



COMPARATIVE STUDY BETWEEN LOW PRESSURE VERSUS STANDARD PRESSURE PNEUMOPERITONEUM TO MINIMIZE SHOULDER TIP PAIN FOLLOWING LAPAROSCOPIC CHOLECYSTECTOMY.

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ABSTRACT **Background:** Shoulder tip pain is a common complication of laparoscopic cholecystectomy. The goal of this prospective randomized controlled trial is to evaluate if low insufflation rate significantly reduces shoulder tip pain
Methods: 50 patients undergoing laparoscopic cholecystectomy were randomized into low pressure pneumoperitoneum (10 mmHg) and standard pressure pneumoperitoneum (14mmHg). The degree of postoperative shoulder tip pain was assessed by mean of visual analogue scale at 4,8,12,24 hours postoperatively
Results : There was a statistically significant increase in degree of postoperative pain in standard pressure pneumoperitoneum in comparison to low pressure pneumoperitoneum at 4,8,12 and 24 hours. However there was no difference in pain at 1 hour post operatively.
Conclusion: Using lower than usual CO₂ insufflation pressure during laparoscopic cholecystectomy reduces the intensity and frequency of post operative shoulder tip pain.

KEYWORDS : Shoulder pain, pneumoperitoneum, laparoscopic cholecystectomy

Introduction:

Laparoscopic cholecystectomy has become the gold standard treatment for gall bladder disease. Since its introduction in 1987, this procedure is being performed keeping a pneumoperitoneum pressure of 14-15 mmHg with the belief that more pressure provides more space¹. There has been an observation that significant number of patients do complain of postoperative pain more specifically in the shoulder tip, at the operative site and the back. Shoulder tip pain at times is so severe requiring injectable analgesics and significantly disturbs the patient of its belief that laparoscopic surgery is comparatively pain free compared to open surgery. The reported incidence of Shoulder tip pain following LC varies from 30-50%². Although the exact mechanism of pain after laparoscopic cholecystectomy is yet to be clarified but shoulder tip pain particularly seems to be linked to the CO₂ insufflation. The underlying pathologies could be either diaphragmatic stretching or an phrenic nerve neuroprexia and release of inflammatory mediators. It is also reported that CO₂ under the diaphragm is responsible for much of the shoulder tip pain and there is a strong correlation between the amount of gas, type of gas and rate of insufflation and severity of pain³. Therefore, it becomes a logical thinking, that in one way or the other CO₂ pneumoperitoneum seems to be the underlying cause of shoulder tip pain. Various authors have also suggested that the loss of visceral surface tension after creation of pneumoperitoneum results in increase weight on the diaphragmatic attachments of liver and hence shoulder tip pain^{4,5,6}. In an attempt to address this important parameter which affects the outcome of the Laparoscopic Cholecystectomy, different authors have put forward their views for different reasons of getting Shoulder tip pain and there remedies. Many authors, though with the conflicting results through their studies have shown that keeping a low pressure of pneumoperitoneum during Laparoscopic Chole cystec tomy does reduce significantly shoulder tip pain. Taking forward these observation we aimed to study the effect of low pressure pneumoperitoneum on shoulder tip pain in Laparoscopic Cholecystectomy

Materials and methods

This study was carried out in the department of General Surgery at A.I.M.S.R ,Bathinda, India over a period of one year from January 2016-December 2017. Patients having symptomatic gallstone disease admitted for elective laparoscopic cholecystectomy during this period were enrolled in the study. The sample size included 50 patients. Patients were randomized into two groups 25 each. In group A low pressure pneumoperitoneum (10 mmHg) and in group B standard pressure pneumoperitoneum (14mmHg) was made. Exclusion criteria

included complicated cholecystitis, choledocholithiasis and with previous abdominal surgery. Demographic data (age , sex and weight) were similar in both groups. There prevalence of gall stone disease was more in females.

