Egyptian Journal of Surgery Vol. (20), No. (1), Jan., 2001

THE INCREASE OF INTRA-ABDOMINAL PRESSURE AFFECTS LIVER FUNCTION AFTER LAPAROSCOPIC CHOLECYSTECTOMY IN COMPROMISED LIVER PATIENTS:

By
Ahmed Hazem Helmy, Mohamed Abbass , Youssef farouk Youssef, Ayman I. Nafeh,, H. Elkhyatt ,.Azza Saleh
Department of Surgery, Department of Gastroentrology and hepatology* and Department of clinical Chemistry**
Theodore Bilharze Research Institute, Imbaba, Giza, Egypt.

The laparascopic Cholecystectomy is the new and accepted procedure for removal of the diseased gall bladder stones.The procedure is standardized and now it is world wide done in department of general surgery. The adverse effects concerning the pneumoperitonium particularly the increase in the intra abdominal pressure and its effect concerning the heamodynamic and ventilatory effects are studied before.The effect of such increase in the intra abdominal pressure on the liver enzymes was reported before. In our study we looked at the liver function before and after 24 hours of doing Cholecystectomy in (76 patients). The Laparoscopic Cholecystectomy group were the IAP was 12-15 mmhg (LAC 43 patients) and Minilaparotomy for Cholecystectomy group (MLC 33 patients).

It was found that the liver transaminase enzymes were all affected in all patients "transaminites". In those who had compansated liver function and potentially liver disease i.e. Cirrhotic liver with child A and B due to HCV and HBV who under went laparoscopic cholycystectomy the liver functions reasched up to 3 -5 -7 times normal. In the Minilaparotomy for Cholecystectomy the enzymes reached 1.5 times normal in normal liver patients and 7 times normal in the compansated liver patients.

The increase in the intrabdominal pressure was the variable factor among those two groups. We suggest that the pneumoperitonium during laparascopic Cholecystectomy initiated some form of ischeamia and this has lead to Ischeamia Reperfusion Injury that had affected the liver function.

Key Words: Laparoscopic cholecustectomy , minilaparotomy for cholecystectomy
Intra abdominal pressure and Intra abdominal hypertension Liver functions, Liver disease

INTRODUCTION

The laparascopic Cholecystectomy is the new and accepted procedure for removal of the diseased gall bladder stones [1]. The procedure is standardized and now it is world wide done in department of general surgery [2]. The adverse effects concerning the pneumoperitonium particularly the increase in the intra - abdominal pressure and its effect concerning the heamodynamic and ventilatory effects are extensivly studied before [3].The effect of such increase in the intra abdominal pressure on the liver enzymes was reported before [4].

This study was carried out to detect the effect of pnemoperitonium on the liver functions in healthy and compromised liver patients during Laproscopic

MATERIALS AND METHODS

The present study was conducted on 76 patients suffering from dyspepsia and subjected to cholecystectomy. Pre-operatively, patients with dyspepsia have been subjected to complete clinical examination.Cardiopulmonary assessment was done whenever needed.

Patients were evaluated by routine ultrasonography and proved to have chronic calcular cholecystitis .Detailed sonographic examination has been done by a convex linear transducer of an instrument Hitachi EUB 515 A with special reference to the liver size and echogenicity. Detailed sonographic examination of the gall bladder has been made with special reference to the wall thickness and the number and size of stones . The CBD has been inspected along its whole length and its diameter has been determined and the presence of stones has been observed. All patients with history or clinical examination suggestive of obstructive jundice were excluded from the study The intrahepatic biliary radicals have been observed for any dilatation as well. The liver echogenisity was studided as well.

A battery of investigation was done in the form of full blood count, prothrombin time and concentration, blood suger, liver function tests [N=normal, HN=high normal range], (ALT, AST, Alk. Phos., Albumin and Bilrubin), blood urea, serum creatinine and electrolytes, hepatitis markers for HBV and HCV.

The cholecystectomy specimens removed either by open surgical procedure (Minilaparotomy for cholecystectomy 33 cases) or by laparoscope (Laparoscopic cholecystectomy 43 cases).

All presented patients (76) were admitted to hospital 24 hours before procedures. Intraoprative antibiotics were given in the form of cephalosporine [1gm Cephredine IV] all cases\ were carried out under General anaesthesia.

Laparoscopic Cholecystectomy:

The LAC group had four ports access and the pneumoperitoneum using CO2 between 12-15 mmHg . We used 10 mm lens [5],[6]. We used clips 2 for ligation of the cystic artery and 2 for ligation of the cystic duct. After that the gall bladder freed from the liver. A closed system drainage is inserted. using such technique. We passed a grasper through the 10 mm port under vision inside the abdominal cavity then introduce it through the lower lateral 5 mm port tip shown in the screen under vision, then slide both the 5 mm port with the grassper inside it outside the abdominal cavity. Then we remove the 5 mm port and find the mouth of the grasspre outside the abdominal cavity. We catch the tip of the drainage tube, pulling it inside the abdominal cavity and guide it with the grasper and another artery forceps from the upper lateral 5 mm port directly and positioned accurately to the sub hepatic space i.e. the morrison pouch.

