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ORIGINAL ARTICLE

Changes in Liver Function Tests after Laparoscopic Cholecystectomy

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ABSTRACT

Introduction: Laparoscopic cholecystectomy (LC) has developed to be the typical treatment for benign diseases of the gallbladder. Though, it was observed that the serum levels of some liver enzymes increased significantly after LC in patients with normal preoperative liver enzyme levels.

Objective: The aim of this study was to estimate the consequence of pneumoperitoneum on serum bilirubin concentration and liver enzymes in laparoscopic cholecystectomy compared to open cholecystectomy (OC).

Study Design: A prospective case-control study.

Place and Duration: In the Department of Surgery of LGH, Lahore for one-year duration from November 2020 to October 2021.

Methods: This analysis encompassed 80 patients treated for laparoscopic cholecystectomy and 40 patients treated for open cholecystectomy as a control group in the surgical department. Blood samples were drawn 24-hours before and 24 hours later to surgery for bio-chemical studies.

Results: Despite a substantial increase in aspartate aminotransferase (AST), bilirubin, lactate dehydrogenase (LDH) and alanine aminotransferase (ALT) in the postoperative period, no remarkable change in serum alkaline phosphatase was observed in the LC group in comparison to the OC group.

Conclusion: It was found that the increase in liver enzymes and serum bilirubin can be accredited to the adverse effect of pneumoperitoneum on hepatic flow of blood. Although these variations do not appear to be significant clinically, caution must be exercised in determining whether to accomplish laparoscopic cholecystectomy in subjects with hepatic impairment.

Keywords: Laparoscopic cholecystectomy, Pneumoperitoneum, Liver enzymes.

INTRODUCTION

For more than 30 years, laparoscopic cholecystectomy (LC) has substituted open cholecystectomy (OC) in the treatment of benign diseases of the gallbladder and has converted to be the 1st line in symptomatic treatment of gallstones[1-2]. Due to its popularity in the world, it has become one of the most frequent general surgeries. The LC enters an era in which day case procedure is considered[3-4]. Though Laparoscopic cholecystectomy has numerous benefits over OC, novel worries have arisen about the impacts of pneumoperitoneum on the respiratory and cardiovascular systems[5-6]. The significant hemodynamic variation is a momentary decrease in hepatic blood flow due to pneumoperitoneum[7]. The pressure and duration of pneumoperitoneum have been shown to increase liver enzyme levels. The upsurge in enzymes of liver is constantly an apprehension for the physician and requires more research to identify the primary pathology[8-9]. Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) are labelled as a criterion for liver function. LFTs are usually done after surgery. Abnormalities are generally temporary and LFTS turn back to standard without any interference. Pneumoperitoneum is a key constituent of laparoscopic surgeries[10]. Although a gas-free approach using an intra-abdominal facelift has been described, this method is not better to pneumoperitoneum in healthy subjects. The hemo-dynamic response to the peritoneal insufflation is defined well and be contingent on the interface of a number of factors[11]. Serum levels of lactate dehydrogenase (LDH), AST, ALT and bilirubin are often used to diagnose liver function. ALP results are generally assessed in conjunction with other liver tests for disease progression[12]. When the bile ducts become choked, bilirubin and ALP can rise much higher than ALT or AST. The aim of this study was to estimate the consequence of pneumoperitoneum on serum bilirubin concentration and liver enzymes in laparoscopic cholecystectomy compared to open cholecystectomy (OC).

MATERIALS AND METHODS

A prospective case-control study was performed in the Department of Surgery of LGH, Lahore for one-year duration from November 2020 to October 2021. This analysis encompassed 80 patients treated for laparoscopic cholecystectomy and 40 patients treated for open cholecystectomy as a control group in the surgical department. Both groups were given anesthesia according to a practice. Blood for laboratory investigations like ALT, AST, LDH, ALP and total bilirubin in serum was obtained from a superficial vein in the antecubital area before surgery and 24 hours after surgery. Patients with increase levels of preoperative liver enzyme, bile duct stones and complications such as biliary injury or hepatic hemorrhage were excluded. Patients with comorbidities such as DM and serologically positive hepatitis B or C were too omitted. The laparoscopic cholecystectomy was achieved with 4 trocars using the US method. Pneumoperitoneum 14 mm Hg was generated and sustained by intraperitoneal insufflation of CO2 using an automatic insufflator. OC was accomplished by the right incision in the subcostal area. In both groups, unipolar electrical coagulation was used to separate the gallbladder from the liver bed. Patients' intraoperative blood pressure, oxygen saturation, and pulse rate were carefully supervised. No changes in blood pressure were observed in both groups. Before and after surgery, patients were administered intravenously antibiotics (cephalosporins) and diclofenac sodium to control pain postoperatively. For the 1st 24 hours; intravenous fluids were given to all patients. Subjects undergoing LC were discharged on the 1st day after sampling of blood and altogether were directed to undergo examination on follow-up. Accepted values for enzymes; ALT and AST up to 20 IU / L, TSB 5-17 µmol / L, ALP 22-91 IU / L and for LDH 25-190 IU / L. Results are presented as mean standard deviation. Statistical analysis was accomplished using Chi-square (χ 2) and paired t-test to calculate the difference between the two means. A $p < 0.05$ was taken as significant.

