

Assessment of the Level of Abdominal Pain in High- Versus Low-Pressure Carbon Dioxide in Patients Undergoing Laparoscopic Cholecystectomy

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Abstract

Background: To assess the level of abdominal pain in high- versus low-pressure carbon dioxide in patients undergoing laparoscopic cholecystectomy. **Subjects and Methods:** One hundred twenty adult patients age ranged 18- 48 years of either gender with history of cholecystitis undergoing laparoscopic cholecystectomy were included. Randomization of patients into 2 groups of 60 each was done. Group A comprised of those who underwent pneumoperitoneum with PaCO₂ of 7–10 and group B were those who underwent using PaCO₂ of 12–14 mm Hg. In both groups, parameters such as abdominal pain at the site of surgery, level of nausea and vomiting and shoulder-tip pain were evaluated. **Results:** The mean pre- operative and post- operative ALP (u/l) was 168.4 and 148.5, AST was 20.5 and 43.2, ALT (u/l) was 19.2 and 32.7, BILLT (u/l) was 0.60 and 0.67 and BILLD (u/l) was 0.20 and 0.32 in group A respectively. In group B was 184.3 and 187.4, 20.4 and 37.6, 21.3 and 32.5, 0.61 and 0.72 and 0.21 and 0.37 in group B respectively. A significant difference was observed (P< 0.05). There was significant difference in systolic blood pressure and heart beat recorded at 1 hour, 3 hours and 6 hours in group A and B. **Conclusion:** Low pressure CO₂ had benefit over high- pressure CO₂ in laparoscopic cholecystectomy.

Keywords: Blood pressure, Laparoscopic cholecystectomy, Low pressure CO₂.

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Introduction

The laparoscopic cholecystectomy (LC) is the gold standard to treat gallstones. It was introduced by Dubois in 1988 and gradually developed by monitor and video systems.^[1] The following advantages of this surgical procedure have encouraged patients and surgeons toward it: short cuts, short hospital stay, less side-effects, lower post-surgery pain, rapid return to normal activities, and mortality less than 1%.^[2]

Surgery of the gallbladder has evolved tremendously over the past decades. Laparoscopic cholecystectomy is considered the gold standard for gallbladder removal and is the most common laparoscopic procedure worldwide.^[3] The tendency of minimising surgical trauma encourages the use of new approaches in laparoscopic surgery. In recent times, the innovative techniques of natural orifice transluminal endoscopic surgery (NOTES) and single incision laparoscopic surgery (SILS) have been applied in gallbladder removal as a step forward toward nearly scarless surgery.^[4]

Pneumoperitoneum in laparoscopic surgery has been shown to increase postoperative pain and confer physiologic adverse effects to the patients. Peritoneal insufflation diminishes venous return and reduces cardiac output. Such changes may be dangerous in patients with a poor cardiac reserve. Studies have shown potential advantages of using lower pressure to maintain pneumoperitoneum in performing LC.^[5] Recent prospective randomized studies showed significantly less postoperative shoulder-tip pain with similar conversion and complication rates when using lower-pressure pneumoperitoneum in performing inpatient LC.^[6] However, it remained unclear whether lower-pressure pneumoperitoneum would contribute further beneficial effects to the outcomes of outpatient LC.^[7] Considering this, we selected present study to compare hemodynamic symptoms and the level of abdominal pain in high- versus low-pressure carbon dioxide in patients undergoing laparoscopic cholecystectomy.

Subjects and Methods

A sum total of one hundred twenty adult patients age ranged

18- 48 years of either gender with history of cholecystitis undergoing laparoscopic cholecystectomy. All pregnant women, patients with BMI >30, patients undergoing abdominal surgery were excluded. Randomization of patients into 2 groups of 60 each was done. Group A comprised of those who underwent pneumoperitoneum with PaCO₂ of 7–10 and group B were those who underwent using PaCO₂ of 12–14 mm Hg. In both groups, parameters such as abdominal pain at the site of surgery, level of nausea and vomiting and shoulder-tip pain were evaluated based on the verbal rating scale (VRS) within 1, 3-, 6-, 12- and 24-hours following surgery. Score was determined as no pain = 0, moderate pain = 1, medium pain = 2, severe pain = 3, and intractable pain = 4. The score of nausea and vomiting was no= 0, slight nausea and vomiting = 1, need for anti-nausea drug = 2, and intractable vomiting = 3. Results were assessed using appropriate statistics. P value <0.05 was considered significant.

