Aim and Objectives: The present study was conducted to compare the changes in the levels of liver enzymes in the immediate and delayed postoperative period following Open Cholecystectomy and laparoscopic cholecystectomy.

Materials & Methods

The present prospective, longitudinal study was carried out in the Department of Surgery, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India. All patients admitted in General surgical Ward/unit either through OPD or emergency.

A total of 70 patients of either gender scheduled to undergo open and laparoscopic cholecystectomy were enrolled. All were informed regarding the study and their written consent was obtained. The institutional ethical committee granted ethical approval. The duration of study was from January 2023 to February 2024. Data such as name, age, gender etc. was recorded.

Inclusion Criteria:

- Patients to give written informed consent
- Patient's age between 18-60 years
- Available for follow up.

Exclusion Criteria:

- Patients not give written informed consent
- Patients having deranged liver function tests
- Patients who had undergone open cholecystectomy after laparoscopic cholecystectomy.
- Patients with immunocompromised status and patients on chemotherapy or steroid treatment, re-operation of the abdominal surgery and
- Those unable to attend follow-up.

Patients were divided into 2 groups of 35 patients in each group. Group I underwent laparoscopic cholecystectomy and group II open cholecystectomy. Levels of alkaline phosphatase (ALP), aspartate transaminase (AST), alanine transaminase (ALT) and total bilirubin were noted in the preoperative period, 24 hours after the surgery and seven days after the surgery.

Statistical Analysis

Statistical analysis was performed on the obtained data by using SPSS version 25.0 and Microsoft 19, P value < 0.05 was considered significant. P value < 0.05 was considered significant.

Results

Table 1: Demographic distribution of patients

Groups	Group I (n=35)	Group II (n=35)
Method	Open cholecystectomy	Laparoscopic cholecystectomy
M:F	21:14	18:17

Table 1 shows that in group I, males were 21 and females were 14. In group II, males were 18 and females were 17.

Table 2: Assessment of biochemical parameters

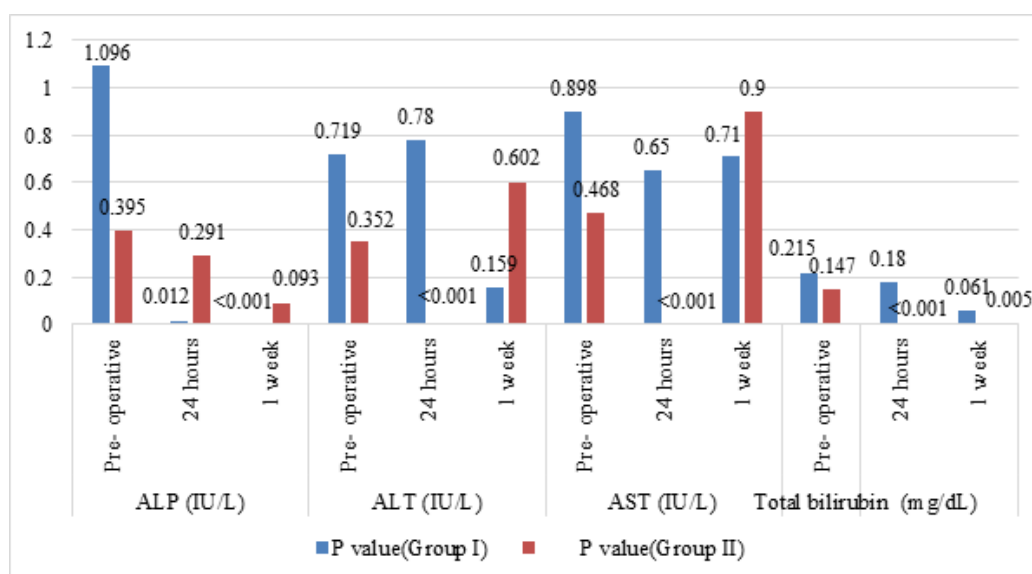
Parameters	Variables	Group I (n=35)	P value	Group II (n=35)	P value
ALP (IU/L)	Pre- operative	91.4±20.13	1.096	87.3±18.12	0.395
	24 hours	85.32±16.91	0.012	85.1±15.91	0.291
	1 week	84.9±19.50	<0.001	84.2±20.10	0.093
ALT (IU/L)	Pre- operative	31.7±9.50	0.719	26.7±7.10	0.352
	24 hours	31.5±10.20	0.780	50.2±14.39	<0.001
	1 week	29.5±9.17	0.159	25.6±6.10	0.602
AST (IU/L)	Pre- operative	30.5±7.90	0.898	27.5±6.90	0.468
	24 hours	32.1±17	0.650	53.69±19.91	<0.001
	1 week	31.8±10.10	0.710	26.7±6.50	0.90
Total bilirubin (mg/dL)	Pre- operative	0.63±0.21	0.215	0.61±0.15	0.147
	24 hours	0.61±0.29	0.180	0.781±0.259	<0.001
	1 week	0.59±0.19	0.061	0.52±0.15	0.005

ALP= alkaline phosphatase, AST= aspartate transaminase, ALT= alanine transaminase

Table 2 and figure I, shows that the mean ALP (IU/L) level was 91.4±20.13 and 85.32±16.91 in pre- operative, 84.9±19.50 and 87.3±18.12 after 24 hours and 85.1±15.91 and 84.2±20.10 after 1 week was, and in group I and II respectively. The mean ALT (IU/L) level was 31.7±9.50 and 31.5±10.20 in pre- operative, 29.5±9.17 and 26.7±7.10 after 24 hours and 50.2±14.39 and 25.6±6.10 after 1 week

in group I and II respectively. The mean AST (IU/L) pre-operative, 24 hours and 1 week was 30.5±7.90 and 32.1±17, 31.8±10.1 and 27.5±6.90 and 53.69±19.91 and 26.7±6.50 in group I and II respectively. The mean total bilirubin (mg/dL) level was 0.63±0.21 and 0.61±0.29 in pre- operative, 0.59±0.19 and 0.61±0.15 after 24 hours, and 0.781±0.259 and 0.52±0.15 after 1 week in

groups I and II, respectively. The difference was significant ($P < 0.05$).



