Med. J. Cairo Univ., Vol. 90, No. 2, March: 547-556, 2022
www.medicaljournalofcairouniversity.net

Effect of Different Levels of Intraperitoneal Pneumoperitoneum on Liver Enzymes during Laparoscopic Cholecystectomy

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Abstract

Background: Laparoscopic cholecystectomy at standard-pressure pneumoperitoneum uses a pressure of 12-14mm Hg, which may cause a variety of adverse physiological changes reflected as subclinical abnormalities in biochemical parameters. The use of low-pressure pneumoperitoneum in the range of 8-10mm Hg has been shown to reduce the adverse physiological changes without affecting the outcome of surgery.

Aim of Study: To study the effect of different levels of carbon dioxide pneumoperitoneum and duration of surgery on liver enzymes during laparoscopic cholecystectomy.

Subjects and Methods: This study was done in a randomized controlled manner. Patients with gallstone disease (n=51) underwent laparoscopic cholecystectomy. Patients were randomly assigned to high-pressure laparoscopic cholecystectomy (HPLC) (n=26) and low-pressure laparoscopic cholecystectomy (LPLC) (n=25). Liver enzymes, including alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were obtained preoperatively and on postoperative Days 1 and 7.

Results: The two study groups had similar demographic profiles, and there were no significant differences in the operative time (HPLC, 45.654±4.088 minutes; LPLC, 47.32 ±2.81 minutes; *p*=0.096) and pneumoperitoneum time (HPLC, 33.923±3.212 minutes; LPLC, 32.440±3.874 minutes; *p*= 0.142). On postoperative Day 1, AST levels were 42.46 ± 13.27IU/L and 35±7.08 for HPLC and LPLC (*p*=0.016), respectively and ALT levels were 45.88±11.12IU/L and 38.48±9.908IU/L (*p*=0.016), respectively. Thus, liver enzyme activities were significantly elevated in the HPLC group compared with the LPLC group.

Conclusions: LPLC causes less abnormality in enzymes in the postoperative period compared with HPLC. The disturbances after the procedure are self-limited and not associated with any morbidity in patients with normal liver function tests.

Key Words: *Pneumoperitoneum – Liver – Enzymes – Laparoscopic – Cholecystectomy.*

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Introduction

LAPAROSCOPIC cholecystectomy (LC) is a minimally invasive surgical procedure considered the gold standard and first choice in the treatment of symptomatic gallstones [1]. The numerous advantages of LC well known: Shorter hospital stay and convalescence [2], limited postoperative pain, quicker recovery, a reduction in complications and lost working days [3]. Laparoscopic cholecystectomy remains an extremely safe procedure, with a mortality of 0.22-0.4% [4]. Major morbidity occurs in approximately 5% of patients [5]. Transient elevation of hepatic transaminases occurred after laparoscopic surgery. The major causative factor seemed to be the CO_2 pneumoperitoneum. In most of the laparoscopic surgery patients, the transient elevation of serum liver enzymes showed no apparent clinical implications and the effect is transient and reverted back to normal. However, if preoperative liver function was very poor, laparoscopic surgery may not be the best choice for the treatment of patients with certain abdominal diseases [6]. One of the important hemodynamic changes that occur by carbon dioxide pneumoperitoneum is the transient reduction in hepatic blood flow [7]. The pressure of the created pneumoperitoneum and its duration was shown to influence the degree of hepatic ischemia. This results in elevations in liver enzymes alanine aminotransferase (ALT) and aspartate aminotransferase (AST), Although laparoscopic cholecystectomy is associated with transient elevation of liver enzymes, the disturbances after the procedure are self-limited and not associated with any morbidity in patients with normal liver function tests [8]. Possible causes are increased and prolonged intraperitoneal pressure, squeezing the liver by cranial retraction of gallbladder during LC, cauterization of the liver bed for hemostasis, manipulation of external bile ducts and effects of general anesthesia these are possible causes of elevation of liver enzymes during laparoscopic cholecystectomy [9].

Subjects and Methods

This is a prospective study that discussed the effect of different levels of carbon dioxide pneumoperitoneum and duration of surgery on liver enzymes during laparoscopic cholecystectomy in General Surgery Department, faculty of medicine, Menoufia University and general surgery department, Banha Teaching Hospital during the period from September 2020 till September 2021. The study included 51 patient suffering from calcular cholecystitis, Patients were randomly divided into two groups: One with standard pressure, where pressure during laparoscopic cholecystectomy (LC) was 12-14mm Hg (HPLC), and another with low pressure, where pressure during LC was 8-10mmHg (LPLC). The duration of CO_2 pneumoperitoneum varying with each case. The main indication for surgery is a calcular cholecystitis. All cholecystectomy procedures were performed by experienced surgeons. Patients were arranged in two groups. Group A (n=26) was assigned to high pressure laparoscopic cholecystectomy (HPLC) and Group B (n=25) was assigned to low pressure laparoscopic cholecystectomy (LPLC). Blood samples were taken from all the patients before the operation as a part of routine preoperative investigations, on the first postoperative day POD 1 (24 hours after surgery) before discharge from the hospital and on 7th day with follow-up at outpatient clinic to investigate the alternations in serum levels of alanine aminotransferase (ALT), aspartate aminotransferase (AST).

Inclusion criteria:

Patient with symptomatic cholelithiasis. Patient with normal preoperative liver function tests (LFTs).

Patient fit for laparoscopy.

Exclusion criteria:

According to the patient assessment the following patients were excluded from the study: Patients refusing laparoscopy. Patients unfit for laparoscopy. Patients with abnormal preoperative liver function tests (LFTs), patient with a history of jaundice with common bile duct stones, biliary pancreatitis and liver neoplasm. Patients with liver cirrhosis or hepatitis. Patient with major comorbid disease e.g., Diabetes mellitus, neoplastic diseases, chronic renal failure.