Results

Table 1: Distribution of patients

Groups	Group A	Group B
Method	PaCO ₂ of 7–10 mm Hg	PaCO ₂ of 12–14 mm Hg
M:F	25:35	28:32

Group A comprised of 25 males and 35 females and group B had 28 males and 32 females [Table 1].

Table 2: Comparison of liver function test

LFT	Group A		P value	Group B		P value
	Pre	Post		Pre	Post	
ALP	168.4	148.5	<0.05	184.3	187.4	>0.05
AST	20.5	43.2	>0.05	20.4	37.6	<0.05
ALT	19.2	32.7	>0.05	21.3	32.5	<0.05
BILLT	0.60	0.67	>0.05	0.61	0.72	<0.05
BILLD	0.20	0.32	>0.05	0.21	0.37	<0.05

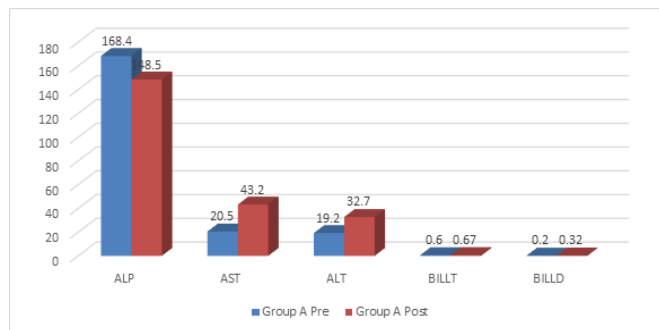


Figure 1: Comparison of liver function test in group A

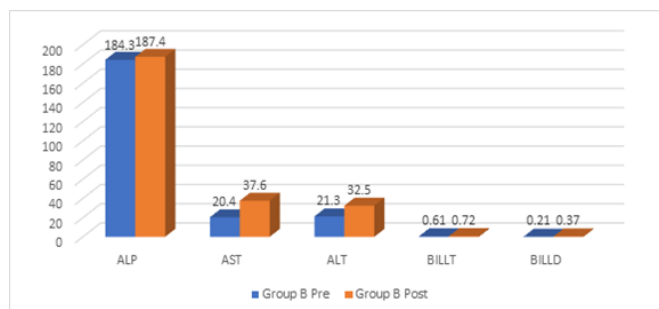


Figure 2: Comparison of liver function test in group B

The mean pre-operative and post-operative ALP (u/l) was 168.4 and 148.5, AST was 20.5 and 43.2, ALT (u/l) was 19.2 and 32.7, BILLT (u/l) was 0.60 and 0.67 and BILLD (u/l) was 0.20 and 0.32 in group A respectively. In group B was 184.3 and 187.4, 20.4 and 37.6, 21.3 and 32.5, 0.61 and 0.72 and 0.21 and 0.37 in group B respectively. A significant difference was observed (P< 0.05) [Table 2, Figure 1-2].

Table 3: Comparison of parameters

Parameters	Variables	Group A	Group B	P value
SBP (mm Hg)	At admission	128.6	120.2	<0.05
	After 1 hour	125.2	117.8	
	After 3 hours	127.4	113.4	
	After 6 hours	120.8	112.4	
DBP (mm Hg)	At admission	78.4	72.4	>0.05
	After 1 hour	71.8	70.8	
	After 3 hours	69.2	68.2	
	After 6 hours	70.4	68.4	
Heart rate (beats/min)	At admission	82.4	79.4	<0.05
	After 1 hour	85.2	81.2	
	After 3 hours	87.6	82.4	
	After 6 hours	81.4	83.2	

The mean SBP (mm Hg) at admission was 128.6 and 120.2, 1 hour after surgery was 125.2 and 117.8, 3 hours after surgery was 127.4 and 113.4 and 6 hours after surgery was 120.8 and 112.4 respectively in group A and group B. The mean DBP (mm Hg) at admission was 78.4 and 72.4, at 1 hour after surgery was 71.8 and 70.8, at 3 hours after surgery was 69.2 and 68.2 and at 6 hours after surgery was 70.4 and 68.4 in group A and group B respectively. The mean heart rate at admission was 82.4 and 79.4, at 1 hour after surgery was 85.2 and 81.2, at 3 hours after surgery was 87.6 and 82.4 and at 6 hours after surgery was 81.4 and 83.2 in group A and group B respectively. The difference was significant (P< 0.05) [Table 3, Figure 3].

