European Journal of Molecular & Clinical Medicine (EJMCM)
ISSN: 2515-8260 Volume 09, Issue 01, 2022

Original research article

Study of Changes in Hepatic Enzymes After Laproscopic Surgery

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Abstract

Background: The modern era has witnessed a vast change in the field of medicine. With the advances in science and technology and better access to a variety of services, The purpose of this study was to investigate the effect of laparoscopic surgeries on liver function in humans and the possible mechanisms behind such effect.

Methods: The department of General Surgery at DMCH, Laheriasarai, Darbhanga. Blood samples were collected from 60 patients undergoing various types oflaparoscopic procedures preoperatively once and post operatively on day 1 and day 7. They were tested for liver function by comparing the level of serum bilirubin, serum alanine amino transferase (ALT), serum aspartate aminotransferase (AST) and serum alkaline phosphatase. The time of CO insufflation was also measured.

Conclusion: Transient elevation of hepatic enzymes occurs after laparoscopicsurgery. CO pneumoperitoneum.is the major causative factor.

Keywords: Laparoscopic surgery, Liver enzyme, Pneumoperitoneum.

Introduction

The purpose of this study was to investigate the effect of laparoscopic surgeries on liver function in humans and the possible mechanisms behind such effect. The modern era has witnessed a vast change in the field of medicine. With the advances in science and technology and better access to a variety of services available in various fields, the concept of surgery has changed from bigger incision - better surgeon toexactly the opposite in the field of laparoscopic surgery, better results with least damage both in terms of life, tissue and cosmesis.

Some of the diseases which were not tackled due to fear of damage to surroundingstructures during access are presently been treated easily with laparoscopic surgery. Laparoscopy has had a profound influence on management of patients like in cases with impalpable testes, gallbladder disease, and Hirschsprung's disease[1]. Everything comes with advantages and disadvantages. With the interest to achieve maximum result with thebest cosmesis, advances like laparoscopy, NOTES are all becoming popular and being widely accepted and practiced. But unfortunately very little emphasis is being given on the adverse effects of laparoscopy on the patient's body. Liver function abnormalities are one of the known effects of laparoscopic surgery. The level of certain serum liver enzymes rise markedly in most patients who have a normal LFT pre-operative. Little has been studied of this abnormality, hence we decided to undertake a study to compare the changes in serum liver enzymes pre-operative and post operation.

Objectives

To evaluate the effects of laparoscopic surgery on liver enzymes Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), Alkaline Phosphatase(ALP) and serum bilirubin.
To correlate the duration of laparoscopic surgery with elevation of liver enzymes

Review of Literature

There is general consensus amongst medical historians that the first credibly recorded instances of endoscopy can be credited to the Arabian physician Albukasim[4.] The idea of minimally invasive surgery traces its roots back to the 19th century, although the data of the use of tube instruments and specular reflection in medicine comes from anearlier epoch of the ancient Mesopotamia civilization and antique Greece. The modern methods of endoscopy rise in 1805 with Phillip Bozzini[5] and an obstetrician from Frankfurt. He began using a mirror, illuminated by a wax candle, to examine the urethra up to the urinary bladder in order to visualize stones and for vagina inspection. In 1897 the Berlin urologist Nitze[6] together with the optician Rayne and a Viennese master contrived the first cystoscope The first documented evidence of laparoscopic surgery dates back to the year 1902 when George Kelling[8] of Dresden first performed laparoscopic procedure on dogs. Hans Christian Jacobaeus using a cystoscope performed the first successful laparoscopy and thoracoscopy on a human, and imported the term of laparoscopy into practice in the year 1910.

In 1947, Raoul Palmer suggested the principle of control of abdominal pressure at insufflations. He used CO_2 for insufflation and understood the importance of intra- abdominal pressure. He advocated close control over intra-abdominal pressure and advised not to exceed 25 mm Hg. Palmer also felt that the speed of insufflation should be limited to not more than 400-500 cc per minute. The source of the modern laparoscopic service is considered to be the German school from the city of Kill by the gynaecologist and engineer, Professor Kurt Semm under whose supervision the modern laparoscopic armaments prototypes and automatic insufflator began to be put into practice. Patrick Steptoe, an Englishmen in the 1980's began performing sterile laparoscopic procedures in the operating theatre. The first solid state camera was introduced in 1982 with which began the era of video-laparoscopy.