Operative:

After doing routine preoperative work up, using a standard protocol, all patients were given one shot of antimicrobial prophylaxis in the form of 3rd generation cephalosporines (1gm cefotaxime IV) just before surgery. Operative time was reported from start of skin incision till closure of the wound. Standard anesthetic technique was used. All patients were operated on by either of two experienced laparoscopic surgeons. Patients were operated by the standard American technique of four-port LC. The abdomen was insufflated using CO_2, and patients were kept in the reverse Trendelenburg position. Monopolar electrocautery was used in both groups to dissect the gallbladder from the liver bed. The operating surgeon had the full liberty to increase the intra-abdominal pressure from low pressure (8mm Hg) to high pressure (14mm Hg) if he thought that the operative field was not adequate. He also had the liberty to convert LC to open cholecystectomy in the case of difficult gallbladder dissection risking the completion of the laparoscopic procedure or excess bleeding that could not be controlled by laparoscopic techniques. Conversion of LPLC to HPLC was considered as a failure of LPLC, and conversion of LC to open cholecystectomy was considered as a failure of HPLC or LPLC.

Results

This is a randomized comparative study, took place in General Surgery Department, Faculty of Medicine, Menoufia University and general surgery department, Banha Teaching hospital during the period from September 2020 till September 2021.

This study included 51 patients in two groups. Group A (n=26) was assigned to high pressure laparoscopic cholecystectomy (HPLC) and Group B (n=25) was assigned to low pressure laparoscopic cholecystectomy (LPLC).

No postoperative morbidity or mortality occurred in any of the patients studied. All patients were hemodynamically stable during the operations and the postoperative period. None of them needed other medication than the planned anesthetic protocol.

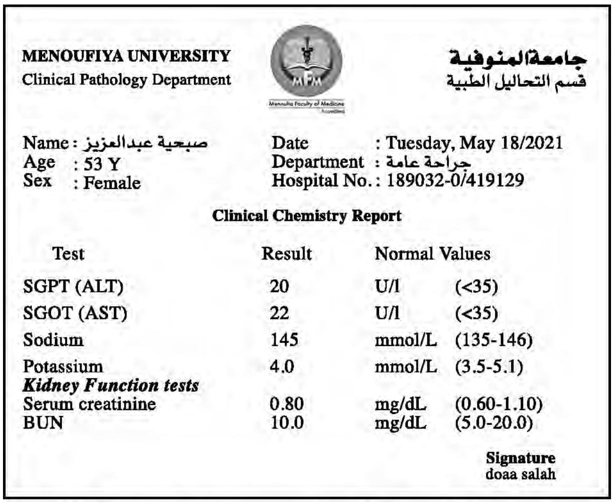
The Male: Female ratio in the study is 1: 2.64, with mean age 44.269 years in HPLC group and 48.52 years in the LPLC group.

Number of patients with BMI <30 in HPLC group were 20 patients 3 male patients and 17 female patient where as in LPLC group were 6 patients 4 male patients and 2 female patients. Number of patients with BMI >30 in HPLC group were 18 patients 4 male patients and 14 female patient where as in LPLC group were 7 patients 3 male patients and 4 female patients.

The operating time range for all the procedures had been recorded and it was between 41-54 minutes for HPLC group and between 42-56 minutes in LPLC group.

The Duration of pneumoperitoneum range for all the procedures had been recorded and it was between 29-39 minutes for HPLC group and between 28-40 minutes in LPLC group.

There is statistically non-significant difference in AST between the studied groups pre or 1 week postoperatively.


MENOUFIYA UNIVERSITY
Clinical Pathology Department
جامعةالمنوفية
قسم التحاليل الطبية

Name : صبحية عبدالعزيز
Age : 53 Y
Sex : Female
Date : Tuesday, May 18/2021
Department : جراحة عامة
Hospital No. : 189032-0/419129

Clinical Chemistry Report

Test	Result	Normal Values	
SGPT (ALT)	20	U/l	(<35)
SGOT (AST)	22	U/l	(<35)
Sodium	145	mmol/L	(135-146)
Potassium	4.0	mmol/L	(3.5-5.1)
Kidney Function tests			
Serum creatinine	0.80	mg/dL	(0.60-1.10)
BUN	10.0	mg/dL	(5.0-20.0)

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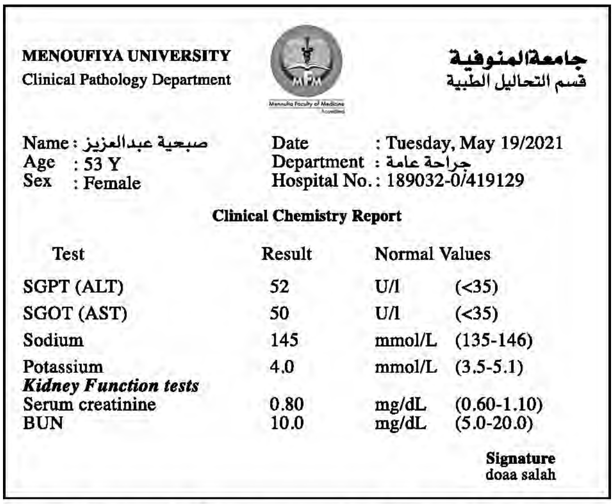
Fig. (1): Patient 1, preoperative AST and ALT in female patient, 53yrs old, HPLC group.


