Laparoscopic cholecystectomy in hepatic patients

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Aim
The aim of this study was to compare low-pressure with high-pressure pneumoperitoneum laparoscopic cholecystectomy in hepatic patients.
Patients and methods
This prospective study included 40 consecutive patients with calcular gall bladder and hepatitis C who were admitted in The Department of General Surgery, Minia University Hospital, between July 2016 and December 2016. We classified them into two groups, group I (high pressure) and group II (low pressure).
Results
In group I, aspartate aminotransferase (AST), alanine aminotransferase (ALT), γ-glutamyltransferase, and lactate dehydrogenase (LDH) were significantly increased 24 h postoperatively. AST and ALT were elevated three-fold, and AST, ALT, and LDH reached levels over upper normal limits after 24 h postoperatively. However, in group II patients the elevation of enzyme levels did not reach two-fold and remained within the normal limits. On comparing the two groups, the elevation of AST, ALT, and LDH was significant for group I (P=0.0001). Moreover, elevation of γ-glutamyltransferase was significant (P=0.041), whereas alkaline phosphatase level changes were nonsignificant.
Conclusion
We conclude that pneumoperitoneum 14 mmHg pressure decreased blood flow to the liver with increased postoperative serum enzyme levels, and pneumoperitoneum 10 mmHg pressure is superior to 14 mmHg pressure pneumoperitoneum in laparoscopic cholecystectomy. Therefore, we recommend this low-pressure pneumoperitoneum in hepatic patients.

Keywords:
cholecystectomy, laparoscopic, pneumoperitoneum

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Introduction

The Egyptian Demographic Health Survey, a cross-sectional survey including hepatitis C virus (HCV) biomarkers, was conducted in 2008 on a large nationally representative sample [1]. It estimated HCV prevalence among individuals in the age group of 15–59 years to be 14.7% [1]. Accordingly, Egypt has the highest HCV prevalence in the world [2–4]. This unparalleled level of exposure to this infection appears to reflect a national level epidemic. It has been postulated that the epidemic has been caused by extensive iatrogenic transmission during the era of parenteral antischistosomal therapy mass-treatment campaigns [5,6]. Today, HCV infection and its complications are among the leading public health challenges in Egypt [7]. The diverse HCV studies conducted among different general population subgroups, regardless of the design or methodology, consistently report a very high HCV prevalence, as high as 41% in some studies [8].

Worldwide, laparoscopic cholecystectomy is most often performed by pumping CO_2 into the abdominal cavity. To provide good exposure of the surgical field, generally 10–15 mmHg pressure ranges are used during pneumoperitoneum creation [9–12].

Junghans *et al.* [13] demonstrated in a pig model that intra-abdominal pressure greater than 12 mmHg may induce a reduction in splanchnic and hepatic perfusion.

Morino *et al.* [14] evaluated the effects of pneumoperitoneum on hepatic function in patients treated with laparoscopic procedures. The cholecystectomies were performed with pneumoperitoneum at 10 and 14 mmHg and found that all patients had a postoperative increase in aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels. They suggested that patients with severe hepatic failure should probably not be subjected to prolonged laparoscopic procedures. In another recent study, Sakorafas *et al.* [15] demonstrated a statistically significant increase in ALT and AST in the

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laparoscopic cholecystectomy group at 14 mmHg of CO_2 pressure.

Patients and methods

This prospective study included 40 patients with compensated hepatitis C-positive tests who were planned for elective laparoscopic cholecystectomy in El-Minia University Hospital from June 2016 to December 2016. Patients were classified carefully into two groups in an attempt to obtain the same range of age, sex, and weight of selected patients between the two groups. Group I patients were operated upon using pneumoperitoneum 14 mmHg pressure, and group II was operated upon using pneumoperitoneum 10 mmHg pressure. Informed written consent was obtained from all patients. Patients with decompensated liver were excluded from the study.

