ORIGINAL ARTICLE

Comparison of Low Pressure versus high Pressure Laparoscopic Cholecystectomy; A Randomized Controlled Trial

PIR MUNEEB REHMAN[1], FARHAN AHMAD[2], SAAD BIN ANIS[3]

ABSTRACT

Aim: To compare the frequency of doubling in liver enzymes with low pressure (LP) versus high pressure (HP) laparoscopic cholecystectomy (LC).

Methodology: A total number of sixty (60) patients planned for elective cholecystectomy having age 20-70 years, of any gender, having normal ALT, AST levels before cholecystectomy were included in this randomized clinical trial within a duration of six months from Jan-2017 to June-2017. In group LP-LC, low pressure CO_2 (7mmHg) was used to create pneumo-peritoneum. In group HP-LC, high pressure CO_2 (14mmHg) was used to create pneumo-peritoneum. Veress needle was used for creation of pneumo-peritoneum. Liver enzymes such as ALT and AST were measured after 48 hours of cholecystectomy.

Results: Mean age of patients was 43.35±9.75 years in LP-LC group and 42.36 ± 10.58 years in HP-LC group (p-value 0.70). Female population was predominant, 23(76.7%) were male patients in LP-LC group and 24 (80%) in HP-LC group (p-value 0.75). Mean operation time was 89.47±17.14 minutes in HP-LC group and 93.41±19.79 minutes in LP-LC groups (p-value 0.41). In post-operative period, doubling of liver enzymes was found in 2 (6.67%) patients, and in 10(33.3%) patients in HP-LC group (p-value 0.009).

Conclusion: Low pressure laparoscopic cholecystectomy (LP-LC) is more safe as compared to the high pressure laparoscopic cholecystectomy (HP-LC) and is associated with less increase in liver enzymes in post-operative period.

Keywords: Laparoscopic cholecystectomy, Liver enzymes.

INTRODUCTION

Cholecystectomy is a routinely used surgical intervention and in most of cases is done using laparoscopes. More than 90% cholecystectomy procedures in USA are done using laparoscopic assistance[1]. This procedure is now used as a gold standard technique in most of the world. Major benefits of using laparoscopic technique is less post-op pain, smaller surgical scars and early recovery and hence early return to life activities[2,3].

Laparoscopy requires to create pneumo-peritoneum for easy visualization of operative field. For this purpose, CO_2 is used. However, induction of CO_2 may result in changes in splanchnic microcirculation resulting in changes in liver, kidney, pulmonary and cardiac blood flow due to increase in intra-peritoneal pressure and hence peripheral vascular resistance[4-6].

It has been shown that the duration and pressure of CO_2 insufflation are important predictors of hepatic function after laparoscopy. However, many patients having normal liver function before laparoscopy do not show any symptoms of liver dysfunction. During laparoscopy. So to reduce the complications of high pressure pneumo-peritoneum, low pressure pneumo-peritoneum is developed by maintaining pneumo-peritoneum pressure of 7mmHg[7,8].

Rationale of this study is to compare change in liver enzymes in patients undergoing laparoscopic cholecystectomy (LC) using low versus high pressure Pneumoperitoneum. It has been observed through literature that low pressure CO_2 can play same role during surgery for pneumo-peritoneum in laparoscopic cholecystectomy as performed by high pressure CO_2 and help in regaining normal liver enzymes level soon after cholecystectomy. But scarce data available in this regard. There is no local evidence found in literature, moreover application of high pressure CO_2 is still in use. So to get local evidence and applicability of low CO_2 pneumo-peritoneum, we want to conduct this study.

The objective of the study was to compare the frequency of doubling in liver enzymes with low pressure (LP) versus high pressure (HP) laparoscopic cholecystectomy (LC).

METHODOLOGY

A total number of sixty (60) patients planned for elective cholecystectomy having age 20-70 years, of any gender, having normal ALT, AST levels before cholecystectomy were included in this randomized clinical trial within a duration of six months from Jan-2017 to June-2017. Patients with Diabetes mellitus (BSR>186mg/dl), hypertension (BP≥140/90mmHg), asthma, COPD, and renal problems (creatinine>1.2mg/dl), Hepatitis B, C or liver cirrhosis (on medical records) were excluded from analysis. Patients who developed complications like bile duct injury, leakage, obstruction and infection (on clinical examination) or per-operative cholangiography were also excluded. The study was conducted in department of surgery, Jinnah Hospital Lahore.