MENOUFIYA UNIVERSITY
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Name : صبحية عبدالعزيز
Age : 53 Y
Sex : Female
Date : Tuesday, May 19/2021
Department : جراحة عامة
Hospital No. : 189032-0/419129

Clinical Chemistry Report

Test	Result	Normal Values	
SGPT (ALT)	52	U/l	(<35)
SGOT (AST)	50	U/l	(<35)
Sodium	145	mmol/L	(135-146)
Potassium	4.0	mmol/L	(3.5-5.1)
Kidney Function tests			
Serum creatinine	0.80	mg/dL	(0.60-1.10)
BUN	10.0	mg/dL	(5.0-20.0)

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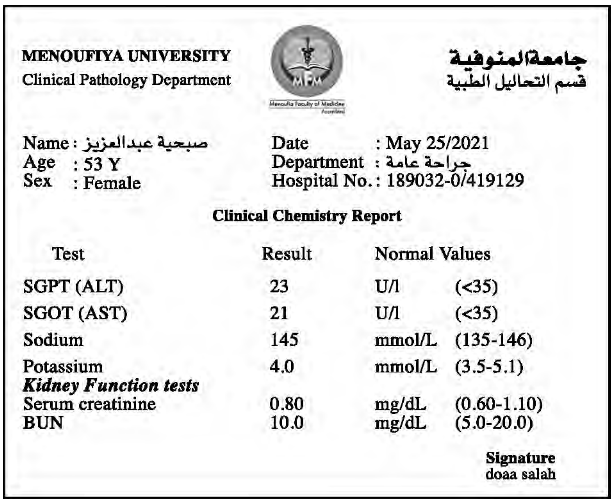
Fig. (2): Patient 1, 1st post-operative AST and ALT in female patient, 53yrs old, HPLC group.


MENOUFIYA UNIVERSITY
Clinical Pathology Department
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قسم التحاليل الطبية

Name : صبحية عبدالعزيز
Age : 53 Y
Sex : Female
Date : May 25/2021
Department : جراحة عامة
Hospital No. : 189032-0/419129

Clinical Chemistry Report

Test	Result	Normal Values	
SGPT (ALT)	23	U/l	(<35)
SGOT (AST)	21	U/l	(<35)
Sodium	145	mmol/L	(135-146)
Potassium	4.0	mmol/L	(3.5-5.1)
Kidney Function tests			
Serum creatinine	0.80	mg/dL	(0.60-1.10)
BUN	10.0	mg/dL	(5.0-20.0)

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Fig. (3): Patient 1, 7th day post-operative AST and ALT in female patient, 53yrs old, HPLC group.

There is statistically significant difference in AST between the studied groups 1 day postoperatively (significantly higher in HPLC group). In each individual group, there is significant change in AST over time. Twenty-four hours after the procedure, ALT increased significantly in the HPLC group (ALT HPLC 24H: 45.88±11.12U/L, p0.016) whereas in the LPLC group (ALT LPLC 24H: 38.48±9.908U/L, p<0.001). seven days after the procedure, ALT values had returned to normal values in both HPLC and LPLC groups.

There is statistically non-significant difference in AST between the studied groups pre or 1 week postoperatively. There is statistically significant difference in AST between the studied groups 1 day postoperatively (significantly higher in HPLC group). In each individual group, there is significant change in AST over time. Twenty-four hours after the procedure, AST increased significantly in the HPLC group (AST HPLC24H: 42.46±13.27U/L, p0.016) whereas in the LPLC group (AST LPLC 24H: 35±7.08U/L, p<0.001). Seven days after the procedure, ALT values had returned to normal values in both HPLC and LPLC groups.

Surgical complications, which were mostly intraoperative complications, such as bile spillage, gallbladder perforation, etc. more in LPLC group. There were no significant differences in terms of intraoperative complications between te 2 groups. There were 3 conversions from the low-pressure to high pressure to get good visualization. Operative time was significantly longer in the low-pressure group compared with the high-pressure group. Low-pressure pneumoperitoneum was associated with a significantly reduced length of hospital stay compared with high-pressure pneumoperitoneum.

patients showed that the low-pressure group had lower analgesic requirements than the high-pressure group.

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Clinical Pathology Department قسم التحاليل الطبية

Name : abd elaziz mahmoud — Date : Tuesday, May 18/2021
Age : 53 Y — Department : جراحة عامة
Sex : male — Hospital No. : 189021-0/419129

Clinical Chemistry Report

Test	Result	Normal Values	
SGPT (ALT)	26	U/l	(<35)
SGOT (AST)	24	U/l	(<35)
Sodium	145	mmol/L	(135-146)
Potassium	4.0	mmol/L	(3.5-5.1)
Kidney Function tests			
Serum creatinine	0.80	mg/dL	(0.60-1.10)
BUN	10.0	mg/dL	(5.0-20.0)

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Fig. (4): Patient 2, pre-operative AST and ALT in male patient, 53yrs old, HPLC group.

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Clinical Pathology Department قسم التحاليل الطبية

Name : abd elaziz mahmoud — Date : 19 May 2021
Age : 53 Y — Department : جراحة عامة
Sex : male — Hospital No. : 189021-0/419129

Clinical Chemistry Report

Test	Result	Normal Values	
SGPT (ALT)	50	U/l	(<35)
SGOT (AST)	53	U/l	(<35)
Sodium	145	mmol/L	(135-146)
Potassium	4.0	mmol/L	(3.5-5.1)
Kidney Function tests			
Serum creatinine	0.80	mg/dL	(0.60-1.10)
BUN	10.0	mg/dL	(5.0-20.0)

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Fig. (5): Patient 2, 1st day post-operative AST and ALT in male patient, 53yrs old, HPLC group.

MENOUFIYA UNIVERSITY جامعة المنوفية
Clinical Pathology Department قسم التحاليل الطبية

Name : abd elaziz mahmoud — Date : May 25/2021
Age : 53 Y — Department : جراحة عامة
Sex : male — Hospital No. : 189021-0/419129

Clinical Chemistry Report

Test	Result	Normal Values	
SGPT (ALT)	23	U/l	(<35)
SGOT (AST)	21	U/l	(<35)
Sodium	145	mmol/L	(135-146)
Potassium	4.0	mmol/L	(3.5-5.1)
Kidney Function tests			
Serum creatinine	0.80	mg/dL	(0.60-1.10)
BUN	10.0	mg/dL	(5.0-20.0)

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Fig. (6): Patient 2, 7th day, post-operative AST and ALT in male patient, 53yrs old, HPLC group.