Minilaparotomy for Cholecystectomy:

The MLC group had Rt. sub coastal transverse incisions between 5 -7 cm in length for access [7,8]. Using a such approach for access the anterior rectus sheath was opend transversaly and the rectus mucle were retracted lateraly by the assistant and not opened. Then the posterior rectus sheath and fascia were opened longitudinally using the diathermy. Good heamostasis and protection of the superior epigastric artery and sub costal nerves were done. Using long deep retractors we had good access and exposure. After identefication of the anatomy we use the laparoscopic clip applaier to clip the cystic artery and the cystic duct. After that the gall bladder freed from the liver bed. We used hot pakes, diathermy, surgicel or gellfoam for heamostasis. For those patients who had a drain left we used closed system drainage. Wound closure starting with the peritonium , the fascia and the posterior sheath. Then position the rectus muscle over and closure of the anterior sheath and the sub-cutanous tissue. We used Proline 0 for the previous steps. Skin closure was done using vicryle 3/0 or prolene 3/0 subcuticular.

All our patients had Cepherdin 1gm oral bd and Metronidazloe 1 gm suppositories bd for 5 days. All patients had pain killers tablets using Tramadol 400 mg.bd and or parcetamol 1 gm QDS.. All patients were encouraged to mobilize early and allow to have oral sips in the form of ice cubes immediately after full recovery. Gradual build up oral intake in the whole hospital stay either short or long until they are back to normal diet. A blood sample was collected for LFT's 24 hours after surgery. Elevation of the liver enzymes and bilirubin was defined as levels more than normal (1.5, 5, 7 times the normal).. All patients were seen after 1 week and 1month in the OPD.

RESULTS

This study included 76 patients in two groups. The LAC 43 patients and MLC 33 patients the Male: Female ratio 1:6, with mean age 40-44 years. shown in (Table 1 & Table 2).

Table (1): ***Number of patients included in the study***

	Lap.Chole.(LAC)	*Mini-Lap. (MLC)*	***Total***
liver diseased	13	4	17
liver normal	30	29	59
Total	43	33	76

Table (2*): Male, Female and age incidence in the study*

	Lap. Chole. (LAC)		***Mini - Lap. (MLC)***	
	Liver normal 30	Liver disease 13	Liver normal 29	Liver disease 4
Males	5	1	5	0
Females	25	12	24	4
Age Mean $\pm$ SD	23-59 44 $\pm$ 11.34 yrs		26-54 40 $\pm$ 9.11yrs	

The operating time rang for all the procedures has been recorded and it was as follows; for LAC group between 57-77 minuts and 63-84 minuts for the normal and compansated liver respectivly. For those who had MLC was 76-100 minutes and 80-106 minutes in the normal and compansated liver patients respectivly. Those who had a drain left were 33% and 12 % in the LAC and MLC respectivly, but the compansated liver patients who had LAC were 85% (11 patients). 43 Patients were discharged within 2 days [until removal of drain], 29 Patients had to stay for 3 days [until removal of drain and recover from pain and passing stools and eating and drinking] and 4 Patients stayed less than 5 days in hospital.because of their preoperative state and the blood transfusion they had.

Table (3): ***Operative details.***

	Lap. Chole. (LAC)		*Mini - Lap (MLC)*	
	Liver normal 30	Liver Disease 13	Liver normal 29	Liver disease 4
Drains	3	11	0	4
Operative time	67.20 ±10.95	74.33± 11.305	88.4 ± 12.11	94.9 ± 14.30
Hospital stay	1	2	3	5

In this study non of our patients had systemic inflamatory response syndrome "sepsis syndrome" or any form of multiple organ failure (MOF). General complications were noticed in 10 patients. Seven patients developed fever due to chest infection and two patients due to UTI. One patient developed DVT. Those complications occurred during hospitalization period.

Local complications were noticed in 7 patients in the out patient department during immediate follow up period. Five patients developed wound infection and were treated with antibiotics, two patients had subhepatic collection were treated conservatively with antibiotics and had U/s guided biopsies for culture and sensitivity and a pig tail catheter were inserted for drainage.

In the follow up which was made on the 1st week, 1st month, patients were generaly examined, the wound was inspected and any new complains were recorded . Non of our patients developed iatrogenic jaundice and there was no recorded death in this study.