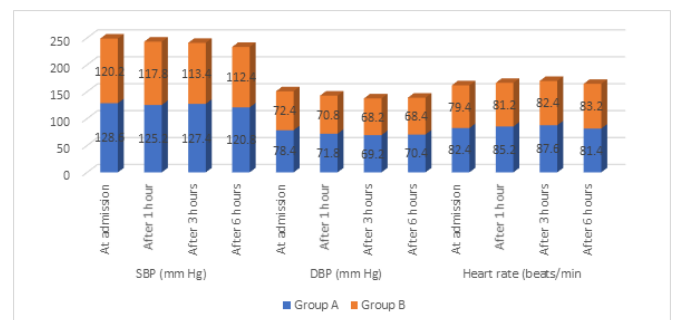


Figure 3: Comparison of parameters

Discussion

The gallstone is a common complication of biliary tract, and since 1882 surgery is the best common traditional method to remove it.^[8] Almost 10 % of the population has gallstones, and cholecystectomy is the most common surgical method to treat it in the Western countries.^[9] Pneumoperitoneum in laparoscopic surgery has been shown to increase postoperative pain and confer physiologic adverse effects to the patients. Peritoneal insufflation diminishes venous return and reduces cardiac output.^[10] Such changes may be dangerous in patients with a poor cardiac reserve. Studies have shown potential advantages of using lower pressure to

maintain pneumoperitoneum in performing LC.^[11] Recent prospective randomized studies showed significantly less postoperative shoulder-tip pain with similar conversion and complication rates when using lower-pressure pneumoperitoneum in performing inpatient LC.^[12] We selected present study to compare hemodynamic symptoms and the level of abdominal pain in high- versus low-pressure carbon dioxide in patients undergoing laparoscopic cholecystectomy.

Our results showed that group A comprised of 25 males and 35 females and group B had 28 males and 32 females. Mohammadzade AR et al,^[13] conducted a study in which abdominal pain at the site of surgery and shoulder-tip pain were evaluated in both groups based on the verbal rating scale (VRS) within 1, 3, 6, 12, and 24 h after the surgery. The level of nausea and vomiting were also recorded in the groups within 1, 3, 6, 12, and 24 h after the surgery. There was a significant difference between the groups regarding the mean of systolic blood pressure. The mean of heart rate was significantly higher in the high-pressure group during surgery and 1 hours after that ($P < 0.05$). The frequency of pain in shoulder-tip and abdomen was higher in the high-pressure group. Frequency of nausea and vomiting 12 hours after the surgery between two groups was significant ($P < 0.05$). The mean of alkaline phosphatase was higher in the low-pressure group than the high-pressure group ($P < 0.05$).

Our results showed that the mean pre-operative and post-operative ALP (u/l) was 168.4 and 148.5, AST was 20.5 and 43.2, ALT (u/l) was 19.2 and 32.7, BILTT (u/l) was 0.60 and 0.67 and BILLD (u/l) was 0.20 and 0.32 in group A respectively. In group B was 184.3 and 187.4, 20.4 and 37.6, 21.3 and 32.5, 0.61 and 0.72 and 0.21 and 0.37 in group B respectively. Sandhu et al,^[14] compared the frequency and intensity of shoulder tip pain between low-pressure (7 mm Hg) and standard-pressure (14 mm Hg). One hundred and forty consecutive patients undergoing elective laparoscopic cholecystectomy were randomized prospectively to either high- or low-pressure pneumoperitoneum and blinded by research nurses who assessed the patients during the postoperative period. The procedure was successful in 68 of 70 patients in the low-pressure group compared with in 70 patients in the standard group. Operative time, number of analgesic injections, visual analogue score, and length of postoperative days were similar in both groups. Incidence of shoulder tip pain was higher in the standard-pressure group, but not statistically significantly so (27.9% versus 44.3%) ($p = 0.100$).

We observed that there was significant difference in systolic blood pressure and heart beat recorded at 1 hour, 3 hours and 6 hours in group A and B. Chok et al,^[15] had 40 inpatient who underwent low-pressure pneumoperitoneum laparoscopic cholecystectomy (LPLC). Less shoulder-tip pain was observed in the LPLC group though without significant difference (5% vs. 20%; $P=0.151$). 3 patients in the LPLC group needed higher insufflation pressure (12 mm Hg) because of inadequate exposure and adhesions, and the operations were successful in all of them. Otherwise, no conversion to open procedure was noted in both groups. The consumption of analgesics was minimal and a high level of satisfaction was achieved in both groups of patients. No difference in LPLC and standard-pressure

pneumoperitoneum laparoscopic cholecystectomy in the outcomes of outpatient LC was seen. Routine use of lower-pressure pneumoperitoneum in outpatient LC would not be recommended unless in selected straightforward cases.

Conclusion

Low pressure CO₂ had benefit over high- pressure CO₂ in laparoscopic cholecystectomy.

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