MENOUFIYA UNIVERSITY جامعة المنوفية
Clinical Pathology Department قسم التحاليل الطبية

Name : mohamed tarek — Date : 22 May 2021
Age : 25 Y — Department : جراحة عامة
Sex : male — Hospital No. : 189080-0/419129

Clinical Chemistry Report

Test	Result	Normal Values
SGPT (ALT)	26	U/l (<35)
SGOT (AST)	23	U/l (<35)

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Fig. (7): Patient 3, pre-operative AST and ALT in male patient, 25yrs old, LPLC group.

MENOUFIYA UNIVERSITY جامعة المنوفية
Clinical Pathology Department قسم التحاليل الطبية

Name : mohamed tarek — Date : 23 May 2021
Age : 25 Y — Department : جراحة عامة
Sex : male — Hospital No. : 189080-0/419129

Clinical Chemistry Report

Test	Result	Normal Values
SGPT (ALT)	39	U/l (<35)
SGOT (AST)	37	U/l (<35)

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Fig. (8): Patient 3, 1st day, post-operative AST and ALT in male patient, 25yrs old, LPLC group.

MENOUFIYA UNIVERSITY جامعة المنوفية
Clinical Pathology Department قسم التحاليل الطبية

Name : mohamed tarek — Date : 29 May 2021
Age : 25 Y — Department : جراحة عامة
Sex : male — Hospital No. : 189080-0/419129

Clinical Chemistry Report

Test	Result	Normal Values
SGPT (ALT)	22	U/l (<35)
SGOT (AST)	20	U/l (<35)

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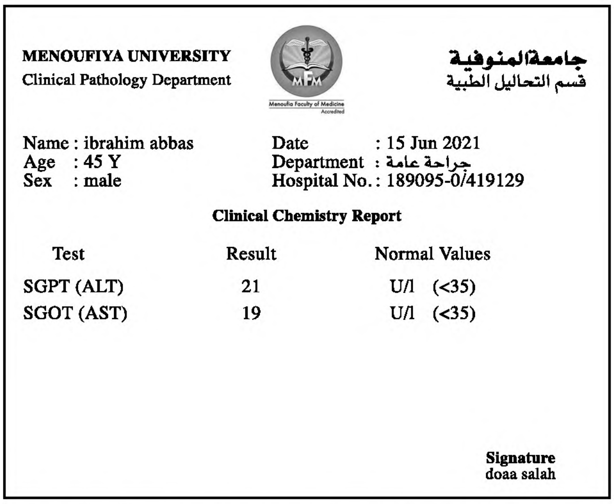
Fig. (9): Patient 3, 7th day, post-operative AST and ALT in male patient, 25yrs old, LPLC group.



MENOUFIYA UNIVERSITY
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جامعة المنوفية
قسم التحاليل الطبية

Name : ibrahim abbas
Age : 45 Y
Sex : male
Date : 15 Jun 2021
Department : جراحة عامة
Hospital No. : 189095-0/419129

Clinical Chemistry Report

Test	Result	Normal Values
SGPT (ALT)	21	U/l (<35)
SGOT (AST)	19	U/l (<35)

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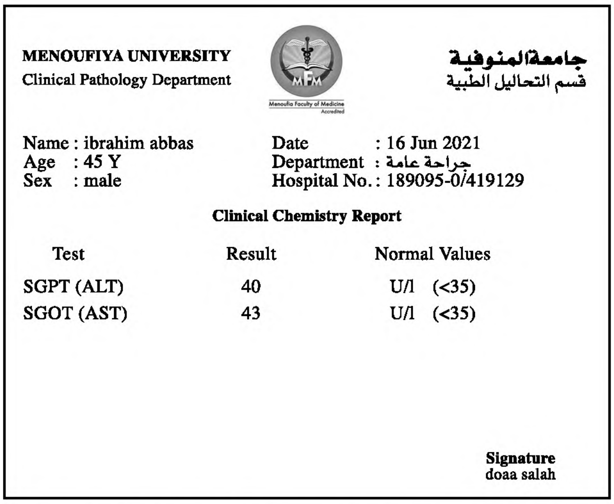
Fig. (10): Patient 4, pre-operative AST and ALT in male patient, 45yrs old, LPLC group.



MENOUFIYA UNIVERSITY
Clinical Pathology Department
جامعة المنوفية
قسم التحاليل الطبية

Name : ibrahim abbas
Age : 45 Y
Sex : male
Date : 16 Jun 2021
Department : جراحة عامة
Hospital No. : 189095-0/419129

Clinical Chemistry Report

Test	Result	Normal Values
SGPT (ALT)	40	U/l (<35)
SGOT (AST)	43	U/l (<35)

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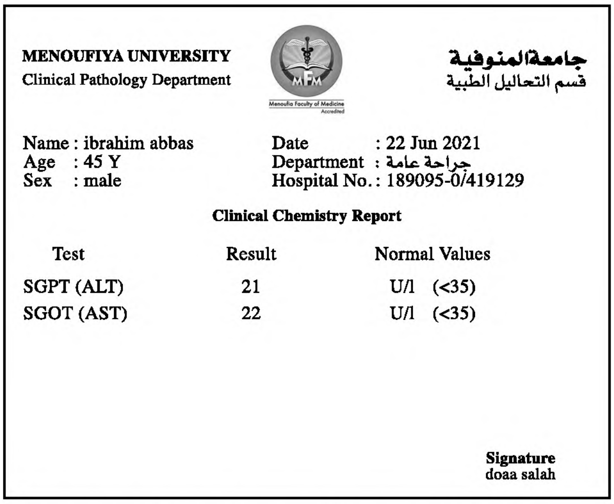
Fig. (11): Patient 4, 1st day, post-operative AST and ALT in male patient, 45yrs old, LPLC group.



MENOUFIYA UNIVERSITY
Clinical Pathology Department
جامعة المنوفية
قسم التحاليل الطبية

Name : ibrahim abbas
Age : 45 Y
Sex : male
Date : 22 Jun 2021
Department : جراحة عامة
Hospital No. : 189095-0/419129

Clinical Chemistry Report

Test	Result	Normal Values
SGPT (ALT)	21	U/l (<35)
SGOT (AST)	22	U/l (<35)

Signature
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Fig. (12): Patient 4, 7th day, post-operative AST and ALT in male patient, 45yrs old, LPLC group.

