

Effect of Carbondioxide Pneumoperitoneum on Liver Enzymes Following Laproscopic Cholecystectomy In Rural Indian Population

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ABSTRACT

Article Info

Volume 9, Issue 6

Page Number : 300-304

Publication Issue

November-December-2022

Article History

Accepted : 15 Nov 2022

Published : 01 Dec 2022

Introduction: Laparoscopic cholecystectomy, a minimal-access procedure for removing the gallbladder, has various benefits, including a significantly shorter hospital stay ,lower cost and a low patient comorbidity

Materials and Methods:- this was a prospective study. The study was conducted on 60 patients of cholecystectomy ,who underwent laparoscopic cholecystectomy under constant intraperitoneal pressure of 15mmhg in GEMS medical hospital, ragolu, Srikakulam, Andhra Pradesh. This study was designed to evaluate the complications of carbon dioxide pneumoperitoneum in laparoscopic cholecystectomy using the liver enzymes

Results:- Total bilirubin pre-operative was 0.72 ± 0.13 mg/dl, increased 24 h after surgery to 1.11 ± 0.30 mg/dl by 138% . Aspartate aminotransferase (AST) pre-operative was 19.523 ± 16 U/l increased 24 h after surgery to 30.12 ± 18.35 U/l by 154 % . Alanine aminotransferase (ALT) was 22.58 ± 5.09 U/l increased 24 h after surgery to 38.62 ± 12.15 U/l by 171%. Alkaline phosphatase pre-operative values were 103.8 ± 23.32 U/ and after 24 h was 147.8 ± 36.54 U/l by 142 %

Conclusion: laparoscopic operations produce a transient rise in serum liver enzymes ,our study too demonstrated bilirubin, AST, ALT, ALP elevated following laparoscopic cholecystectomy . when combined with data from earlier research These changes could be attributable to a decrease in portal venous flow caused by a pneumoperitoneum's high pressures.

Keywords: Laparoscopic Cholecystectomy, GEMS, Carbon Dioxide Pneumoperitoneum

I. INTRODUCTION

The term laparoscopy is originated from Greek language, which literally mean as "to look from the flank side". Other names for laparoscopic surgery

include "minimally invasive surgery," "Band-Aid surgery," and "keyhole surgery." It is referred to as "computer surgery" in lay terms.

laparoscopic cholecystectomy, a minimal-access approach surgery for the removal of the gallbladder, was first performed by Mouret in 1987^{1,2}

Laparoscopic cholecystectomy offers many advantages that include Decreased hospital stay, Minimal pain, Decreased post-operative problems, Less blood loss, Lesser chances of incisional hernia, Less blood loss, Cosmetically better, early recovery to daily life. Because of these distinct advantages, the procedure has gained worldwide popularity and has now become one of the most common operations performed in general surgical practice.

In order to do laparoscopic surgery, gas is insufflated into peritoneal cavity. Carbon dioxide is the preferred gas. It is excreted through the lungs after being absorbed from the peritoneum³. Carbon dioxide has been demonstrated to be absorbed to 32 times more quickly than room air and is 20 times more soluble in serum than oxygen or room air⁴ when compared to open cholecystectomy, pneumoperitoneum is expected to be less voluminous and last less time after laparoscopic cholecystectomy. In the majority of surgical cases, a peritoneum of 12-15 mmHg CO₂ is created⁵⁻⁷.

Despite the fact that laparoscopic cholecystectomy has numerous advantages over laparotomy, new worries about the impact of pneumoperitoneum on the heart and lungs emerged⁸. With the exception of a minor rise in the incidence of cardiac arrhythmias, these modifications are well tolerated even in older and more elderly patients, and no other serious cardiovascular problems appear to be present.⁹

The temporary decrease in hepatic blood flow brought on by a pneumoperitoneum is one of the significant hemodynamic alterations.⁵⁻⁹ It was shown that the duration and pressure of the pneumoperitoneum generated had an impact on the severity of hepatic ischemia. Elevated liver enzymes

are the result of this. Even though transient elevations in liver enzymes are a side effect of laparoscopic cholecystectomy, these changes are self-limited and don't cause any morbidity in patients with normal liver function tests.

