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COMPARATIVE EVALUATION OF POSTOPERATIVE PAIN FOLLOWING LOW PRESSURE VERSUS STANDARD PRESSURE CARBOPERITONEUM AFTER LAPAROSCOPIC CHOLECYSTECTOMY

Anaesthesiology

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ABSTRACT

Background: Laparoscopic cholecystectomy is commonly performed using standard pressure carboperitoneum, but low-pressure techniques have been proposed to reduce postoperative pain. **Methods:** A prospective observational study involving 120 patients undergoing elective laparoscopic cholecystectomy was conducted in General Surgery Department of Assam Medical College and Hospital. The patients were later divided to two groups based on the intraabdominal pressure generated during carboperitoneum: low pressure (Group I, n=60) and standard pressure (Group II, n=60). Visual Analog Scale (VAS) were used to assess pain at 1,2,4,8, 12, and 24 hours postoperatively. **Results:** The VAS score of Group I was found to be significantly lower than Group II at 1,2,4,8,12 and 24 hours postoperatively ($p<0.05$). The postoperative rescue analgesia requirement was also significantly less in Group I as compared to Group II **Conclusion:** Low pressure carbo-peritoneum is associated with reduced postoperative pain in the early postoperative period without compromising surgical outcomes.

KEYWORDS

Laparoscopic cholecystectomy, low pressure, standard pressure, carboperitoneum, postoperative pain

INTRODUCTION:

Laparoscopic cholecystectomy is the gold standard treatment for symptomatic cholelithiasis and chronic cholecystitis[1]. Despite being minimally invasive, patients frequently report postoperative pain. The origin of pain varies. It can arise from the site of access ports, from the dissected viscera or due to carboperitoneum. Post-operative pain prolongs hospital stay and leads to increased morbidity and financial burden. One modifiable factor is the pressure of the pneumoperitoneum created during surgery[2]. While standard pressures (12–14 mmHg) are widely used, low pressures (8–10 mmHg) have been suggested to decrease visceral irritation and reduce pain[3]. Pain due to carboperitoneum occurs due to peritoneal stretching and diaphragmatic irritation. Shoulder tip pain occurs due to over-stretching of the diaphragmatic muscle due to pressure of carbon dioxide insufflation and residual pockets of gas in abdominal cavity[4]. This study aims to compare postoperative pain between low and standard pressure carboperitoneum.

METHODS:

We conducted an observational study on the patients aged 18 to 65 years, belonging to ASA grade I and II, undergoing elective laparoscopic cholecystectomy for chronic calculus cholecystitis in the General Surgery Operation Theatre of Assam Medical College and Hospital after obtaining permission from the patient and the Institutional Ethics Committee. Normal gall bladder anatomy and bile duct morphology in preoperative ultrasonography were also an important prerequisite for the study from surgical point of view.

The patients with compromised cardiac or pulmonary status, bleeding disorders and those who needed conversion from laparoscopic cholecystectomy to open cholecystectomy were excluded from the study. A detailed pre-anaesthetic examination was done on the day prior to the planned surgery. On shifting the patient to the operation theatre, standard monitors were connected and baseline hemodynamic parameters such as systolic blood pressure, diastolic blood pressure, heart rate and oxygen saturation (SpO2) were recorded. A peripheral intravenous cannula of appropriate size was placed and all the patients were uniformly given Inj. Glycopyrrolate 4ug/kg IV and Inj. Fentanyl 1-1.5 µg/kg IV as premedication followed by Infusion Ringer Lactate 5 -10ml/kg/hr. Patients received preoxygenation with 100% oxygen for 3 minutes and were induced with Inj. Propofol 1-2mg/kg and Inj. Rocuronium 0.6 mg/kg, followed by the placement of an I-gel of appropriate size. Anaesthesia was maintained with 1% sevoflurane in a 50% oxygen/nitrous oxide mixture.

