Journal of Rawalpindi Medical College (JRMC); 2019;23(1): 85-88

Original Article

Comparison of High Versus Low Intra-Peritoneal Carbon Dioxide Pressure on Abdominal Pain, Hemodynamic Symptoms and Liver Function Tests in Patients Undergoing Laparoscopic Cholecystectomy.

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Abstract

Background: To compare the intensity of abdominal pain, hemodynamic symptoms and liver function tests due to usage of low and high-pressure CO_2 in individuals undergoing laparoscopic cholecystectomy (LC).

Methods: A randomized double blind clinical trial was conducted on a sample of 60 patients who were undergoing LC. Patients within the age limit of 20-70 years were incorporated in the study. Patients were separated into 2 groups; the first group was administered to a $PaCO_2$ of 7-10 mmHg while the second group was administered to a $PaCO_2$ of 12-14 mmHg. The abdominal pain, liver function tests and hemodynamic symptoms were checked. Data analysis was done using SPSS version 19.0.

Results:A significant statistical variation ($p< 0.05$) was seen among systolic blood pressure of the two groups. Similarly a statistically significant variation was observed among the mean of heart rates. The mean heart rate of the high-pressure group was high during surgery and 1 h after operation ($P < 0.05$). High pressure group had high value of abdominal pain.

Conclusion: Due to quality and less side effects, low-pressure LC technique is better than high-pressure laparoscopic cholecystectomy.

Key Words: Gallstones, Laparoscopic cholecystectomy, Low-pressure, High-pressure.

Introduction

In LC,for a better view of the surgical position, CO_2 is used at a certain pressure. Nowadays gallstones are considered as a widespread problem of biliary tract. In 1882 surgery for gallstones was advised as the finest traditional technique for cholelitheasis .Approximately 10%of the people have gallstones and cholecystectomy is the finest and mainly the most familiar surgical technique for treatment of gallstones in Western countries.[1,2] Now trends have changed and nowadays, LC is considered as standard for treatment of gallstones. LC was proposed by Dubois in 1988 and was slowly turned into advanced technique by monitors and video systems.[3] This technique is now very common in Pakistan and is being preferred by patients as well as physicians.

The consequent preferences of LC have empowered patients and specialists toward embracing this technique. The upsides of LC incorporate; short healing facility stay, small cuts, less symptoms, lesser post-medical procedure torment, brisk come back to common exercises, and passing rate under 1 %.[1, 2] To secure satisfactory outcomes, the area of medical procedure ought to be observably seen all through LC. Pneumoperitoneum is a solitary strategy to exhibit this state.[4] In this strategy, CO_2 enters the peritoneum and the pressure is held steady up to the closure of procedure, the ports are evacuated under a similar pressure.[5] The normal pressure to create pneumoperitoneum in LC is 12– 14 mmHg. This high pressure is additionally connected with intricacies that regularly happen consequent to the broadened and complex medical procedure. Difficulties additionally emerge due to the reverse trendelenburg position and dissemination of CO_2 to peritoneum (pneumoperitoneum). These complexities incorporate; decrease in lung limit, changes in the measure of blood gases, hemodynamic inconveniences, increment in liver chemicals, renal disappointment,and heightening post-agent intra-stomach venous weight.[6–8]

Surgeons have noticed the complications that arise from use of high pressure CO_2. Keeping the complications under observation advances have been

Figure 1 Calot's triangle dissected, cystic duct and cystic artery ligated

made to decrease the complications. Surgeons are now inclined to use gases with 7–10 mmHg pressure as a replacement for of the typical pressure.Utilizing the lower-pressure gases for the aged patients and patients reporting with chronic cardiovascular and respiratory diseases achieves fine outcomes. A reduced amount of shoulder-tip pain and escalating the value of life following the surgery are additional rewards of this process. In contrast to all these advantages using lower-pressure gases restricts clear presentation of surgical spots, which subsequently prolongs the time for surgery and increases the complications which in turn may direct the doctor to use typical pressure and open surgery.[6, 7]

Patients and Methods

A randomized clinical trial (Double-blind) was conducted on 60 patients who were undergoing LC in the selected health care facility. The study was carried out for a period of six months. Participants were divided randomly into two groups. Groups were formed on the basis of CO_2 pressure being administered. All patients who were in the age range of 20-70 years were selected. While patients were excluded if they had a rip apart gallbladder, bile duct stones, patients who were to undergo a major upper abdominal surgery, females who were expecting a baby, patients who had BMI more than 30 and less than 19, patients who had a fatty liver of grade 3 and 4, and patients who had prominent high levels of liver enzymes prior to the operation. Pneumoperitoneum with PaCO2 of 7– 10 mmHg was utilized for the main gathering (first group) while the pneumoperitoneum with PaCO2 of 12– 14 mmHg was utilized for the second gathering. The standard four-port technique, and general anesthesia were utilized as a part of the two gatherings. Anesthesia system was kept same for both the groups.