The same team of surgeons operated all patients, using the same anesthetic protocol. Midazolam hydrochloride was used as a premedication 45 min preoperatively at a dose of 0.7 mg/kg. Preoxygenation was carried out for 2 min, and then anesthesia was induced with fentanyl citrate (1–1.5 μg/kg) and propofol (2–2.5 mg/kg) and vecuronium (0.1 mg/kg) as a muscle relaxant. Maintenance of anesthesia was carried out with sevoflurane (2–2.5 vol.%) with oxygen-in-air mixture (0.50 ratio). Mechanical ventilation was used, and end-tidal carbon dioxide was maintained on 35–38 mmHg.

Heart rate, mean arterial pressure, oxygen saturation, and end-tidal carbon dioxide were all recorded three times first at preinsufflation, and then 10 min after insufflation, and lastly 10 min after desufflation. Anesthetic time and surgery time were recorded.

Serum AST, ALT, γ-glutamyltransferase (GGT), lactate dehydrogenase (LDH), and alkaline phosphatase levels were all recorded preoperatively and at 1 and 24 h postoperatively.

The enzyme levels were evaluated at 1 and 2 weeks of follow-up.

Results

This study included 40 patients, 18 female and 12 male, who were planned for elective laparoscopic cholecystectomy in El-Minia University Hospital. Table 1 shows the sex, age, and weight of patients and the duration of surgery time. There was no difference between the two groups as regards demographic data or time of surgery.

There was no morbidity or mortality in any of the studied patients. In group I, AST, ALT, GGT, and LDH were significantly increased 24 h postoperatively, especially AST and ALT, which were elevated three-fold, and AST, ALT, and LDH reached levels over upper normal limits after 24 h postoperatively. However, in group II patients the elevation of enzyme levels did not reach two-fold and remained within the normal limits. On comparing the two groups, the elevation of AST, ALT, and LDH was significant for group I (P=0.0001). Moreover, elevation in GGT was significant (P=0.041), whereas alkaline phosphatase level changes were nonsignificant (Table 2).

Table 1 Demographic data

Variables	High pressure (group I) (20 patients)	Low pressure (group II) (20 patients)
Age [range (mean)] (years)	35–50 (42.5)	37–50 (43.5)
Sex		
Male	7	5
Female	13	15
Weight [range (mean)] (years)	77–85 (81)	80–87 (83.5)
Duration of surgery [range (mean)] (min)	30–65 (47.5)	40–60 (50)

Table 2 Postoperative enzyme levels in the two groups

Enzymes	High pressure (group I)		Low pressure (group II)		P value[a]
	Preoperative	Postoperative	Preoperative	Postoperative	
AST	23.75±5.44	62.71±27.13	27.53±5.38	41.68±14.96	0.0001
ALT	22.54±7.92	61.29±31.17	24.41±7.09	33.72±10.60	0.0001
GGT	21.70±9.25	31.98±19.63	23.14±7.89	25.26±7.39	0.041
LDH	158.80±2196	222.13±54.92	150.49±18.44	173.34±26.27	0.0001
ALP	67.41±18.40	69.36±17.28	77.03±18.96	80.53±18.81	0.524

Values are presented as mean±SD. ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; GGT, γ-glutamyltransferase; LDH, lactate dehydrogenase. [a]Student's t-test.

On follow-up visits, all elevated enzymes returned to normal levels.

Discussion

With advancement of medical practice in present era, the introduction of laparoscopic surgeries has changed dramatically the management of gall bladder disease and establishing the laparoscopic cholecystectomy as the method of choice for the treatment of uncomplicated cholelithiasis [16].

Surgeons have traditionally relied on creating a pneumoperitoneum of up to 14–15 mmHg by insufflating carbon dioxide gas into the peritoneal cavity at the time of insertion of ports. This has the desired effect of raising the abdominal wall away from the viscera, giving room to visualize the gall bladder and surrounding organs, allowing manipulation of instruments, and also allowing the intestine to fall away from the subhepatic space when the patient is positioned properly [17]. However, pneumoperitoneum with carbon dioxide gas at the pressures commonly used has been shown to be associated with unique and specific side effects [11,18–21].