Table (1): Demographic data.

Parameter	Groups		Test	
	HPLC group N=26 (%)	LPLC group N=25 (%)	χ^2/t	*p*
Gender:				
Female	20 (76.9)	17 (68)	0.51	0.475
Male	6 (23.1)	8 (32)		
Age (year):				
Mean ± SD	44.269±13.141	48.52±15.414	–1.061	0.942
Min - Max	20-68	22-74		

χ^2: Chi square test. *t*: Independent sample *t*-test.

Table (2): Body mass index.

Parameter	Groups		Test	
	BMI >30 group N=38 (%)	BMI <30 group N=13 (%)	χ^2/t	*p*
Gender:				
Female	32 (84.2)	5 (38.4)	0.51	0.475
Male	6 (15.7)	8 (61.5)		
WT (kg)	98	75		
Hight (m)	1.59	1.63	–1.061	0.942
BMI	38.76	28.2		

χ^2: Chi square test. *t*: Independent sample *t*-test.

Table (3): Operative time.

Operative time	Groups		Test	
	HPLC group N=26 (%)	LPLC group N=25 (%)	*t*	*p*
Mean ± SD	45.654±4.088	47.32±2.81	–1.702	0.096
Range	41-54	42-56		

t: Independent sample *t*-test.

Table (4): Pneumoperitoneum time.

Duration of pneumo-peritoneum	Groups		Test	
	HPLC group N=26 (%)	LPLC group N=25 (%)	*t*	*p*
Mean ± SD	33.923±3.212	32.440±3.874	1.491	0.142
Range	29-39	28-40		

t: Independent sample *t*-test.

Table (5): ALT pre and postoperative.

ALT	Groups		Test	
	HPLC group Mean ± SD	LPLC group Mean ± SD	*t*	*p*
Preoperatively	27.154±3.331	25.24±4.024	1.853	0.07
1st day postop.	45.88±11.12	38.48±9.908	2.485	0.016*
7th day postop.	29.53 8±2.929	27.8±4.021	1.77	0.08
p (F)	<0.001 **	<0.001 **		

t: Independent sample *t*-test
F: Repeated measure.. ANOVA test.
***p*≤0.001 is statistically highly significant.

Table (6): AST pre and postoperative.

AST	Groups		Test	
	HPLC group Mean ± SD	LPLC group Mean ± SD	Z	*p*
Preoperatively	26.115±2.984	25.5±3.595	0.601	0.55
1st day postop.	42.46±13.27	35±7.08	2.491	0.016*
7th day postop.	28.115±2.929	26.72±2.894	1.695	0.097
p (F)	<0.001**	<0.001**		

t: Independent sample *t*-test ANOVA test.
F: Repeated measure..

Table (7): Post operative complications.

Parameter	Groups				Test
	HPLC group (26)		LPLC group (25)		*p*
	N	(%)	N	(%)	
Bile spillage	0	(0)	2	(8)	0.001*
Gallbladder perforation	0	(0)	1	(4)	0.005*
Prolonged operative time	0	(0)	3	(12)	0.016*
Conversion to high pressure LC	0	(0)	3	(12)	0.016*
More length of hospital stay	4	(15.3)	0	(0)	0.005*
More analgesic requirements	3	(11.5)	0	(0)	0.016*

t: Independent sample *t*-test ANOVA test.
F: Repeated measure..

Discussion

Laparoscopic cholecystectomy is now considered the "Gold standard" in management of Gall stone disease. More than 90% of cholecystectomy today is done laparoscopically [10]. Despite the many clinical advantages of laparoscopic surgery with the pneumoperitoneum, it might lead to a complex of adverse effects on cardiovascular, respiratory, and renal systems, in addition to the known effects on the liver. Although these changes are of no clinical relevance in healthy patients, they may compound the problem in patients with underlying organ dysfunction [11]. Recently few studies have shown rise in parameters of liver enzymes following LC and have implicating hepatic hypoperfusion and ischemia. It has been noticed that following LC, the serum level of certain liver enzymes rises markedly in patients which were preoperatively normal [12]. Elevation of liver enzymes such as AST and ALT after a non–complicated laparoscopic cholecystectomy once considered as incidental, but now has become a well-known finding. Although the clinical importance of these enzymes elevations has not been clarified, transient hepatic malfunction was suspected in previous studies [11,13,14,15].

The transient postoperative increase in the liver enzymes levels in LC patients might be attributed to number of possible factors. Halevy et al., suggested increased intraperitoneal pressure, squeezing the liver by cranial retraction of gallbladder during LC, cauterization of the liver bed for hemostasis, manipulation of external bile ducts and effects of general anaesthesia as possible causes of elevation of certain liver enzymes [16]. In contrast Blobner et al., demonstrated an increase in splanchnic and portal blood flow due to vasodilatory effect of CO_2 at pressures below 16mmHg [17]. Others have also demonstrated that induction of CO_2 pneumoperitoneum with intrabdominal pressures of 12mmhg was associated with increased hepatic perfusion in healthy individuals [18]. The first factor of consideration was CO_2 pneumoperitoneum. LC patients were subject to CO_2 pneumoperitoneum during the operations and they showed significant changes in serum liver enzymes after operation. In contrast, OC patients were under operative conditions similar to those of LC patients except that they were not subjected to CO_2 pneumoperitoneum and they showed no apparent change in the level of serum liver enzymes. This finding is consistent with other studies that showed similar changes in liver function clearance test after pneumoperitoneum [19]. Preoperative and postoperative levels of AST, ALT have been investigated in various studies to determine the physiological basis of hepatic malfunction [15,20]. However significant elevations after HPLC compared with LPLC have been defined for only AST and ALT levels. Time controlled studies have shown that these enzyme elevations last for about 3 days postoperatively [11,21].

Our study shows a significant transient increase in the postoperative liver enzymes levels that was observed in the HPLC group, compared to the LPLC group. Seven days after the procedure, liver enzymes values had returned to normal in all patients.

