Section: Research Paper

A PROSPECTIVE RANDOMIZED, CONTROLLED STUDY COMPARING LOW PRESSURE V/S STANDARD PRESSURE CO2 PNEUMOPERITONEUM DURING LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background: Laparoscopic cholecystectomy is generally performed by inflating the tummy with carbon dioxide gas to permit the organs and structures within the tummy to be viewed so that the surgery can be performed. The present study was conducted to compare low pressure and standard pressure CO2 pneumoperitoneum during laparoscopic cholecystectomy.

Materials & Methods:58 patients with uncomplicated symptomatic cholelithiasis of both genders were divided into 2 groups of 29 each. Group I was standard pressure pneumoperitoneum and group II was low pressure pneumoperitoneum group. Parameters such as duration of surgery, intra-operative gas consumption, post-operative shoulder tip pain (NPRS Score) in 1st 6 hours and mean arterial pressure (mm of hg) was recorded.

Results: Group I had 10 males and 19 females and group II had 11 males and 18 females. Duration of surgery (mins) was 52.4 and 54.8, surgical field visualisation difficulty was seen in 6 and 10, intra-operative gas consumption (litres) was 110.4 and 103.5, bile spillage was seen in 4 and 7, drain was used in 9 and 12, post-operative shoulder tip pain (NPRS Score) in 1st 6 hours was 4.5 and 3.1 and mean arterial pressure (mm of hg) was 1.2 and 0.94 in group I and group II respectively. The difference was significant ($P< 0.05$).

Conclusion: Laparoscopic cholecystectomy in low pressure pneumoperitoneum at 10 mm of hg pressure is safe and feasible.

Key words:symptomatic cholelithiasis, laparoscopic cholecystectomy, pressure pneumoperitoneum

Introduction

Gallstones are present in about 5% to 25% of the adult Western population. Between 2% and 4% become symptomatic within a year.[1,2] Symptoms include pain related to the gallbladder (biliary colic), inflammation of the gallbladder (cholecystitis), obstruction to the flow of bile from the liver and gallbladder into the small bowel resulting in jaundice (yellowish discolouration of the body usually most prominently noticed in the white of the eye, which turns yellow), bile infection (cholangitis), and inflammation of the pancreas, an organ that secretes digestive juices and harbours the insulin-secreting cells that maintain blood sugar level (pancreatitis).[3] Removal of the gallbladder (cholecystectomy) is currently considered the best treatment option for patients with symptomatic gallstones. This is generally performed by key-hole surgery (laparoscopic cholecystectomy).[4] Laparoscopic cholecystectomy is generally performed by inflating the tummy with carbon dioxide gas to permit the organs and structures within the tummy to be viewed so that the surgery can be performed. The gas pressure used to inflate the tummy is usually 12 mm Hg to 16 mm Hg (standard pressure).[5] However, this causes alterations in the blood circulation and may be detrimental. To overcome this, lower pressure has been suggested as an alternative to standard pressure. However, using lower pressure may limit the surgeon's view of the organs and structures within the tummy, possibly resulting in inadvertent damage to the organs or structures.[6]The present study was conducted to compare low pressure and standard pressure CO2 pneumoperitoneum during laparoscopic cholecystectomy.

Materials & Methods

The present consisted of 58 patients with uncomplicated symptomatic cholelithiasis of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 29 each. Group I was standard pressure pneumoperitoneum and group II was low pressure pneumoperitoneum group. Parameters such as duration of surgery, intra-operative gas consumption, post-operative shoulder tip pain (NPRS Score) in 1st 6 hours and mean arterial pressure (mm of hg) was recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of patients

Groups	Group I (SPP)	Group II (LPP)
M:F	10:19	11:18

Table I shows that group I had 10 males and 19 females and group II had 11 males and 18 females.