The five parameters (Bil, Alb, Alk Phos, AST, ALT) we used as standared liver functions were done before and after both type of surgery the Laparascopic Cholecystectomy (LAC group) and the Minilaparotomy for Cholecystectomy (MLC group) (Table 4).

Table (4): ***Liver function tests before and after***

**Serum level*		*Lap. Chole. (LAC)*				*Mini Lap. (MLC)*			
Normal range	*#times Normal range*	*Liver normal 30 Patients*		*Liver disease 13 Patients*		*Liver normal 29 Patients*		*Liver disease 4 Patients*	
		Before	*After*	*Before*	*After*	*before*	*after*	*before*	*after*
Bilirubin mg/dl 0.2-1.0	N-HN 1.5	30	21 9(30%)	13	8	29	25 4(14%)	4	1
	3-5				5(38%)				
	7								3(75%)
Alk Phos U/L 53-278	N-HN 1.5	30	30	13	11 2(15%)	29	29	4	3
	3-5								1(25%)
	7								
Albumin gm/dl 3.5-5.0	N-HN low	30	25 5(17%)	13	9 4(31%)	29	22 7(24%)	4	2 2(50%)
ALT-U/L Up-to 40	N-HN 1.5	30	10 20(67%)	13	2	29	14 15(52%)	4	1
	3-5								
	7				11(85%)				3(75%)
AST-U/L Up-to 37	N-HN 1.5	30	11 19(63%)	13	3	29	14 15(52%)	4	1
	3-5								
	7				10(77%)				3(75%)

* serum level = N- normal, HN- high normal, 1.5 times normal, 3-5 times normal, 7 times normal

This disturbed laboratory liver functions (enzymes and bilirubin) were high in both groups (LAC & MLC) in the 1st post operative day.

It was clinicaly observed (shoulder, abdominal pain, distention and low grade unexplained fever) in both groups LAC & MLC who had compansated liver disease from the start .

It was also clinicaly observed in normal liver patients who were subjected to LAC while those who had MLC did not have any implication on the clinical picture i.e self-limitted disturbance.

(Table 4) showed the number of patients who had elvated liver function which was either clinicaly noticed or laboratory noticed. The elvation was 1.5 times normal in the LAC group with normal liver. In the LAC group with compansated liver it was between 3-5 and 7 times normal. In the MLC with normal liver it was also 1.5 times normal. In the MLC with diseased liver it was 7 times normal.

- 14 patients (33%) of the LAC group had high serum bilirubin [of them 5 patients had compansated liver disease and 9 patients had normal liver] compared to 7 patients (23%) in the MLC group [of them 4 patients had normal liver and 3 patients had compansated liver.

- 31 patients (72%) of the LAC group had high serum ALT [11 patients of them had compansated liver disease and 10 patients had normal liver] compared to 18 patients (55%) in the MLC group [were 15 patients of them had normal liver and 3 patients had compansated liver].

- 29 patients (67%) of the LAC group had high serum AST [10 patients had compansated liver disease and 19 patients had normal liver] compared to 18 patients (55%) in the MLC group [3 patients had normal liver and 15 patients had compansated liver].The serum AST was less affected than serum ALT in LAC group.

- 21% of the LAC group (9 patients) had low serum albumin 4 of them had compansated liver disease and 5 patients had normal liver, compared to 27% in the MLC group (9 patients) of them 7 patients had normal liver and 2 patients had compansated liver.

- 31 patients had high ALT 72% in the LAC group compared to 18 patients who had MLC 55 %. Those who had normal liver 20 patients 67% compared to 10 patients 85 % in the LAC in the MLC 15 patients with normal liver 52% compared to 3 patients 75 %.

- The AST was less affected than the ALT in the LAC 67% (29 patients) compared to MLC 55 % (18 patients). In those who had normal liver in the LAC 63% and diseased liver 77 % in 19 and 10 patients respectivly. In the MLC the same as the ALT were 52% in 15 patients and 75% in 3 patients with diseased liver.

DISCUSSION

In our study we found that all patients either with normal or compensated liver tolerated cholecystectomy. We also found that patients with compensated liver tolerated LAC well.

All cases had high level of transaminase 24 hour postoperativly. This elevation was clinicaly observed in MLC group with compansated liver and in all patients who had LAC either with normal or compansated liver. In the MLC group with normal liver it was self limited and no clinical symptomes were observed in the contrary to previous studies[9].

In our study no injury occurred to the liver or the porta hepatis structures in both surgical procedures.. The possiable explanation for such liver enzymes disturbance could be either due to the original liver pathology or the main variable which is pnemoperitonum.

The pressure induced during the pnemoperitonum in laparoscopic surgery is the main variable in most recent studies. The harmfull effects of the increase of intra-abdominal pressure in the laparoscopic Cholecystectomy were studied before [10].

