Comparative Study of Low Pressure Pneumoperitoneum versus Standard Pressure Pneumoperitoneum in Laparoscopic Cholecystectomy

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Abstract

Aim: - To evaluate the advantages and disadvantages of low pressure (8mmHg) in comparison to standard pressure pneumoperitoneum (12mmHg) in laparoscopic cholecystectomy.

Setting & Design: - Prospective study from April 2017 to March 2018 in the Department of General Surgery, Saraswathi Institute of Medical Sciences, Hapur.

Methods & Material: - A prospective randomized controlled trial incorporating 80 patients with symptomatic uncomplicated cholelithiasis who underwent laparoscopic cholecystectomy using a four port technique. All patients were divided randomly in two groups: 40 patients underwent LPLC (Low Pressure Laparoscopic Cholecystecomy) and another 40 patients underwent SPLC (Standard Pressure Laparoscopic Cholecystectomy). Factors included in statistical analysis were per-operative pulse, blood pressure, operative time, post-operative pain including shoulder tip pain, complication rate, conversion rate to SPLC, conversion rate to open cholecystectomy, postoperative hospital stay.

Statistical analysis: It was done using Chi-square test & Student t test.

Results: - No statistically significant difference was found in hemodynamic changes, postoperative pain including shoulder tip pain, mean operative time, mean hospital stay in both groups. Conversion from LPLC to SPLC was done in 4 cases. No case was converted to open cholecystectomy.

Conclusions: - Laparoscopic cholecystectomy can be safely performed at low pressure (8 mmHg) pneumoperitoneum.

Key Words: - *Cholelithiasis, pneumoperitoneum, LPLC, SPLC.*

Introduction

Commonest methods to create working space in the abdomen during laparoscopic cholecystectomy is pneumoperitoneum.[1] During laparoscopic surgery the pneumoperitoneum and the patient position induce pathophysiological changes that complicate anesthetic management. Pulmonary & hemodynamic changes are related to pneumoperitoneum pressure which is not a linear relationship. At low pressure (0-10mmHg), relatively few changes occur in a normovolemic healthy adult. Pneumoperitoneum with pressure range 12-14mmHg over prolonged periods is associated with adverse effects such as decreased pulmonary compliance , altered blood gas parameters, impaired functioning of circulatory system, raised liver enzymes, renal dysfunction and increased intraabdominal pressure.[3,4,5,6,7]

Aims & Objective: - To evaluate the advantages and disadvantages of low pressure (8mmHg) in comparison to standard pressure pneumoperitoneum (12mmHg) in laparoscopic cholecystectomy.

Design and Duration: - Prospective study from April 2017 to March 2018.

Setting: - Department of Surgery, Saraswathi Institute of Medical Sciences, Hapur.

Patients: - All patients with symptomatic uncomplicated cholelithiasis undergoing laparoscopic cholecystectomy.

Methodology: - Proper preoperative workup of all symptomatic patients of cholelithiasis of both sexes and age between 18 to 70 years was done. Patients with chronic liver disease, those unfit for surgery, age below 18 years, pregnancy, lactation, coagulopathy, CA Gall Bladder, Empyema Gall Bladder, Acute cholecystitis, previous abdominal surgery were excluded from were excluded from study. Total 80 patients were included in study. Written informed consent was taken from all patients. Approval for this study by local ethical committee was taken. All patients were divided randomly in two groups: A and B, equal in size (n=40).Four port laparoscopic cholecystectomy was performed by experienced laparoscopic surgeon's team. Group A patients underwent low pressure (8 mmHg) pneumoperitoneum laparoscopic cholecystectomy (LPLC). Group B patients underwent standard pressure (12 mmHg) laparoscopic cholecystectomy (SPLC). Intraoperative monitoring of heart rate & blood pressure was done noninvasively. Factors included in statistical analysis were per-operative pulse rate, blood pressure, operative time, post- operative pain including shoulder tip pain, complication rate, conversion rate to SPLC, conversion rate to OC, postoperative hospital stay.

Data Analysis: - Statistical analysis was done using Chi-square test & Student t test (unpaired). P- Value <0.05 was considered statistically significant.

Result

Total 80 patients underwent LC. Age group was 20 to 65 years.

70 patients were females and 10 patients were males. Group A included 40 patients who underwent LPLC. Group B included 40 patients who underwent SPLC. Tachycardia, hypertension after creation of pneumoperitoneum in both group was present but it was not statistically significant. ($P < 0.05$). Mean operative time was longer in LPLC as compared to SPLC but difference was not statistically significant. Conversion from LPLC to SPLC was done in 4 cases. Not a single case was converted in to open cholecystectomy. Postoperative pain including shoulder tip pain was same in both groups. Mean hospital stay was 2.46 days in LPLC vs. 2.26 days in SPLC. Laparoscopic cholecystectomy can be safely performed at low pressure (8 mmHg) pneumoperitoneum. Operative time is more if pressure is kept low.

Table - 1 : Comparative outcome between group A and group B of various parameters

S. No.	Parameters	GROUP A (LPLC) Patients	GROUP B (SPLC) Patients
1.	Mean Pulse Rate (beats per minute)	98	92
2.	Mean Blood Pressure (mmHg)	128.4/74.4	130.4/78.4
3.	Mean Operative Time (minutes)	58	48
4.	Mean Hospital Stay (days)	2.46	2.26
5.	Shoulder Tip Pain	2	2
6.	Gall Bladder Perforation	2	1
7.	Conversion to Open Cholecystectomy	0	0
8.	Conversion to SPLC	4	-
9.	Complication Rate	0	0

Table 1 shows a comparative outcome of different parameters, between two groups, the difference between mean pulse rate (beats per minute) is of 6 beats only. The difference between SBP and DBP between two groups is minimal. The mean operative time difference (in minutes) is of 10 minutes only. Shoulder tip pain in both group is same. The difference between gall bladder perforation is of 1 only. The conversion was not needed in both the groups patients. Conversion of LPLC patient to SPLC was 4. No significant complication were seen in both the groups.

Discussion

The main aim of minimally access surgery is to reduce post- operative pain, post-operative hospital stay and other morbidities. Causes of post-operative pain following laparoscopic cholecystectomy are port site tissue injury, gall bladder bed, peritoneal & diaphragmatic stretch due to pnuemoperitoneum, stimulation of sympathetic nervous system by hypercarbia, Chemical irritation of peritoneum by CO_2 & resultant carbonic acid formation.[6,7] Many studies have reported that the incidence & intensity of postoperative pain including shoulder tip pain was less in low pressure pneumoperitoneum group as compared to standard pressure pneumoperitoneum groups. [8,910,11,12.] Also low pressure pneumoperitoneum results in lesser hemsodynamic changes as compared to standard pressure pneumoperitoneum in many studies.[9,10,11.] In our study there is no statistically significant difference in haemodynamics in both groups. Conversion from SPLC to LPLC was done in four cases in our study. Main reason for this was bleeding & adhesions requiring adequate exposure which was not possible in LPLC as suction of CO_2 along with blood resulting in decreased space demanded intra-abdominal pressure 14 mmHg.

Conclusion

Low pressure pneumoperitoneum with adequate exposure should be recommended in Laparoscopic cholecystectomy in uncomplicated GSD. Operative time is more if pressure is kept low. Advantage of low pressure pneumoperitoneum is decreased post-operative pain including shoulder tip pain.

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Ethical Clearance:- Taken from ethical committee.

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