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EVALUATION OF EFFECT OF PNEUMOPERITONEUM ON HEPATIC FUNCTION IN LAPAROSCOPIC SURGERY

General Surgery

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ABSTRACT

Introduction: The purpose of this study was to investigate the effect of pneumoperitoneum in laparoscopic surgery on liver function and the possible mechanisms behind such effect. **Aims:** To evaluate the effect of pneumoperitoneum in laparoscopic surgery on liver enzymes (AST, ALT, Alkaline Phosphatase and serum bilirubin). **Methods:** 100 Patients which came for elective Laparoscopic surgery were consider. The patients were randomly taken and divided in two groups (group A and group B). Low pressure pneumoperitoneum (12 mm Hg) is taken as Group A and in group B, standard pressure pneumoperitoneum (14 mm Hg) was generated during laparoscopic surgery. Postoperative LFT value was assessed at different time after operation. **Conclusion:** From our study we here by conclude that all types of laparoscopic procedures can cause transient elevation of hepatic enzymes for which the major causative factor seemed to be the CO2 pneumoperitoneum. Though this change caused no apparent clinical implications in patients with normal liver function, we suggest that laparoscopic surgery may not be the best choice for patients with poor liver function.

KEYWORDS

Pneumoperitoneum, Liver function tests, Laparoscopy

INTRODUCTION

The practise of general surgery has altered due to minimally invasive procedures. Laparoscopic surgery aims to improve patient comfort by performing routine, traditional surgical procedures using a laparoscope.

Laparoscopic surgery has a number of key benefits, including smaller skin incisions that cause less tissue stress, fewer adhesions, lower patient morbidity, shorter hospital stays, and quicker return to normalcy.[1]

In order to do laparoscopic surgery, gas is inhaled into the peritoneal cavity. Because it doesn't promote combustion, carbon dioxide is the preferred gas.For patients undergoing laparoscopic surgery, several investigations over the past ten years have revealed "unexplained" variations in postoperative liver function tests.[3]

Pneumoperitoneum-induced temporary decrease in hepatic blood flow is one of the significant hemodynamic alterations.[4]It has been demonstrated that the length and pressure of the pneumoperitoneum generated affect the severity of hepatic ischaemia.

In the majority of surgical cases, a pneumoperitoneum between 12 and 14 mm Hg is established. Because the liver is located slightly under the right hemidiaphragm and is susceptible to pressures from above during positive-pressure breathing, the actual total pressure on the liver may be larger than the insufflation pressure.[5]

The liver may sustain some damage only from this mechanical strain. The serum markers referred to as "liver function tests" are effective indications of hepatocyte destruction. Routine laparoscopic surgery results in considerable elevations in aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in individuals who did not have preoperative hepatic dysfunction or intraoperative bile duct damage.[6]

The abnormalities following laparoscopic surgery are self-limited and not linked to any morbidity in patients with normal liver function tests, despite the fact that the technique is linked to a temporary rise of liver enzymes.[7]

The goal of this study is to determine the incidence and clinical importance of unexplained liver enzyme abnormalities after laparoscopic procedures.

AIMS AND OBJECTIVES

AIM:

The purpose of this study was to investigate the effect of pneumoperitoneum in laparoscopic surgery on liver function and the possible mechanisms behind such effect.

OBJECTIVES:

1. To estimate serum AST, ALT, Serum Bilirubin, and Alkaline Phosphatase in patients undergoing laparoscopic surgeries preoperatively and postoperatively on day 1 and 7.
2. To evaluate the effect of pneumoperitoneum in laparoscopic surgery on liver enzymes (AST, ALT, Alkaline Phosphatase and serum bilirubin).
3. To correlate the duration of laparoscopic surgery with elevation of liver enzymes if any.

4) Materials and Methods:

- Type of study: A Hospital based observational study.
- Period of study: March 2021 to September 2022
- Place of study: Department of General Surgery, Mahatma Gandhi Medical College & Hospital, Jaipur
- Institute ethics committee approval will be obtained before start of study
- Written and informed consent will be obtained from all participants before enrollment into the study.
- The data will be entered in Microsoft office excel worksheet. Appropriate statistical tests will be made to find significant association. $P<0.05$ will be considered statistically significant.

Sample Size

All the patients admitted in the department of general surgery, undergoing Laparoscopic Surgery at Mahatma Gandhi Medical College and Hospital, meeting the inclusion and exclusion criteria, from March 2021 to September 2022 will be included in the study.

Plan of Study

- Patients undergoing laparoscopic surgery at Mahatma Gandhi Medical College and Hospital, Jaipur. Necessary laboratory investigations shall be done pre operatively, on post op Day 1 and Day 7.

Inclusion Criteria

All patients undergoing laparoscopic surgery in Department of General Surgery at Mahatma Gandhi hospital.

Age group: 18 to 70 years

Exclusion Criteria

- Any patient with pre-operative abnormality in liver enzymes or Suspected chronic liver diseases.
- Patient with history of ERC (Diagnostic or therapeutic)
- Conversion to open surgery.
- Injury to common bile duct or liver.
- Patients who refused to give consent.