Egypt has the highest prevalence of HCV in the world, estimated nationally at 14.7% [22].

In our study, we operated on 40 compensated virus C-positive patients and compared the effects of low-pressure versus high-pressure pneumoperitoneum on hepatic enzyme levels and we found that, in group I (the high-pressure group), AST, ALT, GGT, and LDH were significantly increased 24 h postoperatively. AST and ALT were elevated three-fold and AST, ALT, and LDH reached levels over upper normal limits after 24 h postoperatively. However, in group II patients (the low-pressure group) the elevation of enzyme levels did not reached two-fold and remained within the normal limits. On comparing the two groups, the elevation of AST, ALT, and LDH was significant for group I (P=0.0001). Moreover, elevation in GGT was significant (P=0.041), whereas alkaline phosphatase level changes were nonsignificant. These results are in agreement with worldwide studies.

Several previous studies reported the effects of pneumoperitoneum on splanchnic and liver perfusion [23,24]. Meierhenrich *et al.* [23] demonstrated that induction of CO_2 pneumoperitoneum with an IAP of 12 mmHg is associated with an increase in hepatic perfusion in healthy adults. The authors do not have a definite explanation for these findings. Another study conducted by Sato *et al.* [24] compared hepatic blood flow and function in patients undergoing laparoscopic cholecystectomy with an intra-abdominal pressure of 9–12 mmHg and concluded that laparoscopic cholecystectomy might impair hepatic function because of the high pressure.

Standard pressure pneumoperitoneum is associated with significant changes in liver and renal function tests as compared with low-pressure pneumoperitoneum [16].

Operating time was about 2 min longer (very low-quality evidence) in the low-pressure group than in the standard pressure group [25]. This is in agreement with our results in which our operating time was about two and a half minutes longer in the low pressure group than in the standard pressure group.

The safety of low pressure pneumoperitoneum has to be established [25].

Conclusion

We conclude that low-pressure pneumoperitoneum is better to be used, especially in patients with hepatitis, which is a very common disease in Egypt. Further studies will be conducted to evaluate the effect of high-pressure versus low-pressure pneumoperitoneum in more advanced hepatic patients and on a long-term outcome.

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Conflicts of interest

There is no conflict of interest.

References

1 El-Zanaty F, Way A. Egypt Demographic and Health Survey 2008. Egyptian: Ministry of Health. Cairo, Egypt: El-Zanaty and Associates and Macro International; 2009.

2 Lavanchy D. Evolving epidemiology of hepatitis C virus. Clin Microbiol Infect 2011; 17:107–115.

3 Alter MJ. Epidemiology of hepatitis C virus infection. World J Gastroenterol 2007; 13:2436–2441.

4 Shepard CW, Finelli L, Alter MJ. Global epidemiology of hepatitis C virus infection. Lancet Infect Dis 2005; 5:558–567.

5 Frank C, Mohamed MK, Strickland GT, Lavanchy D, Arthur RR, Magder LS, *et al.* The role of parenteral antischistosomal therapy in the spread of hepatitis C virus in Egypt. Lancet 2000; 355:887–891.

6 Strickland GT. Liver disease in Egypt: hepatitis C superseded schistosomiasis as a result of iatrogenic and biological factors. Hepatology 2006; 43:915–922.

7 Miller FD, Abu-Raddad LJ. Evidence of intense ongoing endemic transmission of hepatitis C virus in Egypt. Proc Natl Acad Sci USA 2010; 107:14757–14762.

8 El-Ahmady O, Halim AB, Mansour O, Salman T. Incidence of hepatitis C virus in Egyptians. J Hepatol 1994; 21:687.

9 Dexter SP, Vucevic M, Gibson J, McMahon MJ. Hemodynamic consequences of high- and low-pressure capnoperitoneum during laparoscopic cholecystectomy. Surg Endosc 1999; 13:376–381.