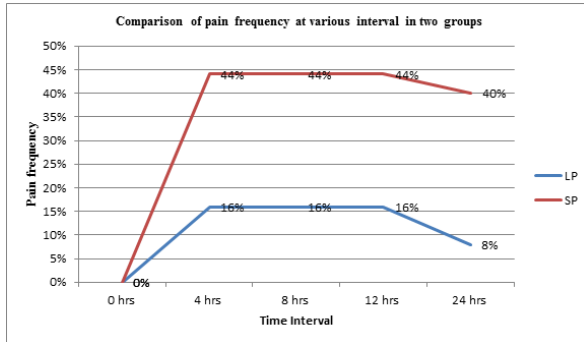
All procedures were performed under General standard anesthesia. Pneumoperitoneum was created with CO₂ insufflations using the standard veress needle technique, until abdominal pressure either 10mmHg or 14 mmHg was reached. In low group the initial insufflation was at 14mmHg for safe insertion, subsequently reduced to 10 mmHg. The insufflation was maintained with an automatic insufflators. In all patients access was achieved using 4 ports and standard American technique. The degree of postoperative shoulder tip pain was assessed in a double blinded manner by mean of visual analogue scale at 4,8,12,24 hours postoperatively with scores ranging from 0(no pain) to 10 (unbearable pain) by a doctor who was blind to the group allocation of the patients, allowing the patients to mark a point along the scale that represented pain at that time. The patients were aware that the scale was analyzing the intensity of post operative shoulder tip pain. Neither the patient nor the assessor were aware of the technique to which the patient have been randomized. Analgesic requirement were recorded. Ethical clearance from the institute ethics committee was taken. The procedure was explained in detail and consent was taken. Post operative analgesia was administered in the form of injection Diclofenac post operatively in recovery room with additional doses when necessary. Patients were encouraged to become ambulatory early and were allowed oral intake 6 hours post surgery. Need of additional analgesics over and above the postoperative Diclofenac and incidence of shoulder tip pain was noted. Statistical analysis was carried out using the Chi square and independent student T test. A p value <0.05 was taken as statistically significant.

Results

- The total duration of surgery ranged between 30-50 minutes in both the groups with a mean duration of 39.16±5.20 mints in group A and 39.36±5.49 mints in group B, p > 0.05 showing that there was no significant difference in the total duration of surgery between the 2 groups.
- The total duration of postoperative hospital stay ranged between 2-6 days in both groups with a mean of 4.24 ±0.926 days in Group A and 4.72 ± 0.843 days in group B. The p value was >0.05 showing that there was no significant different in the duration of postoperative hospital stay between the two groups. There was also no significant difference in the intra operative and post operative complications i.e. intraoperative bile leakage, bleeding

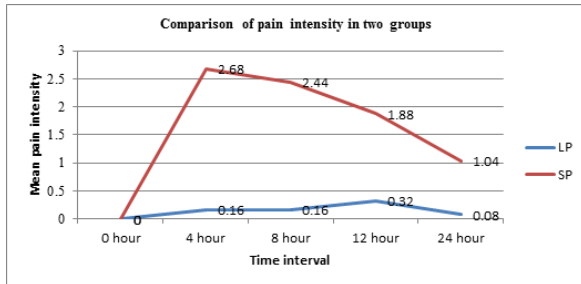
and postoperative nausea and vomiting encountered during surgery between the two groups.

- The frequency of shoulder tip pain was significantly lower in the group that underwent laparoscopic cholecystectomy with low pressure pneumoperitoneum i.e. group A than in Group B with standard pressure pneumoperitoneum. Only 4 patients (16%) in group A suffered a shoulder tip pain and 11 patients (44%) in group B suffered a shoulder tip pain which is statistically significant $p < 0.05$ (Graph-1).



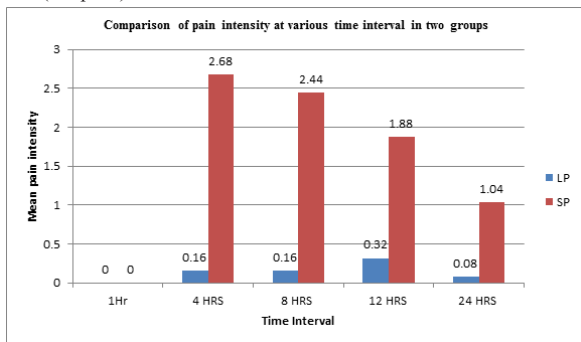
Graph-1

- We observed that shoulder tip pain started at 4 hours in both group (Graph-2). There was no shoulder tip pain in any patient preoperatively and 1 hour postoperatively.



