

Original Article

High and low-pressure carbon dioxide in patients undergoing laparoscopic cholecystectomy

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ABSTRACT:

Background: Gallstones are hardened deposits of the digestive fluid bile, that can form within the gallbladder. The present study was conducted to compare high and low-pressure carbon dioxide in patients undergoing laparoscopic cholecystectomy. **Materials & Methods:** 90 patients of cholelithiasis of both genders were randomly divided into 2 groups of 45 each. Group I experienced PaCO₂ (high pressure) of 12-14 mmHg and group II (low- pressure), 7–10 mmHg. **Results:** There were 21 males and 14 females in group I and 24 males and 11 females in group II. SBP (mm Hg) at admission in group I and group II was 128.4 and 120.4, 1 hour after surgery was 124.2 and 116.8, 3 hours after surgery was 126.4 and 112.4 and 6 hours after surgery was 120.2 and 110.4 respectively. DBP (mm Hg) at admission in group I and group II was 76.4 and 72.0, at 1 hour after surgery was 72.4 and 70.3, at 3 hours after surgery was 70.2 and 68.5 and at 6 hours after surgery was 71.4 and 68.2 respectively. The mean heart rate at admission was 82.0 and 78.4, at 1 hour after surgery was 86.2 and 80.2, at 3 hours after surgery was 88.6 and 81.2 and at 6 hours after surgery was 80.4 and 84.2 in group I and group II respectively. The difference was significant (P< 0.05). There was significant difference in AST, ALT, ALP, BILIT and BILLD level pre- operatively and post- operatively in group I and II (P<0.05). **Conclusion:** Low pressure CO₂ found to be superior as compared to high-pressure CO₂ in laparoscopic cholecystectomy.

Key words: laparoscopic cholecystectomy, Gall stones, Systolic blood pressure

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INTRODUCTION

Gallstones are hardened deposits of the digestive fluid bile, that can form within the gallbladder. They vary in size and shape from as small as a grain of sand to as large as a golf ball. Gallstones occur when there is an imbalance in the chemical constituents of bile that result in precipitation of one or more of the components. Gallstone disease is often thought to be a major affliction in modern society. However, gallstones must have been known to humans for many years.¹

The gallstone is a common complication of biliary tract, and since 1882 surgery is the best common traditional method to remove it. Almost 10 % of the population has gallstones, and cholecystectomy is the most common surgical method to treat it in the Western countries.² 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. It is about

20 years that LC is practiced in Iran. 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 %.³

To reduce the complications, surgeons tend to use gases with 7–10 mmHg pressure instead of the standard pressure.⁴ Using lower-pressure gases for the elderly and patients with chronic respiratory and cardiovascular diseases obtain good results. Less shoulder-tip pain and increasing the quality of life after the surgery are other advantages of this method.⁵ On the other hand, using lower-pressure gases limits clear viewing of surgical site, prolongs the surgery time, and increases the complications which may lead the surgeon to use standard pressure and open surgery.⁶ The present study was conducted to compare high and low-pressure carbon dioxide in patients undergoing laparoscopic cholecystectomy.

MATERIALS & METHODS

The present study comprised of 90 patients of cholelithiasis of both genders. All were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. Patients were randomly divided into 2 groups of 45 each. Group I experienced PaCO₂ (high pressure) of 12-14 mmHg and group II (low- pressure), 7-10

mmHg. The hemodynamic symptoms, abdominal pain, shoulder-tip pain, nausea and vomiting after the surgery, and the mean of liver function tests were evaluated. Abdominal pain at the site of surgery and shoulder-tip pain were evaluated based on the verbal rating scale (VRS) within 1, 3, 6, 12, and 24 hours after the surgery. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II
Status	High pressure	Low pressure
M:F	21:14	24:11

Table I shows that there were 21 males and 14 females in group I and 24 males and 11 females in group II.

Table II Comparison of parameters

Parameters	Variables	Group I	Group II	P value
SBP (mm Hg)	At admission	128.4	120.4	0.01
	1 hour after surgery	124.2	116.8	
	3 hours after surgery	126.4	112.4	
	6 hours after surgery	120.2	110.4	
DBP (mm Hg)	At admission	76.4	72.0	0.07
	1 hour after surgery	72.4	70.3	
	3 hours after surgery	70.2	68.5	
	6 hours after surgery	71.4	68.2	
Heart rate (beats/min)	At admission	82.0	78.4	0.02
	1 hour after surgery	86.2	80.2	
	3 hours after surgery	88.6	81.2	
	6 hours after surgery	80.4	84.2	