Calot's triangle was dissected with conventional monopolar electrocautery hook. Cystic duct and cystic artery were ligated with titanium clips (Figure 1). Gallbladder dissection was performed, extracted from epigastric port and hemostasis secured. CO_2 gas exsufflated and skin closed with polypropylene 2/0 suture.

Since it was a twofold blinded clinical trial so neither the patient nor the doctor thought about the gathering compose. Patients were encouraged to begin eating following 8 hours after procedure. Abdominal pain at the site of operation and shoulder-tip pain were noted in both groups. Evaluation of the pain was done on the basis of an oral/verbal rating scale(VRS). Rating was done within one, three, six, twelve, and twenty-four hours past the surgery. The verbal rating scale was scored on the basis that zero= no pain, 1=moderate pain, 2=medium pain (require one dosage of tranquilizer), 3=severe pain, and 4=intractable pain. To assess the intensity of liver enzymes such as alanine transaminase (ALT), aspartate transaminase (AST), bilirubin (BIL) and alkaline phosphatase (ALP), blood samples were taken from the subjects prior to and after 24 hours of surgery. The level of heart rate, body temperature and arterial blood pressure of the patients was noted during the surgery. All these parameters were also noted after one, three and six hours of operation. For inferential statistics continuous variables were reported using a t-test while categorical variables were explained by using a Chi-Square test. The parameter changes of both groups prior to and after the operation were reported by using ANOVA and repeated measurement were used.

Results

In first group 73.3% and in second group 94.7% were females . The mean age of the first group was recorded as 37±12.8 years (p=0.643). The mean weight of first group was recorded as 67.8±6.1 kg while mean weight of second group was recorded as 72.3±7.1 kg. No statistically significant difference was observed between the mean weight of both groups (p=0.214). A statistically significant difference (p=0.03) was observed between the mean systolic blood pressure of the two groups. Blood pressure readings for the groups were taken at specific intervals. The hemodynamic symptoms were observed using repeated measure ANOVA (Fig 2). On the contrary no statically significant difference was observed between the diastolic blood pressure values of the two groups (p=0.07), (Fig 3). The mean heart rate of the two groups differed significantly (p=0.002). The mean heart rates at the defined intervals were not same for the two groups under study. Variation was also observed between the heart rates during surgery and

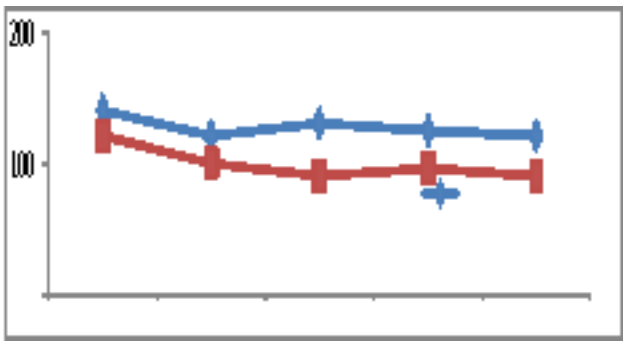

Figure 2: Systolic pressure values at high and low pressure (mmhg)

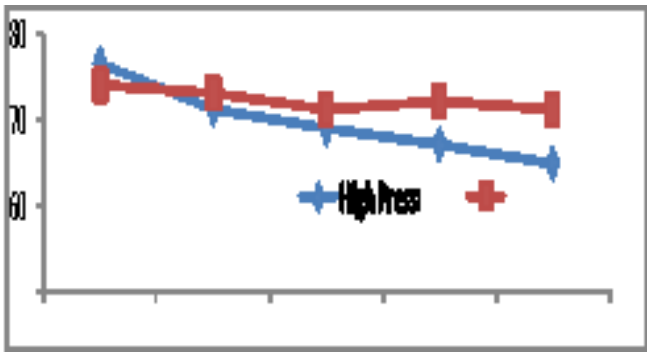

Figure 3: Diastolic pressure values at high and low pressure (mmhg)

Table 1: Liver function tests prior to and after the operation

	Post - Operation	Pre - Operation		Post - Operation	Pre- Operation	
AST	36.8±14.4	21.7±8.6	0.002*	44±30.1	21.7±6.2	0.002*
ALT	32±13.2	21.7±12.3	0.002*	33.4±16.5	178±7.6	0.002*
ALP	186±77.3	186±64	0.6	146±62.4	168.9±55	0.003*
Bili-Total	0.6±0.1	0.7±0.2	0.007	0.68±0.4	0.62±0.17	0.02*
Bili-Direct	0.2±0.2	0.3±0.2	0.02*	0.2±0.2	0.22±0.06	0.003*

*Level of significance was taken as; p-value < 0.05.