Graph-2

- Pain scores, as recorded on a visual analogue scale, revealed that postoperative shoulder tip pain was significantly less intense at 4h, 8h, 12h and 24h in the low pressure group A than in Group B (Graph-3)



Graph-3

- At 4 hours the mean pain intensity was $0.16 + 0.374$ in group A and $2.68 + 3.27$ in group B. $p = < 0.001$ which shows a significant difference in pain intensity of 2 groups at 4 hours.
- At 8 hours the mean intensity was $0.16 + 0.374$ in group A and $2.44 + 2.97$ in group B. $p = < 0.001$ which shows a significant difference in the two groups.
- At 12 hours the mean pain intensity was $0.32 + 0.0802$ in group A and $1.88 + 2.35$ in group B. $p = 0.003$ showed a significant difference in two groups.
- At 24 hours the mean intensity pain was $0.08 + 0.277$ in group A and $1.04 + 1.54$ in group B. $p = 0.004$ which shows a significant difference in two groups.
- In both groups there some patients who did not require any analgesics medication 11 patients (44%) in group A and 1 patient (4%) in group B, with significant difference between the two

groups ($p < 0.05$). This shows the pain intensity is significantly less in Group A than in Group B. Mean postoperative intramuscular diclofenac sodium requirement were lower in Group a in the 24h post operative period (69.00 mg/day versus 255 mg/day) than in group B.

Discussion

Laparoscopic cholecystectomy is the gold standard in the management of symptomatic gallstone disease. The adverse side effects of laparoscopic cholecystectomy include postoperative pain, circulatory, respiratory, and renal problems have been reported with high-pressure pneumoperitoneum^{6,7}.

Although pain occurring post laparoscopic surgery is less severe and of shorter duration than that after open surgery, it still causes considerable discomfort and increase stress response in some patients. The origin of shoulder pain is only partly understood, but it is commonly assumed that the cause is overstretching of the diaphragmatic muscle fibers owing to the high rate of insufflation⁶. Several studies demonstrated that the degree of stretching in the intra abdominal cavity is a significant source of postoperative pain, and it has been shown that a low insufflation rate significantly reduces shoulder tip pain^{6,8}.

While attempts have been made to reduce the pressure of insufflation as much as is practicable for such a surgical maneuver, there is still exists a need to maintain sufficiently good exposure of the surgical site during surgery without compromising the efficacy, feasibility and safety of the surgical procedure⁹.

The application of a low pressure CO₂ elicited pneumoperitoneum has been shown to not only significantly reduce the adverse cardiovascular effects associated with the use of a greater insufflation pressure, but also lessen the level of postoperative pain that occurs and accelerate patient recovery^{7,8,10}. In our study there were no significant difference in the duration of surgery, length of hospital stay and Intraoperative and postoperative complications.

In our study the frequency of shoulder tip pain was significantly lower in the group that underwent laparoscopic cholecystectomy with low pressure pneumoperitoneum i.e. group A than in Group B with standard pressure pneumoperitoneum.

We observed that postoperative shoulder tip pain was significantly less intense at 4h, 8h, 12h and 24h in the low pressure group A than in Group B. The frequency of shoulder tip pain was significantly lower in group A at 4h,8h,12 and 24 hours.

Summary and conclusion

In conclusion, this study demonstrated that there is statistically significant increased incidence shoulder tip pain in standard pressure group in comparison to low pressure group. The frequency of occurrence of shoulder tip pain at various time interval is significantly higher in standard pressure group. The mean intensity of shoulder tip pain at various interval is significantly less in low pressure group than in standard pressure group. The mean VAS of pain is significantly less in low pressure group than standard pressure group. There was no significant difference in the total duration of surgery, complication rate and hospital stay in both the groups. The patients of low pressure group showed early recovery than standard pressure

People and contributions

Anuj Jindal M.B.B.S drafted and designed the manuscript, Karam Singh, M.S., FICS, FAIS, Professor, Department of Surgery, Adesh Institute of Medical Sciences and Research, Bathinda, reviewed and revised the manuscript critically for important intellectual content. Gurpreet Singh Gill M.S, and Nancy Sandhu M.B.B.S. assisted in formulating the study plan.

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