Table II, graph I shows that SBP (mm Hg) at admission in group I and group II was 128.4 and 120.4, 1 hour after surgery was 124.2 and 116.8, 3 hours after surgery was 126.4 and 112.4 and 6 hours after surgery was 120.2 and 110.4 respectively. DBP (mm Hg) at admission in group I and group II was 76.4 and 72.0, at 1 hour after surgery was 72.4 and

70.3, at 3 hours after surgery was 70.2 and 68.5 and at 6 hours after surgery was 71.4 and 68.2 respectively. The mean heart rate at admission was 82.0 and 78.4, at 1 hour after surgery was 86.2 and 80.2, at 3 hours after surgery was 88.6 and 81.2 and at 6 hours after surgery was 80.4 and 84.2 in group I and group II respectively. The difference was significant (P< 0.05).

Graph I Comparison of parameters

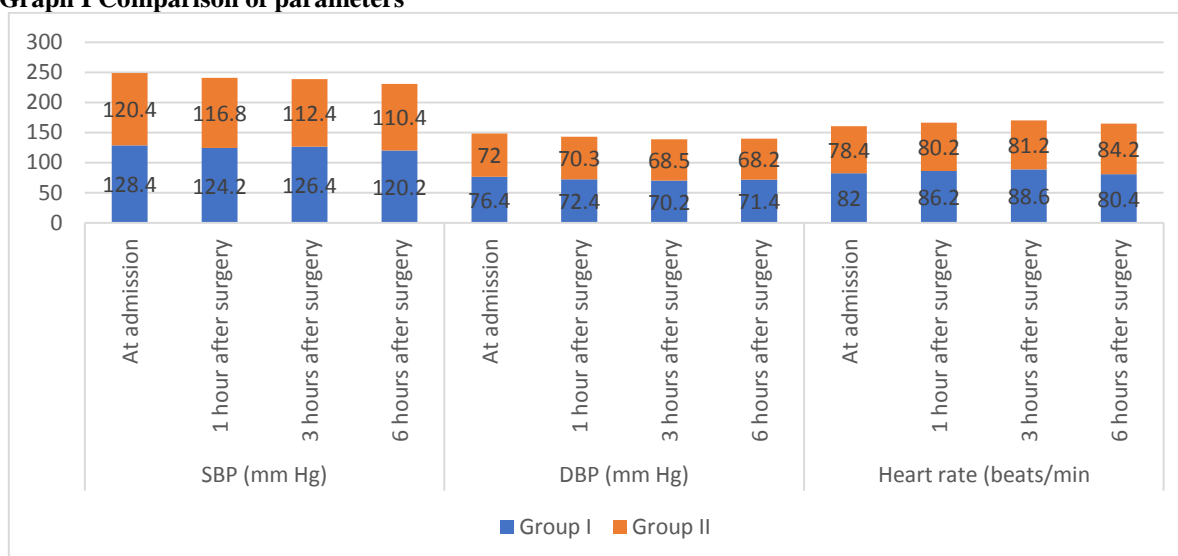
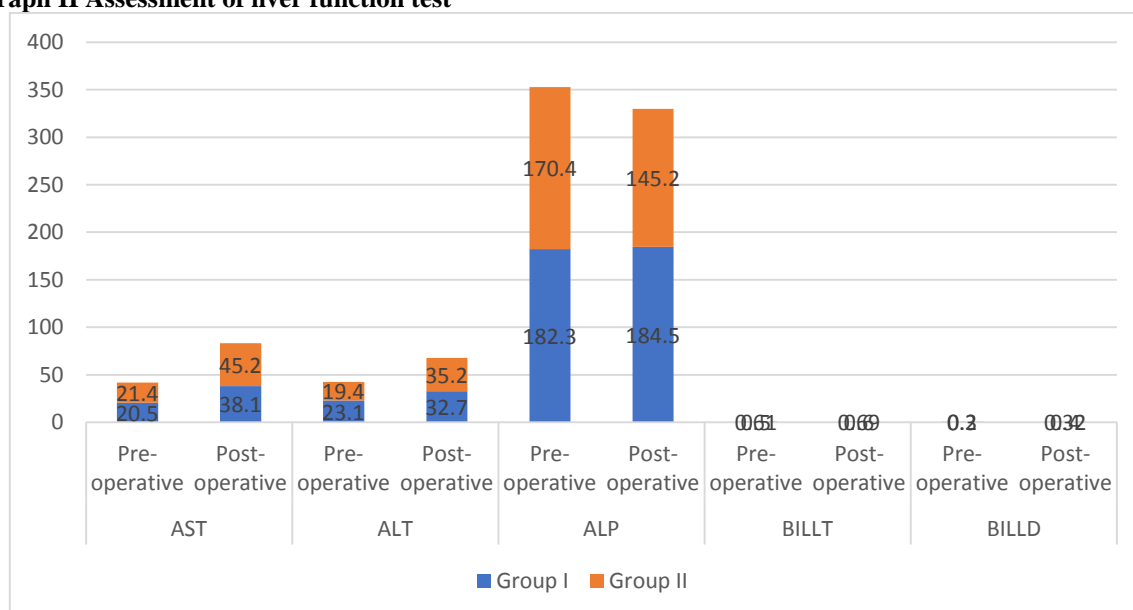