Table 1: Age distribution in the study

Age Group	No. of patients	Percentage (%)
21-30	31	31%
31-40	25	25%
41-50	34	34%
51-60	2	2%
> 60	8	8%
Total	100	100%

Table 2: Types of Laparoscopic Surgery

	No. of patients	Percentage (%)
Appendicectomy	40	40%
Cholecystectomy	32	32%
Laparoscopic Hernia repair	28	28%
Total	100	100%

Table 3: Correlation of CO_2 insufflation time with preoperative level of serum liver enzymes

		Pre Serum Bilirubin (mg/dL)	Pre SGPT (U/L)	Pre SGOT (U/L)	Pre S. Alkaline Phosphatase (U/L)
Co2 insufflation time (min)	Pearson Correlation	.357**	-.136	.329**	.050
	Sig. (2-tailed)	.000	.177	.001	.620
	N	100	100	100	100

RESULT

Of the 100 patients constituting in the study population, most of the 40 patients underwent appendicectomy and 28 patients underwent laparoscopic hernia repair, 32 patients underwent cholecystectomy.

When compared preoperative levels, postoperative day 1 and postoperative day 7, serum bilirubin level significantly increased in postoperative day 1 (p=0.000). This value came down to near preoperative levels by postoperative day 7. The serum bilirubin level increased significantly within 24-48 hrs following laparoscopic surgery and it came down within a week's time When compare to preoperative SGPT levels significantly increased in postoperative day 1 (p=0.001). This value came down to near preoperative levels by postoperative day 7. The SGPT levels increased significantly within 24-48 hrs following laparoscopic surgery and it came down within a week's time.

When compared to preoperative SGOT level significantly increased in postoperative day1 (p =0.000). This value came down to near preoperative levels by postoperative day 7. The SGOT levels increased significantly within 24-48 hrs following laparoscopic surgery and it came down within a week's time.

When compared to preoperative serum alkaline phosphatase level significantly increased in postoperative day 1 (p=0.000). This value came down to near preoperative levels by postoperative day 7. The serum alkaline phosphatase levels increased significantly within 24-48 hrs following laparoscopic surgery and it came down within a week's time.

In our study we have found that there is a significant co-relation between the CO_2 insufflation time and the cases with elevated liver enzymes level.

DISCUSSION

Laparoscopic procedures has rapidly emerged as an established method for treatment of many common surgical diseases. The growing interest in laparoscopy is mostly attributable to cumulative evidence suggesting a reduction in patient morbidity, shortening of hospital stay and early return to normal activity.

During the last decade many studies have disclosed unexplained changes in post-operative liver function in patients undergoing laparoscopic procedures CO_2 pneumoperitoneum might be one of the main reasons for the change of serum liver enzymes, as this is the only main difference laparoscopic surgeries had when compared with open surgeries.

This study is therefore intended to assess the presence of clinical significance of unexplained disturbances in liver enzymes following laparoscopic surgeries. In our study in the 100 patients who constituted the study population, 76 were female patients and 24 were male. All the patients were between 21 and 70 years of age. Majority of these patients are below 41-50 and 21-30 years of age group.

Patients who underwent various types of laparoscopic surgeries were included in the study. In all patients the levels of serum bilirubin, serum AST, serum ALT and serum Alkaline phosphatase was checked preoperatively once and post operatively on day 1 and day 7.

In details, the mean level of serum bilirubin preoperatively was 0.701±0.145 mg/dL. Postoperatively on day 1 and day 7 the levels were 1.072±0.300mg/dL and 0.745±0.173mg/dL respectively. Thus it was found that there was a significant rise (p=0.000) in the serum bilirubin levels in the immediate post-op period which came down to near preoperative values within 1 week postoperatively. There are highly significant difference between various time and serum bilirubin levels.

Similarly, the mean level of SGPT pre-operatively was 20.978±20.79U/L. Postoperatively day 1 and day 7 the levels were 28.920±8.896 U/L and 19.732±5.141 U/L respectively. There was a significant rise (p=0.000) in the SGPT levels in the immediate post-op period when compared to the preoperative values, which came down to near preoperative values with in a week's time.

The mean level of SGOT preoperatively was 22.530±4.770 U/L. Postoperatively day 1 and day 7 the levels were 37.210±11.336 U/L and 25.160±5.633 U/L respectively. Here again there was a significant rise (p=0.000) in the SGOT levels in the immediate postoperative period when compared to the preoperative values. The levels came down to near preoperative values by post-op day 7.

The mean level of serum Alkaline phosphatase pre-operatively was 103.900±21.792 U/L. Post operatively on day 1 and day 7 the mean levels were 144.610±34.171 U/L and 107.920±19.790 U/L respectively. A significant rise (p=0.000) was seen in the postoperative day 1 level of serum Alkaline phosphatase values when compared to the preoperative level. This came down to near preoperative values within a week in the postoperative period.

The transient post operative increases in the serum bilirubin and liver enzyme levels were seen in the study population irrespective of the type of laparoscopic surgery they underwent. It was also noticed that the postoperative day 1 levels doubled the preoperative values in 22% patients in case of serum bilirubin. 36.1% patients had doubling of SGPT levels and 32.3% had doubling of SGOT levels. Serum Alkaline phosphatase levels doubled only in 17.7% of the patients. These increased levels were seen in those patients who had a prolonged period of CO_2 pneumoperitoneum when compared to others.

In all the patients where there was a transient rise in the enzyme levels, the values returned to near-pre-operative concentrations within one week after surgery. None of the patients presented with clinical hepatic dysfunction after the surgery according to follow up observations and feedback from these patients.

From our study we here by conclude that all types of laparoscopic procedures can cause transient elevation of hepatic enzymes for which the major causative factor seemed to be the CO_2 pneumoperitoneum. Though this change caused no apparent clinical implications in patients with normal liver function, we suggest that laparoscopic surgery may not be the best choice for patients with poor liver function.

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