The increase of intrabdominal pressure during laparoscopic surgery is the cause of reduction in viseral perfusion [11]. This causes decrease in the splanchnic blood flow and the portal and hepatic arterial and venous blood flow [12],[13]. The cause of increase in the liver function or what is described as transaminities is considered due to the transiant ischeamic attacks which occurred during the obstruction of flow while pneumoperitoinum is performed [14]. The possible other factor is the ischeamia reperfusion injury which occurs after the intra-abdominal pressure regain its normal pressure [15]. ALT enzyme is concidered more specfic among liver enzymes for liver cell damage[16,17].

The elvation of liver enzymes in our study was higher in the ALT compared to the AST in the LAC group. While both enzymes were equally elvated in the MLC group .

This might reflect the extensive damge that occurred in cases with increase IAP, particularly in those patients with companceted liver .

CONCLUSION

The study verified that the incerse of IAP due to during LAC has a deletrion effect on the liver function. This findings should be taken in consideration in decision making of choosing either laparoscopic or open cholecystectomy in compromised liver patients. If the needs for doing cholecystectomy and laparoscopic approch is an option, in such patients we should think either to use low pressure, gasless laparoscopy or we should think how to protect the liver against the well documented harmful effects of increase intra abdominal pressure. This may open the gate for using a prophylactic drugs to protect and gard the liver against such inevitable expected damge during Laparoscopic Cholecystectomy. Still remain the orthodox method of open cholecystectomy as a valid alternative option for those high risk patients, as patients safty should come first.

REFERENCES

1. Malouf A F, Murry AW, MacGregor : Major intra-abdominal pathology missed at laparoscopic cholecystectomy B J Surgery 2000 October, Vol 87: 10, 1434-5

2. Mageed AW,Reed MW, Hall J, Ross B, Johonson AG : The value of abdominal exploration during Cholecystectomy J R C Surg Edinb, 1995 Dec 40:6 377-9

3. Kamal N, El Fandy G, Kamel H, Helmy AHI : Heamodynamic and ventilatory Changes during Laparoscopic Cholecystectomy in medicaly compromised patients , Anasthesia & Analgisia March 1999,88:S1-484,S 417

4. Eleftheriadis E Papnotas K : Splanchenic ischeamia during laparoscopic cholecystectomy , Surg Endosc 10:324, 1996

5. Ginn FP, Miles AJ, Ozman M, terzi C, Humby M : Randomised controle trial of laparoscopic cholecystectomy and mini cholecystectomy , Br J Surgery 1995 Oct 82:10 1374-7

6. McMahon AJ, Russel IT, Ramsay G, Sunderland G, Baxter JN, Galloway D : Laparoscopic and minilaparotomy cholecystectomy . Surgery 1994 May 115:5 533-9

7. Shmitze, V Rohde, J Treckmann, S Shah : Randomised controled trial of conventional cholecystectomy versus minicholecystectomy , British J Surgery 1998 , 85,1683-1686

8. Al Tameem M M : Minilaparotomy Cholecystectomy , J Royal college of Surg Edinburgh 1993 June, 38:3 154-7.

9. Halevy A ,Gold – Deutch A, Negri M, Lin G, Shlamovich N, Evans S : Are elvated Liver enzymes and bilirubin levels signficant after lap Choley in the absense of bile duct injury? Ann Surg 1994;219: 362-4

10. Dieble LN, Wilson RF : Effect of increase intra abdominal presssure on hepatic arterial ,portal venous, and hepatic microcirculatory blood flow , J Trauma 33:279,1992

11. Schien M, Wittmann DH,Condon RE : The abdominal compartment syndrome , J Am coll Surg 1995;180:745-753

12. Paul A, Triodl H, Peters S : Fatal Ischeamia following Lap.Chole. , B J Surg 1994;81:1207

13. Melson DS Burton PA, Thomson MH : Acute intestinal ischeamia following Lap.Chole. , Br J Surg 1995;82:1413

14. Dieble LN, Porter , Simon RJ,Ivatury RR : Intra abdominal hypertention and abdominal compartment syndrome , Surg Cl North America Vol 77 :4 Augest 1997.

15. Fulda GJ, Fulda SE : Physiologic changes and outcome following surgical decompression for increased intra abdominal pressure , Crit Care Med 15:1140.1987

16. Andri VE,Schein M, Margolis M, Rucinski J C, Wise L : Liver enzymes are commonely elvated following Lap.Chole. is elvated intra-abdominal pressure the cause , Dig Surg 1998;15:256-259

17. Theal RM, Scott K : Evaluating asymtomatic patients with abnormal liver function test results , Am Fam Physision 1996;53:2111-2119