The low-pressure technique could be employed in the majority of patients subjected to laparoscopic cholecystectomy. However, in some situations that may affect the operative field, e.g., in obese patients, the pneumoperitoneum pressure should be increased until exposure is adequate [22].

Regarding ALT pre and postoperative at HPLC group:

In this study pre-operative ALT range from 24-30IU, after 24hrs post operative range from 34-56IU and after 7th day range from 26-32.

Accepted with:

- Bellad et al., [23] pre-operative ALT was 23-38IU, after 24hrs post-operative range 36-70 and after 7th day range 28-34.
- Hiremath S, [8] pre-operative ALT was 23-43IU, after 24hrs post-operative range 40-66 and after 7th day range 26-38.
- Tan et al., [21] pre-operative ALT was 12-34IU, after 24hrs post-operative range 23-54 and after 7th day range 12-39.

But statically significant difference with:

- Gupta et al., [24] pre-operative ALT was 22-34IU, after 24hrs post-operative range 37-99 and after 7th day range 25-35.
- Rana M, [25] pre-operative ALT was 24-36IU, after 24hrs post-operative range 73-111 and after 7th day range 24-37.

Regarding ALT pre and postoperative at LPLC group:

In this study pre-operative ALT range from 21-29IU, after 24hrs post operative range from 29-47IU and after 7th day range from 23-31.

Accepted with:

- Bellad et al., [23] pre-operative ALT was 22-35IU, after 24hrs post-operative range 30-50 and after 7th day range 28-34.
- Hiremath S, [8] pre-operative ALT was 23-40IU, after 24hrs post-operative range 30-56 and after 7th day range 26-38.
- Tan et al., [21] pre-operative ALT was 13-33 IU, after 24hrs post-operative range 30-52 and after 7th day range 15-37.

But statically significant difference with:

- Gupta et al., [24] pre-operative ALT was 19-33IU, after 24hrs post-operative range 25-60 and after 7th day range 21-35IU.
- Rana M, [25] pre-operative ALT was 23-33IU, after 24hrs post-operative range 40-62 and after 7th day range 24-34.

Regarding AST pre and postoperative at HPLC group:

In this study pre-operative ALT range from 23-39IU, after 24hrs post operative range from 29-55IU and after 7th day range from 25-31IU.

Accepted with:

- Bellad et al., [23] pre-operative ALT was 16-32IU, after 24hrs post-operative range 31-51IU and after 7th day range 19-34IU.
- Hiremath S, [8] pre-operative ALT was 15-29IU, after 24hrs post-operative range 25-39IU and after 7th day range 16-33IU.
- Tan et al., [21] pre-operative ALT was 18-38IU, after 24hrs post-operative range 23-55 and after 7th day range 13-38.

But statically significant difference with:

- Gupta et al., [24] pre-operative ALT was 22-32IU, after 24hrs post-operative range 40-91IU and after 7th day range 24-34IU.
- Rana M, [25] pre-operative ALT was 24-36IU, after 24hrs post-operative range 60-100IU and after 7th day range 24-37IU.

Regarding AST pre and postoperative at LPLC group:

In this study pre-operative ALT range from 22-28IU, after 24hrs post operative range from 28-42IU and after 7th day range from 24-38IU.

Accepted with:

- Bellad et al., [23] pre-operative ALT was 22-30IU, after 24hrs post-operative range 30-50IU and after 7th day range 24-32IU.
- Hiremath S, [8] pre-operative ALT was 23-38IU, after 24hrs post-operative range 30-48 and after 7th day range 24-35IU.
- Tan et al., [21] pre-operative ALT was 13-33IU, after 24hrs post-operative range 30-52 and after 7th day range 15-37.

But statically significant difference with:

- Gupta et al., [24] pre-operative ALT was 20-34IU, after 24hrs post-operative range 28-64 and after 7th day range 21-35IU.
- Rana M, [25] pre-operative ALT was 23-33IU, after 24hrs post-operative range 36-62IU and after 7th day range 24-34IU.

Regarding intra and post-operative complications in both HPLC & LPLC groups:

In this study bile spillage is about 8% of cases of LPLC group, gallbladder perforation represents about 4% of LPLC group, prolonged operative time in LPLC group than HPLC group represents about 12%, conversion from LPLC to HPLC represents about 12%, hospital stay period increased in HPLC patients 15.3% than LPLC patients, 11.5% of HPLC patient required more analgesic than LPLC patients.

Conclusion:

Transient elevation of ALT and AST occurs after HPLC. CO_2 pneumoperitoneum pressure and duration seems to be the main reason for these changes, but other factors such as surgical manipulation, diathermy, general anaesthesia, and arterial injury may also contribute. These changes return to normal seven days after the procedure and they have no clinical consequences in patients with normal hepatic function.

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تأثير المستويات المختلفة لضغط ومدة ثانى أكسيد الكربون داخل الغشاء البريتونى على انزيمات الكبد أثناء استئصال المرارة باستخدام منظار البطن الجراحى

استئصال المرارة بالمنظار هو إجراء جراحى طفيف التدخل يعتبر المعيار الذهبى والاختيار الأول فى علاج حصوات المرارة.

المزايا العديدة لاستئصال المرارة بالمنظار معروفة جيداً : قصر فترة البقاء فى المستشفى والنقاهة، الألم المحدود بعد الجراحة، التعافى السريع وإنخفاض المضاعفات وفقدان أيام العمل.

لا يزال استئصال المرارة بالمنظار إجراء آمناً للغاية ، حيث يبلغ معدل الوفيات ٠.٢٢-٠.٤٪ وتصل نسبة الاعتلال المرضى إلى حوالى ٥٪ من المرضى.