Patients were divided into two groups based on the difference in the intraabdominal pressure generated during carbo-peritoneum:

- **Group I (low pressure):** Pneumoperitoneum maintained at 8–10 mmHg
- **Group II (standard pressure):** Pneumoperitoneum maintained at 12–14 mmHg

The postoperative pain was assessed using the Visual Analog Scale (VAS) at 1, 2,4, 8, 12, and 24 hours postoperatively. The postoperative rescue analgesic requirement was also recorded in the first 24 hours. Patients demanding rescue analgesia were given Inj. Fentanyl 20µg IV when the pain score was greater than or equal to 4. The study continued until the sample size of 60 patients were achieved in each group.

Sample Size Calculation: The sample size for this present study was calculated and rounded off to be total of 120 patients with 60 in each group, considering 95% confidence interval with 80% power.

Statistical Methods: Analysis was done on MS Excel using appropriate statistical methods like Chi-square test, ANOVA and T-test etc. To describe about the data for continuous variables was presented as mean ± standard deviation, frequency analysis used for descriptive data and percentage analysis was used for categorical variables. To find the significance difference in continuous data between the groups, independent student t-test was used. For multivariate analysis the repeated measures of two-way ANOVA test (analysis of variance) were used. To find the significance in categorical data Chi-square test was used. The probability value < 0.05 is considered as significant level in all the above statistical analysis.

Outcome Measures:

Primary Outcome Measures: The intensity of postoperative pain in laparoscopic cholecystectomy following low pressure versus standard pressure carboperitoneum using the Visual Analogue Scale (VAS).

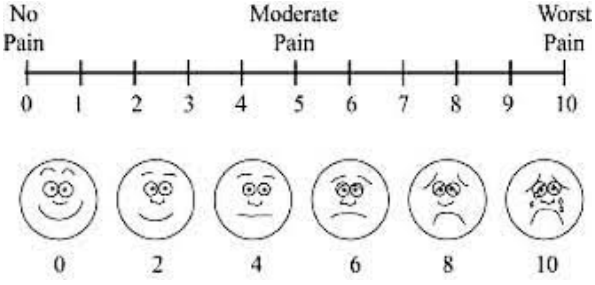

Fig. The Visual Analogue Scale (VAS) score.

Secondary Outcome Measures: To determine the rescue analgesics

required in the first 24 hours postoperative period in low pressure (8-10 mmHg) versus standard pressure (12–14 mm Hg) carboperitoneum patients undergoing laparoscopic cholecystectomy.

RESULTS:

The observation and results are the foundation stone of any research or experimental study, upon which conclusions are drawn. The demographic data such as age, sex, weight, ASA grading are comparable in both the groups.

Demographic Data:

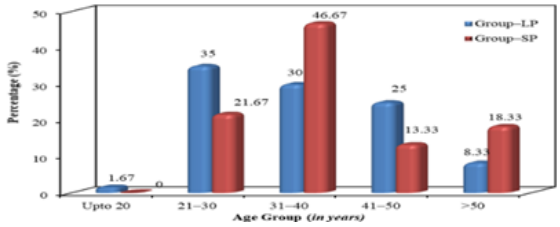

Fig. 1: Comparison of mean age of patients.

There is no statistical difference between both the groups with respect to mean age distribution.

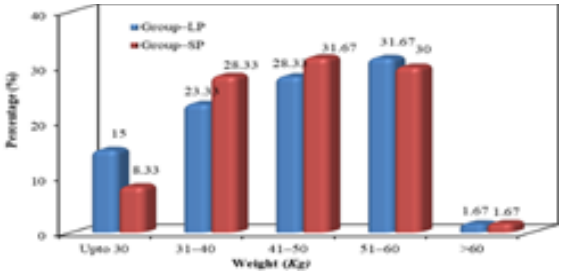

Fig. 2: Comparison of mean weight among the two groups

There is statistical difference between both the groups in respect to mean weight.

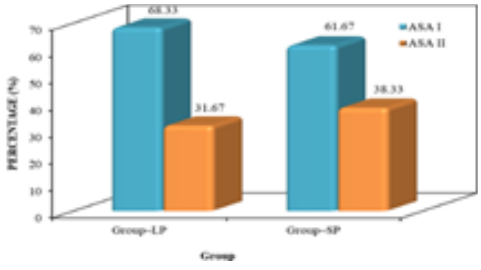

Fig. 3- Comparison of ASA status among the two groups

There is no statistically significant difference among the two groups in respect to ASA status.