10 Diebel LN, Wilson RF, Dulchavsky SA, Saxe J. Effect of increased intra-abdominal pressure on hepatic arterial, portal venous, and hepatic microcirculatory blood flow. J Trauma 1992; 33:279–283.

11 Hasukić S. Postoperative changes in liver function tests: randomized comparison of low- and high-pressure laparoscopic cholecystectomy. Surg Endosc 2005; 19:1451–1455.

12 Barczyński M, Herman RM. A prospective randomized trial on comparison of low-pressure (LP) and standard-pressure (SP) pneumoperitoneum for laparoscopic cholecystectomy. Sur Endosc 2003; 17:533–538.

13 Junghans T, Böhm B, Gründel K, Schwenk W, Müller JM. Does pneumoperitoneum with different gases, body positions, and intraperitoneal pressures influence renal and hepatic blood flow? Surgery 1997; 121:206–211.

14 Morino M, Giraudo G, Festa V. Alterations in hepatic function during laparoscopic surgery: an experimental clinical study. Surg Endosc 1998; 12:968–972.

15 Sakorafas GH, Anagnostopoulos GK, Stafyla V, Koletis T, Kotsifopoulos N, Tsiakos S, Kassaras G. Elevation of serum liver enzymes after laparoscopic cholecystectomy. N Z Med J 2005; 118:1317.

16 Jaiswal AK, Singh VB, Ansari IM, Mahajan D. Comparison of the effect on renal and liver functions of low pressure versus standard pressure pneumoperitoneum in laparoscopic cholecystectomy. Int J Sci Res 2016; 5.

17 Chok KS, Yuen WK, Lau H, Fan ST. Prospective randomized trial on low pressure versus standard pressure pneumoperitoneum in out patient laparoscopic cholecystectomy. Surg Laparosc Endosc Percutan Tech 2006; 16:383–386.

18 Koc M, Ertan T, Tez M, Kocpinar MA, Kilic M, Gocmen E, *et al.* Randomized prospective comparison of postoperative pain in low versus- high pressure pneumoperitoneum. ANZ J Surg 2005; 75:693–696.

19 Esmat ME, Elsebae MM, Nasr MM, Elsebaie SB. Combined low pressure pneumoperitoneum and intraperitoneal infusion of normal saline for reducing shoulder tip pain following laparoscopic cholecystectomy. World J Surg 2006; 30:1969–1973.

20 Joris J, Cigarini I, Legrand M, Jacquet N, De Groote D, Franchimont P, *et al.* Metabolic and respiratory changes after cholecystectomy performed via laparotomy or laparoscopy. Br J Anaesth 1992; 63:341–345.

21 Baraka A, Jabbour S, Hammond R, Aouad M, Najjar F, Khoury G, Sibai A. End tidal carbon dioxide tension during laparoscopic cholecystectomy. Anaesthesia 1994; 49:403–406.

22 Mohamoud YA, Mumtaz GR, Riome S, Miller D, Abu-Raddad LJ. The epidemiology of hepatitis C virus in Egypt: a systematic review and data synthesis. BMC Infect Dis 2013; 13:288.

23 Meierhenrich R, Gauss A, Vandenesch P, Georgieff M, Poch B, Schütz W. The effects of intraabdominally insufflated carbon dioxide on hepatic blood flow during laparoscopic surgery assessed by transesophageal echocardiography. Anesth Analg 2005; 100:340–347.

24 Sato K, Kawamura T, Wakusawa R. Hepatic blood flow and function in elderly patients undergoing laparoscopic cholecystectomy. Anesth Analg 2000; 90:1198–1202.

25 Gurusamy KS, Vaughan J, Davidson BR. Low pressure versus standard pressure pneumoperitoneum in laparoscopic cholecystectomy. Cochrane Database Syst Rev 2014; 18:CD00693.