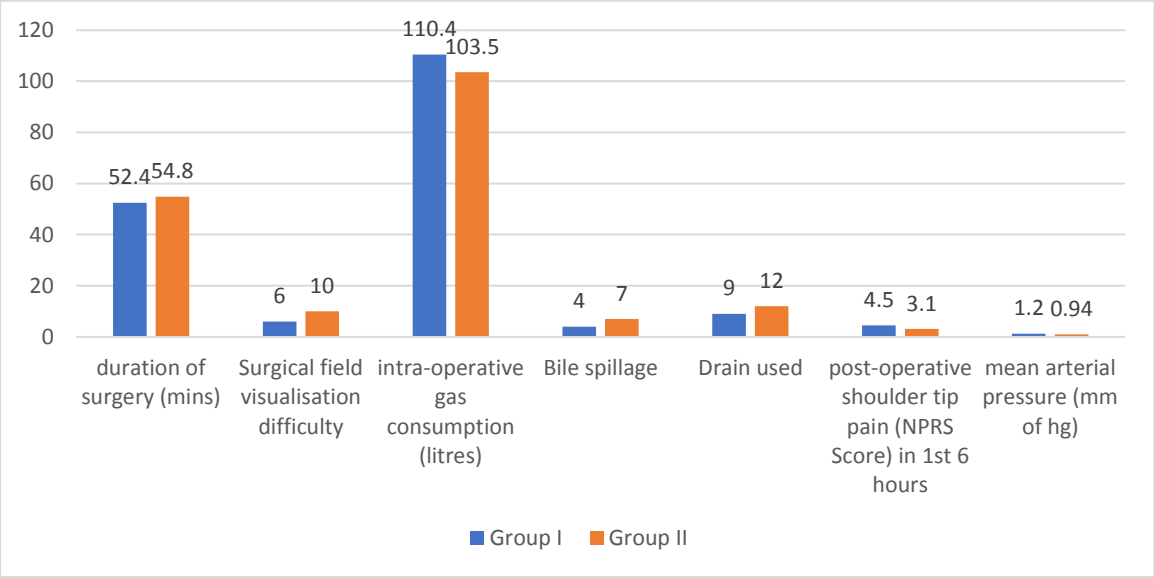
Table II Comparison of parameters

Parameters	Group I	Group II	P value
duration of surgery (mins)	52.4	54.8	0.82
Surgical fieldvisualisationdifficulty	6	10	0.05
intra-operative gas consumption (litres)	110.4	103.5	0.17

Bile spillage	4	7	0.05
Drain used	9	12	0.04
post-operative shoulder tip pain (NPRS Score) in 1st 6 hours	4.5	3.1	0.01
mean arterial pressure (mm of hg)	1.2	0.94	0.05

Table II, graph I shows that duration of surgery (mins) was 52.4 and 54.8, surgical field visualisation difficulty was seen in 6 and 10, intra-operative gas consumption (litres) was 110.4 and 103.5, bile spillage was seen in 4 and 7, drain was used in9 and 12, post-operative shoulder tip pain (NPRS Score) in 1st 6 hours was 4.5 and 3.1 and mean arterial pressure (mm of hg) was 1.2 and 0.94 in group I and group II respectively. The difference was significant (P< 0.05).

Graph IComparison of parameters



Discussion

Minimally invasive surgery, or laparoscopic surgery, describes an era that crosses all traditional disciplines and has changed the face of general surgery, with the goal to make operative procedures more patient and surgeon friendly.[7,8] Laparoscopic cholecystectomy is the most common laparoscopic intervention done worldwide. Laparoscopic surgery requires creation of pneumoperitoneum by insufflation of carbon dioxide or other gases to a standard pressure of 10-14 mm of Hg and a constant pressure is maintained till the end of surgery. Air, oxygen, nitrous oxide apart from carbon-dioxide can be used in the creation of pneumoperitoneum.[9]International guidelines recommend that the use of "the lowest intra-abdominal pressure allowing adequate exposure of the operative field rather than a routine pressure" should be used due to minimize the impact of pneumoperitoneum on normal physiology and the positive impact on postoperative pain.[10] Low pressure pneumoperitoneum is defined as a pressure of 6-10 mm Hg. The main concern about low-pressure pneumoperitoneum is its safety in terms of inadequate exposure resulting in the longer than usual operating time, increased rate of intra-operative complications and also possibly

increased frequency of conversion to open cholecystectomy.[11]The present study was conducted to compare low pressure and standard pressure CO2 pneumoperitoneum during laparoscopic cholecystectomy.