RESULTS

The patients mean age was 45.1 years (22-76 years). There were no substantial gender variances in postoperative liver enzymes in LC and OC (Table 1).

Table 1: Association of gender to post-operative liver enzymes

Gender	Changes, n=	No Changes, n=	P– value
Female	66	36	0.08
Male	14	6	
Total	78	42	120

The length of pneumoperitoneum with LC was 30-65 minutes. Postoperative liver enzyme changes in LC showed a significant increase in pneumoperitoneum for 40 min in Table 2.

In OC, postoperative liver enzyme changes were lower significantly than LC (Table 3).

Table 2: Association between post-operative liver enzymes and duration of pneumoperitoneum

Duration of pneumoperitoneum	changes No.	No changes No.	Total	P- value
Up to 30 minutes	15	8	23	0.4
31-40 minutes	10	2	12	0.3
>40 minutes	44	1	45	0.01
Total	69	11	80	

The mean time of surgery in OC group was 48.30 minutes and out of 40 patients, only 4 had serum bilirubin and liver enzymes changes and these fluctuations were not statistically significant. While in the group of laparoscopic cholecystectomies there was a substantial upsurge in serum total bilirubin, AST, ALT and LDH after surgery, no substantial change was observed in ALP (Table 4).

Table 3: Post - operative liver enzymes according to types of operation

Post op. enzymes	LC, n=	OC, n=	P- value
Change	65	4	0.000
No change	15	36	
Total	80	40	

Table 4: Mean values for postoperative enzyme changes after LC and OC.

Test	LC group (n=80)		OC group (n=40)		P-value	95% confidence
	Preoperative	Post-operative	Preoperative	Post-operative		interval
TSB	9.40±2.81	20.01 ±3.95	10.40 ±2.97	16.10±2.11	0.00	2.70- 5.04
AST	10.02±2.41	31.85 ±9.81	10.39±3.062	18.39 ± 3.01	0	11.88- 15.98
ALT	12.50±1.88	33.41 ±8.5	12.50±3.050	18.64 ± 3.80	0	10.85- 16.96
LDH	105.99±23.49	200.0 ±53.2	110.90±21.2	160.5 ± 20.5	0	27.32- 56.49
AKP	48.82±11.65	48.0 ± 13.4	50.05±10.88	51.5 ± 10.9	0.17	-11.20

DISCUSSION

Increased liver enzymes after uncomplicated LC have turn out to be an identified fact. However, the clinical significance of these high enzyme levels has not been established. In our study, the ratio of women to men was 5: 1. This is in line with various other studies but different from other reports. In this study, there was no substantial alteration in the level of liver enzymes after surgery between men and women[13]. This is consistent with various other studies. We found that prolonged surgery time was related with increased levels of postoperative liver enzyme in the LC group, while surgery time had no effect on postoperative liver enzyme levels in the OC group[14]. In addition, the duration of pneumoperitoneum was associated with increased levels of hepatic enzymes after surgery. In disparity, patients with OC underneath the same conditions of study as patients of LC did not display any significant fluctuations in serum liver enzymes, except that they did not experience CO2 pneumoperitoneum[15-16]. These results are constant with other various analysis that show comparable variations in LFTs. It is clear that pneumoperitoneum and its extent increase the level of liver enzymes postoperatively[17]. While the mean postoperative enzymes levels tested in the OC group were in the normal range, the rise in AST, TSB, LDH and ALT in the LC group was significant. Though, fluctuations in the levels of ALP were insignificant in both groups. These outcomes are consistent with many formerly available literatures on the subject[18-19].

In this study, 57.5% of patients had changes in serum levels of liver enzymes. Changes in liver enzymes have been previously described in patients with LC, up to 80% in some studies[20]. Raised pressure of peritoneum, pressure on the liver with gallbladder retraction during LC, coagulation of the liver bed for homeostasis, external bile duct manipulation, and general anesthesia effects are known probable reasons of elevated liver enzyme levels[21]. Though, in OC, liver contraction for improved exposure, bile duct manipulation to detect probable CBD stones, and electrical coagulation of the liver bed were characteristically executed[22]. We compared enzymatic changes in LC patients with patients in the OC group who received similar antibiotics and anaesthetics. The solitary probable factor that could have caused these changes in this analysis was the high intraperitoneal pressure that occurred during LC[23].

In a randomized study associating the high- and low-pressure pneumoperitoneum effects on liver function, Hasukic et al. Found that increases in ALT and AST were significantly greater in patients undergoing high-pressure pneumoperitoneum (14 mm Hg)[24]. In a study associating liver enzyme abnormalities in LC, gas-free LC, and LC under low-pressure pneumoperitoneum, Giraudo et al. A significant increase in enzyme levels was observed after LC, which was not observed after LC, without gas or low pressure, which highlights the complete effect of this increase[25].

CONCLUSION

It was found that the increase in liver enzymes and serum bilirubin can be accredited to the adverse effect of pneumoperitoneum on hepatic flow of blood. Although these variations do not appear to be significant clinically, caution must be exercised in determining whether to accomplish laparoscopic cholecystectomy in subjects with hepatic impairment.

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