يحدث ارتفاع مؤ قت للإنزيمات الكبدية بعد الجراحة بالمنظار. يبدوأن العامل الرئيسى المسبب هو نفخ الغشاء البريتونى باستخدام غاز ثانى أكسيد الكربون. فى معظم مرضى الجراحة بالمنظار لم يظهر الارتفاع المؤقت لإنزيمات الكبد أى آثار سريرية واضحة والتأثير مؤقت ويعود إلى طبيعته. ومع ذلك، إذا كانت وظائف الكبد قبل الجراحة منخفضة للغاية، فقد لا تكون الجراحة بالمنظار الخيار الأفضل لعلاج المرضى الذين يعانون من بعض أمراض البطن.

واحدة من التغيرات الديناميكية الدموية الهامة هى انخفاض عابر فى تدفق الدم الكبدى الناجم عن نفخ البطن بثانى أكسيد الكربون. وقد تبين أن ضغط ثانى أكسيد الكربون الذى تم إنشاؤه ومدته يسببان نقص تدفق الدم إلى الكبد وينتج عن ذلك ارتفاع فى إنزيمات الكبد على الرغم من أن استئصال المرارة بالمنظار يرتبط بالارتفاع العابر لإنزيمات الكبد، فإن الاضطرابات بعد الإجراء تكون محدودة ذاتياً ولاتسبب أى اعتلال فى المرضى الذين يعانون من خلل بوظائف الكبد.

الأسباب المحتملة لارتفاع انزيمات الكبد هى زيادة الضغط داخل الغشاء البريتونى وإطالة مدته، الضغط العكسى على الكبد الناتج عن سحب الحويصلة المرارية باستخدام آلات المنظار الجراحى، كيّ قاعدة المرارة بالكبد لوقف النزيف، التلاعب فى القنوات الصفراوية الخارجية وتأثير التخدير العام، وهى أسباب محتملة لارتفاع إنيزيمات الكبد أثناء استئصال المرارة بالمنظار.

هذه دراسة استطلاعية لواحد وخمسون مريضاً على التوالى سيخضعون لاستئصال المرارة بالمنظار الاختيارى سيتم تشخيصهم بالتهاب مرارى حصوى عرضى من العيادات الخارجية للجراحة العامة فى مستشفى جامعة المنوفية ومستشفى بنها التعليمى

اشتملت دراستنا على مريض بالتهاب مرارى حصوى، مريض ذو وظائف كبد طبيعية قبل الجراحة ومريض لائق لاستخدام منظار البطن الجراحى، وتم استبعاد المرضى التاليين من الدراسة : المرضى الذين يرفضون الجراحة باستخدام منظار البطن الجراحى، المرضى الغير لائقين لاستخدام منظار البطن الجراحى، المرضى ذو وظائف كبد غير طبيعية قبل العملية، مريض يعانى من اختلال وظيفى فى الكبد، مريض لديه تاريخ مرضى لارتفاع نسبة الصفراء بالدم مع وجود حصوات بالقناة المرارية المشتركة،التهاب البنكرياس الصفراوى وأورام الكبد، مريض يعانى من تليف بالكبد أو التهاب كبدى، مريض مصاب بمرض اعتلال رئيسى مثل داء السكرى، أمراض الأورام، الفشل الكلوى المزمن.

تم فحص جميع المرضى المشمولين فى الدراسة للتأكد من تاريخهم السريرى بما فى ذلك تقديم الأعراض، مدة الأعراض والجراحة السابقة والمرض المزمن وقام جميع المرضى بإجراء فحص سريرى عام مفصل لتقييم الصحة العامة.

العمل الروتينى قبل الجراحة : فحص دم شامل، اختبارت وظائف الكبد والكلى، التخثر الدموى، وتخطيط القلب وتخطيط صدى القلب عند الحاجة، دلالات الفيروسات (دلالات فيروس التهاب الكبد B و C وفيروس نقص المناعة المكتسبة، وفقاً لبروتوكول المستشفى الجامعى، التحقيقات الإشعاعية (أشعة تليفزيونية على البطن والحوض - أشعة مقطعية على البطن والحوض إذا لزم الأمر).

فى دراستنا خطوات الجراحة كالتالى : بعد القيام بالعمل الروتينى قبل الجراحة، تم إعطاء جميع المرضى جرعة واحدة من الوقاية المضادة للميكروبات (باستخدام بروتو كول قياسى) قبل الجراحة مباشرة. وتم حساب وقت الجراحة من بداية شق الجلد حتى إغلاق الجرح.

تم تقسيم المرضى إلى جموعتين : إحداهما ذات ضغط مرتفع، حيث الضغط أثناء استئصال المرارة بالمنظار ١٢-١٤ مليمتر زئبق، والآخر بضغط منخفض حيث الضغط أثناء استئصال المرارة ٨-١٠ مليمتر زئبق مع مدد مختلفة من نفخ الغشاء البريتونى باستخدام غاز ثانى أكسيد الكربون وتم تنفيذ العمليات من قبل الجراحين العاملين باستخدام نفس الأسلوب والقواعد المتعارف عليها.

فى دراستنا تم متابعة المريض بعد العملية كالتالى : تم إعطاء العلاج بالمضادات الحيوية الروتينية (الجيل الثالث من السيفالوسبورين) والسيطرة على الألم لجميع المرضى وفقاً لبروتوكول المستشفى الخاص لإجراء العمليات الجراحية النظيفة. تم السماح للمرضى بالتغذية عن طريق الفم بعد ٦ ساعات من الجراحة وتم اخراجهم من المستشفى فى نفس اليوم الذى تم فيه إجراء الجراحة النهارية أو فى أول يوم بعد العملية الجراحية بعد التأكد من تحسن الحالة العامة والتغذية من خلال الفم.

تم عمل تحليل انزيمات الكبد مثل الأسبارتات الترانساميناز (AST) والألينين الترانساميناز (ALT) فى اليوم التالى للعملية الجراحية (بعد ٢٤ ساعة من إجراء العملية) وفى اليوم السابع بعد إجراء العملية، وتم مقارنتها بنفس الانزيمات التى تم إجرائها قبل العملية.

بعد إجراء الفحوصات المعملية الازمة وهى (AST,ALT) على ثلاث فترات وهى قبل العملية وبعد العملية بأربعة وعشرون ساعة وبعد العملية بسبعة أيام.