OBJECTIVES

1) To measure liver enzymes in patients undergoing laparoscopic procedures.

2) To study incidence of alterations in liver enzymes following laparoscopic cholecystectomy

II. METHODS AND MATERIAL

This was an open-label and prospective study on the Indian population. The study was conducted in 60 patients of cholecystectomy who underwent laparoscopic cholecystectomy under constant intraperitoneal pressure OF 15mmHg in gems hospital, ragolu, Srikakulam. The goal of the study was to assess the side effects of laparoscopic cholecystectomy, particularly the alterations in liver enzymes.

All laparoscopic cholecystectomy patients were invited to participate in the trial, and signed informed consent was obtained from each patient. All patients underwent a standard clinical and laboratory evaluation, The subject satisfying inclusion and exclusion criteria were enrolled in the study

24 hours later, the liver function tests were performed again, and in some cases, the test was repeated to track the status of the liver. Moreover, all patients reported experiencing negative side effects. The length of the patient's stay in the hospital was also documented. The study did not include the patients who experienced intra-abdominal problems.

INCLUSION CRITERIA

- All patients undergoing laparoscopic cholecystectomy at our hospitals.

- The patients who have given written consent to be part of the study group

EXCLUSION CRITERIA

- Any patient with pre-operative abnormality in liver enzymes.
- Suspected chronic liver diseases.
- Common bile duct pathology.
- Conversion to open cholecystectomy (OC).
- Hematological disorders.
- Intraoperative complication - common bile duct injury.

III. RESULTS AND DISCUSSION

RESULTS

We studied 60 patients who underwent laparoscopic cholecystectomy from JANUARY 2021 to JUNE 2022. 37 patients were females and 23 were males. The mean age is 46 years.

We observed a significant increase in total bilirubin , AST , ALT, ALP after performing laparoscopic cholecystectomy as compared to baseline values.

Total bilirubin pre-operative was 0.72 ± 0.13 mg/dl, increased 24 h after surgery to 1.11 ± 0.30 mg/dl by 138% (p=0.001)

Aspartate aminotransferase (AST) pre-operative was 19.523 ± 16 U/l increased 24 h after surgery to 19.523 ± 16 U/l by 154 % (p=0.001)

Alanine aminotransferase (ALT) was 22.58 ± 5.09 U/l increased 24 h after surgery to 38.62 ± 12.15 U/l by 171%. (p=0.001)

Alkaline phosphatase pre-operative values were 103.8 ± 23.32 U/l and after 24 h was 147.8 ± 36.54 U/l by 142 %.(p=0.001)

Paired t-test applied. P value is significant if <0.05

DISCUSSION

Laparoscopic cholecystectomy offers many advantages that include Decreased hospital stay, Minimal pain, Decreased post-operative problems, Less blood loss, Lesser chances of incisional hernia , Less blood loss, Cosmetically better, early recovery to daily life.

Laparoscopic cholecystectomy has taken the role of open cholecystectomy (OC) in the treatment of benign gallbladder illnesses in 25 years and it has established itself as the gold standard for symptomatic cholelithiasis.

Even though laparoscopic cholecystectomy was superior to laparotomy in many ways, there were new worries about how a pneumoperitoneum would affect the cardiovascular and respiratory systems, Except for a minor rise in the incidence of cardiac arrhythmias, these modifications are well tolerated even in older and more weakened patients, and no other severe cardiovascular problems occur.

The temporary decrease in hepatic blood flow brought on by the pneumoperitoneum is one of the significant hemodynamic alterations. It has been demonstrated that the pressure and length of a pneumoperitoneum generated can affect the severity of hepatic ischemia. As a result, the liver enzymes ALT, AST, alkaline phosphatase, GGT, bilirubin, and INR increase. The abnormalities following laparoscopic cholecystectomy are self-limited and not linked with any morbidity in patients with a normal liver function, despite the fact that laparoscopic cholecystectomy is associated with temporary rise of liver enzymes .