Table III Assessment of liver function test

Parameters	Variables	Group I	Group II	P value
AST	Pre- operative	20.5	21.4	0.03
	Post- operative	38.1	45.2	
ALT	Pre- operative	23.1	19.4	0.01
	Post- operative	32.7	35.2	
ALP	Pre- operative	182.3	170.4	0.05
	Post- operative	184.5	145.2	
BILLT	Pre- operative	0.5	0.61	0.02
	Post- operative	0.6	0.69	
BILLD	Pre- operative	0.3	0.2	0.01
	Post- operative	0.4	0.32	

Table III, graph II shows that there was significant difference in AST, ALT, ALP, BILLT and BILLD level pre-operatively and post-operatively in group I and II ($P < 0.05$).

Graph II Assessment of liver function test

DISCUSSION

Cholecystectomy is one of the most common abdominal surgical procedures in developed countries.⁷ Since its introduction in the late 1980s, laparoscopic cholecystectomy (LC) has replaced open cholecystectomy (OC) as the treatment of choice for symptomatic gallstones.⁸ Beneficial effects of LC have been demonstrated in studies showing the advantages from real-life settings using secondary databases. Laparoscopic cholecystectomy (LC) has gained widespread popularity for treatment of symptomatic cholelithiasis.^{9,10} The present study was conducted to compare high and low-pressure carbon dioxide in patients undergoing laparoscopic cholecystectomy.

We found that there were 21 males and 14 females in group I and 24 males and 11 females in group II. Mohammadzade et al¹¹ compared the hemodynamic symptoms and the level of abdominal pain due to using high and low-pressure carbon dioxide in patients undergoing LC. The current double-blind randomized clinical trial was conducted on 60 patients with the age range of 20–70 years old undergoing LC.

The first and second groups experienced PaCO₂ of 7–10 and 12–14 mmHg, respectively. The hemodynamic symptoms, abdominal pain, shoulder-tip pain, nausea and vomiting after the surgery, and the mean of liver function tests were evaluated. There was a significant difference between the groups regarding the mean of systolic blood pressure ($P < 0.05$). The mean of heart rate was significantly higher in the high-pressure group during surgery and 1 hour 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 h 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 ($P < 0.05$). Considering the good performance and low side effects of low-pressure laparoscopic cholecystectomy compared to those of high-pressure, this method can be replaced by high-pressure in LC.

We found that SBP (mm Hg) at admission in group I and group II was 128.4 and 120.4, 1 hour after surgery was 124.2 and 116.8, 3 hours after surgery was 126.4 and 112.4 and 6 hours after surgery was 120.2 and

110.4 respectively. DBP (mm Hg) at admission in group I and group II was 76.4 and 72.0, at 1 hour after surgery was 72.4 and 70.3, at 3 hours after surgery was 70.2 and 68.5 and at 6 hours after surgery was 71.4 and 68.2 respectively. The mean heart rate at admission was 82.0 and 78.4, at 1 hour after surgery was 86.2 and 80.2, at 3 hours after surgery was 88.6 and 81.2 and at 6 hours after surgery was 80.4 and 84.2 in group I and group II respectively. Vezakis et al¹² that compared the level of pain between the low-pressure and without pressure groups, there was no significant difference regarding the level of abdominal pain between the groups; but because of prolonged surgery, the shoulder-tip pain was more in the high-pressure group.

We found that there was significant difference in AST, ALT, ALP, BILLT and BILLD level pre-operatively and post-operatively in group I and II ($P < 0.05$). Kanwer et al¹⁵ compared the results of two CO₂ pneumoperitoneum pressures, 10 and 14 mmHg, and reported no significant difference between the groups regarding the levels of systolic and diastolic blood pressures, heart rate, and pain, 6 hours after the surgery, although the results were lower in the low-pressure group.

CONCLUSION

Authors found that low pressure CO₂ found to be superior as compared to high-pressure CO₂ in laparoscopic cholecystectomy.

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