Graph I: Assessment of biochemical parameters

Discussion

Inflammation of the gall bladder is termed as cholecystitis. It is usually associated with gallstones in 90% of cases [6]. However, it may be acalculous in 10% of cases. Acute cholecystitis is one of the common surgical emergencies [7]. Prompt diagnosis, assessment of severity and commencement of appropriate treatment is essential to prevent morbidity and mortality. Many etiological factors have been associated with gallstones in children. Chronic haemolytic diseases are considered the most common cause [8]. Other risk factors include liver cirrhosis, chronic cholestasis, total parenteral nutrition, and ileal diseases such as ileal resection, ileal Crohn's disease, cystic fibrosis, prolonged use of high-dose ceftriaxone, cancer therapy, family history, obesity, and congenital anomalies in the GB [9]. The liver enzymes namely ALP, ALT, and AST and total bilirubin levels should theoretically remain unchanged in the postoperative following cholecystectomy. A rise in the above-mentioned parameters following cholecystectomy is usually suggestive of injury to the biliary tree [10,11]. The present study was conducted to compare the changes in the levels of liver enzymes in the immediate and delayed postoperative period following open cholecystectomy and laparoscopic cholecystectomy.

We found that in group I, males were 21 and females were 14. In group II, males were 18 and females were 17. Choudhary et al [12], compared the changes in the levels of liver enzymes in the immediate and delayed postoperative period following LC and following open cholecystectomy (OC) with respect to the preoperative values. A total of 43 patients who underwent LC and 43

patients who underwent OC were randomly selected from the surgical wards. Their levels of Alkaline Phosphatase (ALP), Aspartate Transaminase (AST), Alanine Transaminase (ALT) and total bilirubin were noted in the preoperative period, 24 hours after the surgery and seven days after the surgery. The changes in the levels of the above mentioned parameters were analysed. The mean age of the study participants who underwent OC was 40.98 ± 12.46 years while the mean age for those who underwent LC was 36.42 ± 10.53 years. There was a significant increase in the levels of AST (27.02 ± 7.272 IU/L to 53.70 ± 19.902 IU/L), ALT (26.21 ± 7.399 IU/L to 50.21 ± 14.410 IU/L) and total bilirubin (0.601 ± 0.173 mg/dL to 0.782 ± 0.261 mg/dL) in the immediate postoperative period (24 hours after surgery) among the patients who underwent LC but returned to its baseline preoperative value within seven days of the surgery. No such significant change was noted in the levels of the liver enzymes (AST: 30.93 ± 8.160 IU/L to 32.14 ± 16.988 IU/L, ALT: 31.51 ± 10.762 IU/L to 31.14 ± 10.921 IU/L) among patients undergoing OC.

We found that the mean ALP (IU/L) level was 91.4 ± 20.13 and 85.32 ± 16.91 in pre-operative, 84.9 ± 19.50 and 87.3 ± 18.12 after 24 hours and 85.1 ± 15.91 and 84.2 ± 20.10 after 1 week was, and in group I and II respectively. The mean ALT (IU/L) level was 31.7 ± 9.50 and 31.5 ± 10.20 in pre-operative, 29.5 ± 9.17 and 26.7 ± 7.10 after 24 hours and 50.2 ± 14.39 and 25.6 ± 6.10 after 1 week in group I and II respectively. The mean AST (IU/L) pre-operative, 24 hours and 1 week was 30.5 ± 7.90 and 32.1 ± 17 , 31.8 ± 10.1 and 27.5 ± 6.90 and 53.69 ± 19.91 and 26.7 ± 6.50 in group I and II respectively. The mean total bilirubin (mg/dL)

level was 0.63 ± 0.21 and 0.61 ± 0.29 in pre-operative, 0.59 ± 0.19 and 0.61 ± 0.15 after 24 hours, and 0.781 ± 0.259 and 0.52 ± 0.15 after 1 week in groups I and II, respectively. The difference was significant ($P < 0.05$).

Halevy et al. [13], stated that bile duct injury is the most feared complication of laparoscopic cholecystectomy. Some laboratory tests may be indicative of this complication, such as increases in liver enzyme (AST, ALT, and ALP) and bilirubin. These parameters have not been investigated in patients who had laparoscopic cholecystectomy and in whom no damage to the bile duct was noted. Sixty-seven patients with normal results of preoperative liver function test were entered into the study. Blood was collected 24 hours after laparoscopic cholecystectomy, and AST, ALT, ALP, and bilirubin levels were measured. A mean 1.8-fold increase in AST occurred in 73% of patients; 82% showed a 2.2-fold increase in ALT. A statistically nonsignificant increase was noted in 53% of patients (ALP remained within normal limits), and in 14% of patient's bilirubin levels were increased (they were primarily of the unconjugated type). In many patients, a significant increase in AST and ALT levels occurred after laparoscopic cholecystectomy, but they returned to normal values within 72 hours. The cause of this is unclear, and these elevations appear to have no clinical significance.

Limitation of the Study: The shortcoming of the study is small sample size and short duration of study.

Conclusion

Authors found that the levels of ALT, AST, and total bilirubin rise significantly but briefly after LC, whereas the levels of ALP did not change significantly in the first 24 hours after laparoscopic cholecystectomy (LC), which was not the case for open cholecystectomy (OC).

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