In our study of 60 subjects of mean age of 46 years, we observed a significant increase in total bilirubin , AST, ALT and ALP after performing laparoscopic

cholecystectomy as compared to baseline values. The finding of our study is in the line with the reported literature. However, the clinical importance of these enzyme elevations has not been clarified.

Although the exact mechanism for changes in the liver enzyme is not known, following several mechanisms are cited to explain the condition

1. These enzymes may be released into the bloodstream by the gallbladder's traction on the liver, which exerts a "squeeze" pressure.
2. Extended diathermic application to the liver surface and heat transfer to the liver parenchyma
3. When the gallbladder is pulled, the extrahepatic ducts briefly kink, which may lead to an increase in endoluminal pressure and a subsequent rise in enzyme levels.
4. passage of a small stone.
5. accidental amputation of the right hepatic artery branch or any other atypical arterial branch that supplying blood to the liver.
6. A combination of above causes

Majority of hepatic blood flow comes from the portal venous system and normal portal venous pressure ranges from 7 to 10 mmHg, it is believed that transient hepatic ischemia following laparoscopic cholecystectomy is caused by 15 mmHg of pneumoperitoneum generated with CO₂.

In addition, transient liver dysfunction occurs in patients after some general anaesthesia. Another possible mechanism of alterations of serum liver enzymes

Morino et al. investigated the duration of pneumoperitoneum at constant pressure and found that when the duration of operation exceeds 60 min, elevations in AST and ALT levels become more significant.

In our study, all the patients were discharged within 4 days after surgery. no patients experienced any complications, substantial disabilities, or negative outcomes. These indicate that the changes in the liver's enzymes are temporary and will go away on their own.

TABLE 1 :- Mean Age

Parameter	Mean ± SD
Age	46±14.77

TABLE2:- sex distribution

Sex	Frequency
Male	23 (38%)
Female	37(62%)

TABLE3 :- Comparison of pre-operative and post- operative values of liver enzymes

enzyme	Pre-operative	Post operative @24 hrs	Test value	P value
Bilirubin	0.72±0.13 mg/dl	1.11 ± 0.30 mg/dl (138%)	-12.03	0.001
AST	19.523 ± 16 U/l	19.523 ± 16 U/l (154%)	-4.483	0.001
ALT	22.58 ± 5.09 U/l	38.62 ± 12.15U/l (171%)	-13.95	0.001
ALP	103.8 ± 23.32 U/l	147.8 ± 36.54 U/l (142%)	-11.597	0.001

IV. CONCLUSION

Laparoscopic cholecystectomy operations produce a transient rise in serum liver enzymes. . when combined with data from earlier research These changes could be attributable to a decrease in portal venous flow caused by a pneumoperitoneum's high pressures

Since all patients recovered without any sequelae within 4 days, there is no evidence to support the claim that these enzyme abnormalities in otherwise healthy people are indicative of a real hepatic ischemia.

However, before preparing to perform a laparoscopic cholecystectomy on patients with established hepatic insufficiency, surgeons should exercise caution

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Cite this article as :

Dr. Pusuluri Sai Vaibhav Kumar, Dr. Purna Chandra Rao Paritala, Dr. Sairam Peddireddy, Dr. Kanna Chandra Varma, Dr. Ashok Reddy, "Effect of Carbondioxide Pneumoperitoneum on Liver Enzymes Following Laproscopic Cholecystectomy In Rural Indian Population ", *International Journal of Scientific Research in Science and Technology (IJSRST)*, Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 6, pp. 300-304, November-December 2022. Available at doi :

<https://doi.org/10.32628/IJSRST229632>

Journal URL : <https://ijsrst.com/IJSRST229632>