In 1983, Semm and his scientific group first described the methods of laparoscopic appendectomy. In 1985, the surgeon Mühe from Boeblingen first introduced the operation of laparoscopic cholecystectomy by using carbonic gas for insufflation, and a modified proctoscope for visualization. The revolution in endoscopic technology took place in 1986 when a group of Japanese engineers constructed a matrix which allowed transferring video signals to the monitors. The appliance of laparoscopy at examining young women on suspicion of acuteappendicitis decreased the frequency of unchanged appendix extraction to 50%. In 1986, Warshow used laparoscopy to identify the stages of cancer of pancreas. The preciseness of the diagnosis reached 93%. Dr. F.P. Antia, then Physician at the KEM Hospital, Mumbai performed a diagnostic laparoscopy on a patient with cirrhosis using a Nitze-type telescope and a feeble filament light bulb and atmospheric air instilled with the help of a sigmoidoscope pump for induction of pneumoperitoneum. The term laparoscopy comes from the Greek word which when translated literallymeans to see from the flank side. Laparoscopic surgery is also known as the minimally invasive surgery, band-ait surgery or keyhole surgery. In the lay mans language, it is known as the computer surgery.

It is more difficult to the control of bleeding endoscopically as the bleeding pointsretract within the surrounding tissues. Apart from the risk of hypovolaemia, bleeding obscures the field of vision due largely to the light absorption of the extravasated blood. Laparoscopic procedures

require more technical knowledge and are slower to perform. Tan M, Xu FF, et.al in their study concluded that transient elevation of hepatic transaminases occurred after laparoscopic surgery. The major causative factor seemed to be the CO2 pneumoperitoneum, if preoperative liver function was very poor, laparoscopic surgery may not be the best choice for the treatment of patients with certain abdominal diseases. Similarly in their study Morino M, Giraudo G, et.al concluded that the duration and level of intraabdominal pressure are responsible for changes of hepatic function during laparoscopic procedures. A study by Tareq et al showed changes in liver function parameters are more common in female patients and are not related to age.

Material and methods

This is prospective study was conducted to evaluate the effect of laparoscopic procedures on liver function. The patients included in the study were selected by purposive sampling method from those who underwent laparoscopic surgery in Darbhanga medical college and Hospital Laheriasarai, Darbhanga, Bihar. Study duration of two years. All the patients studied were selected for laparoscopic procedures after theyunderwent routine history taking, physical examination and investigations to exclude pre-existing liver diseases or generalized debility. Those selected had normal values of serumliver enzymes prior to the operations.

Serum bilirubin was measured by Identikit using calorimetry. AST and ALT weremeasured by Raichem spectrophotometer capable of accurate measurement at 340nm. Serum alkaline phosphatase was measured by Raichem Sphectrophotometer or calorimeter capable of accurately measuring absorbance changes at 405 nm. During the surgery, the intraabdominal pressure (IAP) was maintained at a range of 12-14 mmHg. The CO insufflation time was recorded in each procedure. All patients had a urinary catheter introduced before the surgery. Perioperative antibiotics wereadministered in all patients.

Results

Out of the 60 patients in the study population, 29 patients (48.3%) had undergone cholecystectomy and 15 patients (25%) underwent appendicectomy. 6 patients (10%) had undergone hernioplasty (TAPP). 2 patients (3.3%) had undergone Laparoscopic Assisted Vaginal Hysterectomy, ovarian cystectomy and Salpingectomy each.

The serum bilirubin level increased significantly within 24-48 hrs following laproscopic surgery and it came down within a week's time.

Parameter: S. ALP (U/L)

Table 1:

(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	hange(%)	p	
Pre	Day1	-42.233	4.263	-40.68	.000	HS
Day7		-4.200	1.291	-4.05	.006	HS
Day1	Day7	38.033	4.245	26.04	.000	HS

When compared to pre-op levels S. Alkaline phosphatase values increasedminimally in post-op day 1. This value came down to near pre-op levels by post-op day 7.

Table 2: Parameter: SGPT (U/L)

(I) factor1	(J) factor1	Mean Difference (I-J)	Std. Error	hange(%)	p	
Pre	Day1	-12.563	.985	-71.91	.000	HS
Day7		-2.500	.360	-14.31	.000	HS
Day1	Day7	10.063	.982	33.51	.000	HS

When compare to pre-op levels SGPT values increased significantly in post-opday 1 (P =0.001). This value came down to near pre-op levels by post-op day 7.

Table 3: Parameter: SGOT (U/L)

	N	Minimum	Maximum	Mean	Std. Deviation	ANOVA F	p value
Pre	60	13.0	42.0	22.567	5.0969	157.497	.000
Day 1	60	22.0	86.0	38.633	12.1724		HS
Day 7	60	13.0	50.0	25.350	6.1031		

When compared to pre-op levels SGOT values increased significantly in post-opday1 (P =0.001). This value came down to near pre-op levels by post-op day 7.
When compared to pre-op levels S. Alkaline phosphatase values increasedminimally in post-op day 1. This value came down to near pre-op levels by post-op day 7.

