IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 5 Ser.3 (May. 2023), PP 01-04
www.iosrjournals.org

Comparison Of Liver Function Test In Low Pressure And Standard Pressure Pneumoperitoneum Laparoscopic Cholecystectomy

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ABSTRACT
Introduction:*Laparoscopic cholecystectomy is gold standard treatment for cholelithiasis now a days. Post-operative shoulder tip pain is common complain after laparoscopic cholecystectomy. The cause of this shoulder tip pain is multifactorial e.g. peritoneal stretching and diaphragmatic irritation. The main cause of this shoulder tip pain is pneumoperitoneum caused by carbon dioxide. Intra-operative and post-operative outcomes are largely affected by the pneumo peritoneum used in laparoscopic cholecystectomy.*
Aim: *To compare the effect of standard pressure and low pressure pneumoperitoneum on liver enzymes in selected group of patients undergoing laparoscopic cholecystectomy.*
Materials and Methods: *A prospective randomized study was done in 100 patients of cholelithiasis in SMS hospital Jaipur Rajasthan. The patients were divided into two groups-Group A patients undergoing laparoscopic cholecystectomy at low pressure (7-8 mmHg) and group B patients undergoing laparoscopic cholecystectomy at standard pressure (12-14 mmHg). The two groups were compared using unpaired t-test.*
Results: *Serum Aspartate Aminotransferase (AST) and Alanine Transaminase (ALT) were raised signifcantly postoperatively in group B patients. There was no signifcant difference in bilirubin and Alkaline phosphatase (ALP) in both the groups*
Conclusion: *There is less derangement of liver function test in patient undergoing laparoscopic cholecystectomy at low pressure pneumoperitoneum.*

Keywords: *Laparoscopic cholecystectomy, Low pressure, Standard pressure*

Date of Submission: 27-04-2023 Date of Acceptance: 08-05-2023

I. INTRODUCTION

Laparoscopic cholecystectomy is gold standard technique for cholelithiasis nowdays[1]. Intra-abdominal pressure created by pneumoperitoneum is thought to be one reason for postoperative shoulder tip pain. Peritoneal stretching and diaphragmatic irritation by high pressure pneumoperitoneum or by carbon dioxide absorption from the peritoneal cavity are responsible for post-operative shoulder tip pain [2]. Pneumoperitoneum and Trendelenberg position used in laparoscopic cholecystectomy causes cephalad shift of diaphragm decreasing functional residual capacity and pulmonary compliance, increases airway resistance and airway pressure and thus increases risk of baro-trauma. It also impairs renal function and reduces urine output due to increased renal vascular resistance and reduced glomerular fltration rate. One more important haemodynamic change that occurs is the transient reduction in hepatic blood flow which can be known by assessing the liver function tests [3]. Elevation of liver enzymes such as AST and ALT after non-complicated laparoscopic cholecystectomy. The probable cause is explained to be a transient hepatic malfunction due to decreased blood flow to liver [3]. Several studies have showed unexplained changes in post-operative liver function tests after laparoscopic cholecystectomy. Rana ML et al., found high level of change in AST, ALT and Gamma-glutamyl transferase (GGT) whereas level of ALP remain minimally changed with exception of few cases, all the values returned to normal at follow-up after three weeks [5].Alteration in hepatic profile does occur in patients undergoing laparoscopic cholecystectomy [6].

II. MATERIALS AND METHODS

A prospective randomized study was done in the department of general surgery at SMS Medical College and Hospital, Jaipur, Rajasthan, India. 100 patients of age group 18-60 years underwent elective laparoscopic cholecystectomy for uncomplicated gallstone disease. Patients were divided into two groups of 50 each. Group A patients underwent laparoscopic cholecystectomy with low pressure pneumoperitoneum (7-8 mmHg) while group B underwent laparoscopic cholecystectomy with standard pressure pneumoperitoneum (12-14 mmHg). A written informed consent was taken from all the patients.

Patients were randomised into two groups.

Group I: Low pressure (7-8 mm of Hg) pneumoperitoneum. Group II: Standard pressure (12-14 mm of Hg) pneumoperitoneum. Physical examination & appropriate laboratory investigation was done before surgery. A standard laparoscopic cholecystectomy with four ports was done by experienced surgeons. Pressure was raised to 12-14 mm of Hg in standard pressure group and reduced to 7-8 mm Hg in low pressure group.

III. STASTICAL ANALYSIS

Statistical analysis was carried out by using unpaired t-test . The p-value≤0.05 was considered to be signifcant.

STUDY PERIOD

The study was conducted from March 2019 to December 2020.

INCLUSION CRITERIA

Age 18 to 60 years, cases giving written informed consent.

EXCLUSION CRITERIA

Pregnancy, patient having pre-existing shoulder pain, acute cholecystitis

IV. RESULTS

The study was done at SMS medical college and hospital Jaipur, Rajasthan. The study was conducted on 100 patient underwent laparoscopic cholecystectomy. 50 patients (group A) underwent laparoscopic cholecystectomy at low pressure pneumoperitoneum (7-8 mmHg) and 50 patients (group B) underwent laparoscopic cholecystectomy at standard pressure pneumoperitoneum (12-14 mmHg).