Table 2: Comparison of abdominal pain in two groups

Time Intervals	Pressure Groups	Scoring					p-value
		0	1	2	3	4	
One hour	Low Pressure	1	3	19	5	2	0.81
	High Pressure	0	5	13	10	2	
3 hours	Low Pressure	2	6	20	2	0	0.002*
	High Pressure	1	0	16	9	4	
Six hours	Low Pressure	2	14	12	1	1	0.03*
	High Pressure	1	7	16	4	2	
Twelve hours	Low Pressure	3	5	21	1	0	0.002*
	High Pressure	1	1	6	20	2	
Twenty-four hours	Low Pressure	7	23	0	0	0	0.003*
	High Pressure	1	23	4	2	2	

*Level of significance was taken as; p-value < 0.05.

one hour after surgery. Statistically Significant results were obtained for liver function tests , prior to and after the operation (Table1). Abdominal pain and its frequency were also checked for both the groups. The intensity of pain was checked at one, three, six, twelve and twenty-four hour duration after the operation (Table 2).

Discussion

Result of the present study demonstrated that patients in the two groups were having comparative statistical attributes. There was a vital variety between the groups concerning mean heart rate and mean systolic circulatory strain, methods for the low weight aggregate were lesser than people of the high-weight group ($p < 0.05$). No noteworthy variety was found in the methods for diastolic pulse of groups one and group two $P = 0.08$. Stomach injury was recorded less in the people who were experiencing low weight LC, with a special case of the primary hour following the medical procedure. LC is linked with improved maintenance of bodily functions as compared to open surgeries. The top benefits include fast hospital release, fewer post-operative complications, and less cost. Moreover, the post-operative pain is lesser in laparoscopic operations. Laparoscopy is extensively used in numerous surgeries and laparoscopic cholecystectomy is one of these .[9]

For better surgical outcomes, visibility of the operation site is very important. This also reduces the need for a second operation. For a successful surgery to be performed with a clear view of the surgical site CO2 is used. The concentration of CO_2 is directly proportional to the view of surgical site. The more the concentration of CO_2 throughout the surgery the better is the view of the surgical site. The high concentration of CO_2 is also related with a few complications. Keeping these complications in mind numerous studies are conducted on using different CO2 pressures throughout the operation for improved presentation of the surgical location and lesser complications.[10]

An incessant confusion of laparoscopy is diminished cardiovascular yield which emerges on account of the hemodynamic changes because of peritoneal insufflations of carbon dioxide. It is likewise related with the expanded hypertension, diminished respiratory capacity, and more prominent aviation route weight.[11] A study done by Detrex et al. results acquired from medical procedures with 15 and 7 mmHg PaCo2 are talked about. In perspective of the report gave by the previously mentioned authors it is accounted for that low cardiovascular yield and heart rate changes in the low-weight aggregate was a

considerable measure lesser than those of the high-weight gathering.

In an alternate report, Kanwer et al. thought about the result of two CO2 weights, 14 and 10 mmHg. The investigation demonstrated no important variety between the groups concerning the levels of systolic and diastolic blood weights. No critical change in heart rate and agony was accounted for after the medical procedure, despite the fact that the outcomes were lesser in the low-weight patients .[11] Stomach discomfort is more pronounced in high-weight group.[12-14]

In a study by Al– Dabbagh the level of post-agent injury was analyzed between low (8mmHg) and high weight (12mmHg) LC. Level of four, eight, twelve and twenty-four hour post-agent injury in guts was lesser in the low-weight gathering. A measurably critical difference was seen between the two gatherings (P = 0.02).[15] Results of the examination done by Al-Dabbag are in accordance with those of the present investigation.[10]

In the present study , the methods for liver compounds after the medical procedure were raised, than those of previously medical procedure in the two gatherings. There was a significant variety concerning the level of ALP between the gatherings; the mean was bring down in the low-weight gathering, however as indicated by Sayadi the distinction was seen in the level of LDH.[17]

Conclusion

Keeping in view the prevalent execution and low reactions of low-weight laparoscopic cholecystectomy it is exhorted that this strategy can be supplanted by high-weight laparoscopic cholecystectomy.

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Key for Contribution of Authors : A= Conception/ Study/ Designing /Planning; B= Experimentation/Study conduction;C=Analysis/Interpretation/ Discussion; D= Manuscript writing;E= Critical review;F= Facilitated for reagents/Material/Analysis