The demographic information of patients like age, sex, and BMI was obtained. All patients were randomly divided in two equal groups by using lottery method. In group LP-LC, low pressure CO_2 (7mmHg) was used to create pneumo-peritoneum. In group HP-LC, high pressure CO_2 (14mmHg) was used to create pneumo-peritoneum. All patients underwent LC by a single surgical team with

[1]*Consultant Surgeon, Govt. Mian Meer Hospital Lahore.*
[2]*PGR Surgery, Jinnah Hospital Lahore*
[3]*Neurosurgeeon, Agha Khan Hospital Karachi.*
Correspondence to Dr. Pir Muneeb Rehman,
Email ID; dr_pm@outlook.com, Mobile No; 0322-7407500

assistance of researcher. The operations were performed under general anesthesia with the patients in slight reverse Trendelenburg position and 3-trocars technique. Veress needle was used for creation of pneumo-peritoneum. Intra-abdominal pressure was maintained stable at pressure in respective groups. After surgery, patients were shifted in post-surgical wards and followed-up there for 48 hours. After 48 hours, blood sample were sent for assessment of liver enzymes; such as ALT & AST levels. If levels were doubled as compared to baseline levels, then doubling of liver enzymes was labelled.

All the data was entered and analyzed in SPSS v20. Both groups were compared for frequency of doubling of liver enzymes by using chi-square test taking p-value≤0.05 as significant.

RESULTS

Mean age of patients was 43.35± 9.75 years in LP-LC group and 42.36±10.58 years in HP-LC group (p-value 0.70). Female population was predominant, 23(76.7%) were male patients in LP-LC group and 24(80%) in HP-LC group (p-value 0.75). Mean body weight of patients was 62.81±10.35 Kg in LP-LC group and 64.74±10.06 Kg in HP-LC group (p-value =0.47). Baseline liver enzymes such as ALT and AST levels were also similar LP-LC. Mean operation time was 89.47±17.14 minutes in HP-LC group and 93.41±19.79 minutes in LP-LC groups (p-value 0.41) [Table 1]. In post-operative period, doubling of liver enzymes was found in 2(6.67%) patients, and in 10(33.3%) patients in HP-LC group (p-value 0.009) (Table 2)..

Table 1: Baseline variables of study patients.

Variable	LP-LC (n=30)	HP-LC (n=30)	P-value
Age (Y)	43.35±9.75	42.36 ±10.58	0.70
Gender			
Male	7(23.3%)	6 (20%)	0.75
Female	23(76.7%)	24 (80%)	
Body weight (kg)	62.81±10.35	64.74±10.06	0.47
Liver Enzymes			
Baseline ALT Levels	535.04±216.55	523.49±210.96	0.83
Baseline AST Levels	377.85±124.75	431.44±129.42	0.11
Operation time (min)	93.41 ± 19.79	89.47 ± 17.14	0.41

Table 2:Comparison of Doubling of Liver Enzymes.

Doubling of Liver Enzymes	LP-LC (n=30)	HP-LC (n=30)
Yes	2 (6.67%)	10 (33.3%)
No	28 (93.3%)	20 (66.67%)

P value 0.009

DISCUSSION

Pneumo-peritoneum creation using CO_2 results in many physiological changes, and these changes are associated with intra-abdominal pressure for creating pneumo-peritoneum and duration of pressure. Diaphragm is lifted up during creating of pneumo-peritoneum resulting in reduction of lung compliance, this puts pressure on inferior vena cava (IVC) causing blood accumulation in IVC causing reduction in stroke volume. The visceral vascular also shrinks so blood flow to the kidneys, liver and other organs is also reduced[9-11]. Some studies have shown that this results in increase in liver enzymes and some experimental studies have demonstrated reduction in hepatic blood flow in animal experimental models. However, this increase in not constant and these levels return to normal within 2 to 3 days after laparoscopy[12,13].

High pressure laparoscopic cholecystectomy (HP-LC) is preferably used by laparoscopic surgeons to get better visualization of the operative field. Effect of use of low pressure LC (LP-LC) on liver physiology and pathological sequences has not been widely studied[14].

In this present study, we compared to doubling of liver enzymes in patients undergoing LC using HP versus low pressure protocol. We found doubling of liver enzymes in 6.67% in LP-LP and in 33.3% in HP-LC group.

One trial found that with low pressure CO2 pneumo-peritoneum, doubling of ALT was noticed in 4% cases while ALT in 0% cases, however with high pressure CO2 pneumo-peritoneum, doubling of ALT was noticed in 44% cases while ALT in 32% cases ($p<0.05$)[15].

A study by Nitin et al. compared pre-op and post-op liver enzymes taken at 3rd and 7th day of surgery and reported insignificant difference in liver enzymes in LP and HP-LC groups in study patients and these changes in liver enzymes are not linked with direct injury of the liver.[16] Hypothetically higher pressure can cause more reduction in blood flow and so more rise in liver enzymes, so if possible higher pressure should be avoided during LC. Moreover, in present study we found significant difference in doubling of liver enzymes in HP-LC patients as compared to the LP-LC patients.

CONCLUSION

Low pressure laparoscopic cholecystectomy (LP-LC) is more safe as compared to the high pressure laparoscopic cholecystectomy (HP-LC) and is associated with less increase in liver enzymes in post-operative period.

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