We found that group I had 10 males and 19 females and group II had 11 males and 18 females. Aggarwal et al[12]assessed the impact of high pressure and low pressure pneumoperitoneum in selected group of patients undergoing laparoscopic cholecystectomy. Sixty patients with confirmed diagnosis of chronic cholecystitis with cholelithiasis undergoing laparoscopic cholecystectomy were randomised into two groups. Group I- in which low pressure pneumoperitoneum (14 mm of Hg) was used intra-operatively. There was no significant difference in bilirubin and ALP in both the groups but serum Aspartate Aminotransferase (AST) and Alkaline phosphatase (ALP) were raised significantly postoperatively in group II patients. Operative time, hospital stay and time to return to normal routine was less in group I postoperatively but this was statistically non-significant.

We found that duration of surgery (mins) was 52.4 and 54.8, surgical field visualisation difficulty was seen in 6 and 10, intra-operative gas consumption (litres) was 110.4 and 103.5, bile spillage was seen in 4 and 7, drain was used in 9 and 12, post-operative shoulder tip pain (NPRS Score) in 1st 6 hours was 4.5 and 3.1 and mean arterial pressure (mm of hg) was 1.2 and 0.94 in group I and group II respectively. Mandal et al[13] in their study 66 participants were allocated into two arms i.e. low-pressure pneumoperitoneum (LPP) and standard pressure pneumoperitoneum (SPP). The necessary data were collected using laboratory investigations, clinical examination and perioperative findings. Mean duration of surgery, surgical difficulty and field visualization difficulty were insignificantly greaterin LPP group than SPP group. CO2 consumption was significantly less in LPP. Incidence of bile spillage, usage of drain was insignificantly increased in LPP. Post-operative pain was significantly greater in SPP group. Time for per oral tolerance of food and incidence of nausea were significantly greater in SPP group. Standard pressure group needed significantly more tramadol injection than LPP. There were no significant haemodynamic changes in SPP group compared to LPP group. Length of hospital stay was significantly greater in SPP.

Gurusamyet al[14]assessed the benefits and harms of low pressure pneumoperitoneum compared with standard pressurepneumoperitoneum in people undergoing laparoscopic cholecystectomy.A total of 1092 participants randomly assigned to the low pressure group (509 participants) and the standard pressure group (583 participants) in 21 trials. One trial including 140 participants was at low risk of bias. The remaining 20 trials were at high risk of bias. The overall quality of evidence was low or very low. No mortality was reported in either the low pressure group (0/199; 0%) or the standard pressure group (0/235; 0%) in eight trials that reported mortality. One participant experienced the outcome of serious adverse events (low pressure group 1/179, 0.6%; standard pressure group 0/215, 0%; seven trials; 394 participants; RR 3.00; 95% CI 0.14 to 65.90; very low quality evidence). Quality of life, return to normal activity, and return to work were not reported in any of the trials. The difference between groups in the conversion to open cholecystectomy was imprecise (low pressure group 2/269, adjusted proportion 0.8%; standard pressure group 2/287, 0.7%; 10 trials; 556 participants; RR 1.18; 95% CI 0.29 to 4.72; very low quality evidence) and was

compatible with an increase, a decrease, or no difference in the proportion of conversion to open cholecystectomy due to low pressure pneumoperitoneum. No difference in the length of hospital stay was reported between the groups (five trials; 415 participants; MD -0.30 days; 95% CI -0.63 to 0.02; low quality evidence). Operating time was about two minutes longer in the low pressure group than in the standard pressure group.

The limitation the study is small sample size.

Conclusion

Authors found that laparoscopic cholecystectomy in low pressure pneumoperitoneum at 10 mm of hg pressure is safe and feasible.

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