The Visual Analogue Scale (VAS) Score: was used for assessment of postoperative pain.

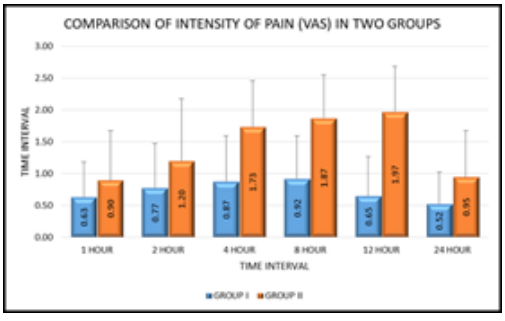

Fig. 4 – Comparison of VAS score for among the two groups

VAS scores were significantly lower in Group I than Group II at all time intervals in the 24 hour postoperative period.

Post Operative Analgesic Requirement:

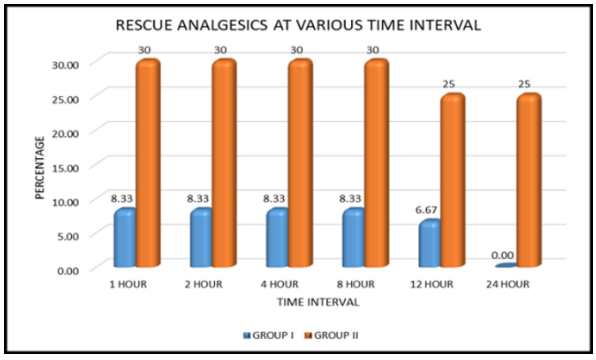

Fig. 5- Comparison of number of patients who required rescue analgesics among the two groups.

Group I required less postoperative analgesia in comparison to Group II ($p<0.05$).

DISCUSSION:

In our study, the VAS scores were significantly lower in low pressure group (8-10 mmHg) in comparison to standard pressure group (12–14 mmHg) at 1,2,4,8,12 and 24 hours postoperatively. Group I required less postoperative analgesia in comparison to Group II ($p<0.05$).

Yasir M. et al. evaluated post operative shoulder tip pain in low pressure versus standard pressure pneumoperitoneum and concluded that incidence, intensity of pain was less in the low pressure group following laparoscopic cholecystectomy[5].

Kanwer D. et al. randomised 60 patients undergoing laparoscopic cholecystectomy into two groups and reported that low pressure pneumoperitoneum benefits the patient in the form of lower intensity of postoperative pain without having an impact on intraoperative hemodynamics[6].

Sandhu R. A studied postoperative abdominal and shoulder tip pain following low and standard pressure pneumoperitoneum and concluded that laparoscopic cholecystectomy using low pressure pneumoperitoneum at 9 mm of Hg pressure is safe and feasible in the hands of experienced surgeon. Intra-operative complications, operative field visualisation, operative difficulties and duration of surgery are not affected by low-pressure pneumoperitoneum. Moreover, it confers advantage of decreased consumption of intra-operative CO_2, less incidence and intensity of postoperative abdominal and shoulder tip pain due to pneumoperitoneum, post operative nausea and vomiting (PONV) and promotes early recovery after surgery[7].

However, Chang W et al. in his study randomised 150 patients into very-low pressure (6–8 mmHg), low pressure (9–11 mmHg) and standard pressure (12–14 mmHg) groups and observed no difference in postoperative pain among the three groups[8].

The limitations of the present study encompass a limited, single-centred data with a small sample size. The duration of pneumoperitoneum should also have been taken into consideration. Inter-observer difference in assessment of postoperative pain and inter-individual difference between pain perception may also be present. Also, the cause of post-operative pain is multifactorial.

CONCLUSION:

The severity of post operative pain was considerably reduced in low pressure (8–10 mmHg) group compared to the standard pressure (12–14 mmHg) group.

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Conflict Of Interest: There exists no conflict of interest.

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