The mean age of low pressure group was 38.28 years with a maximum and minimum age of 20 and 60 years, respectively. The mean age of standard pressure group was 37.96 years with a maximum and minimum age of 19 and 60 years [table1]. In terms of age distribution both the groups were similar (p= 0.586 by unpaired t-test)

Table 1: Age profile of low and standard groups

Group	Mean(years)	Standard Deviation	Maximum	Minimum
Low pressure	38.28	12.27	60	20
Standard pressure	37.96	11.99	60	19

The mean duration of surgery in low pressure group was 26.66 minutes while in standard pressure group the mean duration of surgery was 24.8 minutes with no significant difference between the two groups (p=0.485 by unpaired t-test) [table 2].

Table 2: Mean duration of surgery of low and standard pressure groups

Group	N	Mean Duration of Surgery (minutes)	Standard Deviation
Low pressure	50	26.66	10.03
Standard pressure	50	24.8	7.3086

The mean duration of postoperative hospital stay in low pressure group as 1.42 days while in that of standard pressure group was 1.49 days [table 3].

Table 3: Postoperative hospital stay of low pressure and standard pressure group

Group	Duration of Postoperative Stay (Days)		
	N	Mean	Standard Deviation
Low pressurecount %within group	50	1.42	0.81
Standard pressure count %within group	50	1.49	0.56

The difference in serum bilirubin levels in both the groups, postoperatively, was non-signifcant (p>0.05). Liver enzymes (AST and ALT) decreased in group A post-operatively but increased in group B post-operatively and this difference was found to be highly statistically signifcant (p<0.05). Post-operatively, serum levels of ALP decreased in patients of both the groups and this difference was non-signifcant (p>0.05).

Table 4: Liver function test of low and standard pressure groups

Parameters	Group I (Mean±SD)	Group II (Mean±SD)	p-value
S.Bilirubin (mg/dL)			
Preoperative	0.65±0.27	0.69±0.28	0.57
Post-operative	0.52±0.27	0.60±0.29	0.26
AST (U/L)			
Preoperative	25±6.6	26.5±7.5	0.28
Post-operative	24±5.8	35±1.3	0.0001
ALT (U/L)			
Preoperative	28±8.5	27.2±8.7	0.76
Post-operative	26.1±7.9	36±1.5	0.0001
ALP (U/L)			
Preoperative	89±8.72	88±2.5	0.62
Post-operative	88±9.3	87±2.3	0.9

SD- Standard Deviation

V. DISCUSSION

In the past, studies have concluded many physiological changes in patients underlying laparoscopic procedure, due to creation of pneumoperitoneum which can be attributed to the mechanical effect of gas in the peritoneal cavity and due to chemical nature of gas used e.g., carbon dioxide [7,8]. Serum bilirubin level difference in patients undergoing low pressure and standard pressure laparoscopic cholecystectomy was found to be statistically non-signifcant (p-value>0.05). Singal R et al., when studying the effect of pneumoperitoneum concluded that bilirubin level is not altered signifcantly [9]. Post-operatively, it was found that serum levels of AST and ALT both are raised significantly (p=0.0001) in patients undergoing standard pressure laparoscopic cholecystectomy. Thus, it can be concluded that standard pressure used for laparoscopic cholecystectomy has deleterious effects on AST and ALT. Study by Ahmad NZ it was found that AST and ALT levels increased in patients who underwent HPPLC [10]. Serum levels of ALP decreased in patients of both the groups but this difference was non-signifcant (p-value>0.05). Similar results were seen in study by Ahmad NZ et al., where signifcant levels were raised for AST and ALT with the exception of ALP [10].
All laparoscopic procedures is responsible for these altered liver enzymes. Similar results were found in study done by Rana ML et al., [5].

Increased intra-abdominal pressure triggers the neuro-humoural response of rennin-angiotensin-aldosterone system. Vasopressin and norepinephrine play a signifcant role in causing damage to hepatic function and thus elevating liver enzymes post laparoscopic surgery. These factors are responsible for signifcantly higher elevation of liver enzymes in high pressure pneumoperitoneum group [3,4].
In this study, it was noted that operating time was slightly more in low pressure pneumoperitoneum group (but the difference was non-signifcant statistically). Post-op hospital stay is slightly less in low pressure pneumoperitoneum group.

VI. CONCLUSION

This study demonstrates that use of simple expedient of reducing the pressure of the pneumoperitoneum to 7-8 mmHg results in less alteration of liver enzymes.It is also seen that there is no disadvantage of duration of surgery and post-op hospital stay by reducing the pressure of pneumoperitoneum to 7-8mmHg.

On the basis of these results, the widespread use of low pressure pneumoperitoneum for laparoscopic cholecystectomy can be used in uncomplicated gall stone disease.

VII. DECLARATIONS:

FUNDING: None
CONFLICT OF INTEREST: None declared

VIII. LIMITATIONS

There is a limitation of the study. All surgeries performed by different surgeon with different years of experience, so outcomes may differ.

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Lakshman Agarwal, et. al. "Comparison Of Liver Function Test In Low Pressure And Standard Pressure Pneumoperitoneum Laparoscopic Cholecystectomy." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)* 22(5), 2023, pp. 01-04.