Table 3:

	Serum Bilirubin	**SGPT**	**SGOT**	**Serum ALP**
CO2 insufflation time (min) Pearson Correlation	0.389	-0.061	0.331	0.075
Sig. (2-tailed)	0.00020HS	0.644	0.01 HS	0.571
N	60	60	60	60

we have found that there is a significant correlation between theCO2 insufflation time and the cases with elevated liver enzymes level.

Discussion

The progress in laparoscopic procedures has largely been due to the technological advances in endoscopic optics, video cameras and endoscopic instrumentation. The advantages of small incisions, reduced postoperative pain and discomfort, shorter hospitalstay, early ambulation and return to work have increased the popularity of laparoscopic procedures. the intraoperative requirements of laparoscopic surgery produce significant physiological changes, some of which are unique to these procedures. Several studies have disclosed unexplained changes in post-operative liver function in patients undergoing laparoscopic procedures.CO pneumoperitoneum might be one of the main reasons for this change of serum liver enzymes, as this is the one of the main differences laparoscopic surgeries had when compared with open surgeries. In the 60 patients who constituted our study population, 32 were male patients and 28 were females. All patients were between 15 and 75 years of age. Majority of the patients were below 50 years (i.e. 53 patients) Patients who underwent various types of laparoscopic surgeries were included in the study. 15 patients (25%) underwent laparoscopic appendicectomy. Laparoscopic cholecystectomy was done in 29 patients (48.3%), mostly for calculous cholecystitis. vaginal hysterectomy (LAVH) was done in 2 patients (3.3%) along

with salpingoopherectomy. Ovarian cysterectomy was done in 2 patients (3.3%). Laparoscopic Splenectomy was done in 1 patient (1.7%) with symptomatic splenomegaly and multiple parenchymal cysts. In all patients, the levels of serum bilirubin, serum AST, serum ALT and serum Alkaline phosphatase were checked preoperatively once and post operatively on day 1 and day 7.

The mean level of S.bilirubin preoperatively was 0.79 ± 0.69mg/dL. Postoperatively on day 1 and day 7 the levels were 1.10 ± 0.32mg/dL and 0.75 ± 0.18mg/dL respectively. The elevation and depression of intra abdominal pressure in a short time during the laparoscopic surgery might also be causative as the sudden alteration of intra abdominal pressure could cause the undulation of portal blood flow. , transient liver dysfunction was also found to occur in patients after some general anaesthesia which is associated with anaesthesia induced changes in splanchnic blood flow and oxygen consumption. The "squeeze pressure" effect on the liver can be a mechanism for alterations of serum liver enzymes after laparoscopic cholecystectomy . The traction of the gall bladder may free the liver enzymes into the blood stream. But it is not significant here since in our study similar changes are seen in other surgeries like laparoscopic appendicectomies and laparoscopic hernia repair too, where liver was not handled at all. We conclude by our study that if the patients pre-operative liver function was very poor, laparoscopic surgery might not be the optimal choice. An alternative could be gasless laparoscopy which may help avoid hepatic dysfunction.An increase of 5mmHg from 10mmHg to 15mmHg, of the intraabdominal pressure resulted in a blood flow decrease by 39% to liver and by 60% to peritoneum. Meanwhile it was also found that, splanchnic blood flow decreased along with operative time, in spite of a constant intra-arterial pressure.

Conclusion

All types of laparoscopic procedures can cause transient elevation of hepatic enzymes and serum bilirubin for which the major causative factor seems to be CO2 pneumoperitoneum. This study compared the preoperative and postoperative changes in AST and ALTbetween open (OC) and laparoscopic cholecystectomy (LC) as well as open (OCR) and laparoscopic colorectal cancer resection (LCR) in 286 patients. It revealed that a significant rise in AST and ALT was seen 48hrs postop both LC and LRC whereas both open surgeries had near normal values and this was attributed to CO2 pneumoperitoneum. laparoscopic procedures cancause transient elevation of hepatic enzymes for which CO pneumoperitoneum remains the major causative factor. No apparent clinical changes were seen in the patients undergoing laparoscopic surgery having these transient changes. Hence, as its benefits overcome its limitations, Laparoscopic surgery is soon emerging to be the choice for common surgical conditions in all patients except those with pre-existing liver dysfunction.

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Received :18-11-2021. Revised:28-11-2021. Accepted:04-01-2022