تبين ارتفاعاً ملحوظاً فى بعض انزيمات الكبد (AST,ALT) يحدث بعد عملية استئصال المرارة بالمنظار تحت ضغط بريتونى مرتفع ويحدث ارتفا ع طفيف لهذه الانزيمات تحت ضغط بريتونى منخفض علماً بأن هذا الارتفا ع لا يستمر طويلاً ففى اليوم السابع للعملية تعود هذه الارتفاعات فى الانزيمات إلى قيمها الطبيعية.

هذه الدراسة مقارنة عشوائية، أجريت فى قسم الجراحة العامة، كلية الطب، جامعة المنوفية وقسم الجراحة العامة، مستشفى بنها التعليمى خلال الفترة من سبتمبر ٢٠٢٠ حتى سبتمبر٢٠٢١.

وشملت هذه الدراسة ٥١ مريضاً فى مجموعتين. تم تعيين المجموعة A (n=26) لاستئصال المرارة بالمنظار عالى الضغط العالى (HPLC) وتم تعيين المجموعة B (n=25) لاستئصال المرارة بالمنظار بضغط منخفض (LPLC).

لم تحدث أى مراضة أو وفيات بعد العملية الجراحية فى أى من المرضى الذين تمت دراستهم. كان جميع المرضى مستقرين بشكل طبيعى أثناء العمليات وفترة ما بعد الجراحة. لم يكن أى منهم بحاجة إلى أدوية أخرى غير بروتوكول التخدير المخطط له.

نسبة الذكور : الإناث فى الدراسة هى ٢.٦٤:١، مع متوسط العمر ٤٤.٢٦٩ سنة فى مجموعة HPLC و ٤٨.٥٢ سنة فى مجموعة LPLC.

فى دراستنا عدد المرضى الذين يعانون من مؤشر كتلة الجسم <٣٠ فى مجموعة HPLC عشرون مريضاً ٣ مرضى ذكور و١٧ مريضة حيث كان كما هو الحال فى مجموعة LPLC ستة مرضى، ٤ مرضى ذكور و ٢ مرضى إناث. كان عدد المرضى الذين يعانون من مؤشر كتلة الجسم >٣٠ فى مجموعة HPLC 18 مريضاً، ٤ مرضى ذكور و ١٤ مريضة حيث كان كما هو الحال فى مجموعة LPLC 7 مرضى، ٣ مرضى ذكور و ٤ مرضى من الإناث.

تم تسجيل النطاق الزمنى للتشغيل لجميع الإجراءات وكان بين ٤١–٥٤ دقيقة لمجموعة HPLC وبين ٤٢–٥٦ دقيقة فى مجموعة LPLC. وتم تسجيل مدة نطاق pneumoperitoneum لجميع الإجراءات وكان بين ٢٩–٣٩ دقيقة لمجموعة HPLC وبين ٢٨–٤٠ دقيقة فى مجموعة LPLC.

فى دراستنا هناك فرق يعتد به إحصائياً فى AST بين المجموعات المدروسة بعد يوم من إجراء الجراحة (أعلى بكثير فى مجموعة HPLC). فى كل مجموعة على حدة، هناك تغيير كبير فى AST مع مرور الو قت. بعد ٢٤ ساعة من العملية ارتفع ALT بحيث (ALT HPLC24H : 45.88±11.12 U/L)، p0.016 بينما فى مجموعة الضغط المنخفض أصبح : (ALT LPLC24H) 38.48±9.908 U/L، p<0.001. وبعد سبعة أيام من الإجراء، قيم عادت إلى القيم العادية فى كل من مجموعات HPLC وLPLC.

هناك اختلاف إحصائى غير مهم فى AST بين المجموعات المدروسة قبل أو أسبوع واحد بعد الجراحة. وهناك فرق يعتد به إحصائياً فى AST بين المجموعات المدروسة بعد يوم من الجراحة (أعلى بكثير فى مجموعة HPLC). فى كل مجموعة على حدة، هناك تغيير كبير فى AST بمرور الو قت. بعد ٢٤ ساعة من الإجراء، زادت AST بشكل كبير فى مجموعة الضغط العالى (AST HPLC24H : 42.46±13.27 U/L)، p0.016 بينما فى مجموعة الضغط البريتونى المنخفض أصبحت النتائج كالتالى (AST LPLC24H : 35±7.08 U/L)، p0.001 وبعد سبعة أيام من الإجراء، قيم AST قد عاد إلى القيم العادية فى كل من مجموعات HPLC و LPLC.

المضاعفات الجراحية، والتى كانت فى معظمها مضاعفات أثناء العملية الجراحية، مثل تسرب الصفراء، ثقب المرارة، وما إلى ذلك أكثر فى مجموعة LPLC. ولم تكن هناك اختلافات كبيرة من حيث المضاعفات أثناء العملية الجراحية بين المجموعتين. كان هناك ٣ تحويلات من الضغط المنخفض إلى الضغط العالى للحصول على صورة جيدة. كان وقت العمل الجراحى أطول بكثير فى مجموعة الضغط المنخفض مقارنة بمجموعة الضغط العالى. ارتبط انخفاض ضغط pneumoperitoneum مع إنخفاض كبير فى طول الإقامة فى المستشفى مقارنة مع ارتفا ع ضغط pneumoperitoneum أظهر المرضى أن مجموعة الضغط المنخفض لديها متطلبات مسكن أقل من مجموعة الضغط العالى.

فى دراستنا يحدث الارتفا ع العابر من ALT و AST بعد HPLC. ويبدو أن ضغط ومدة ثانى أكسيد الكربون هى السبب الرئيسى لهذه التغيرات، ولكن عوامل أخرى مثل التلاعب الجراحى، والتخدير العام، وإصابات الشريين قد تسهم أيضاً. تعود هذه التغييرات إلى طبيعتها بعد سبعة أيام من العملية وليس لها عواقب سريرية فى المرضى الذين يعانون من وظيفة كبدية طبيعية.