

Prospective Randomized Trial of Low Pressure Pneumoperitoneum for Reduction of Shoulder Tip Pain following Laparoscopic Cholecystectomy: A Comparative Study

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ABSTRACT

Background: Abdominal pain and shoulder tip pain after laparoscopic cholecystectomy are distressing for the patient. Various causes of this pain are peritoneal stretching and diaphragmatic irritation by high intra-abdominal pressure caused by pneumoperitoneum. We designed a study to compare the postoperative pain after laparoscopic cholecystectomy at low pressure (7-8 mm Hg) and standard pressure technique (12-14 mm Hg).

Aim: To compare the effect of low pressure and standard pressure pneumoperitoneum in post-laparoscopic cholecystectomy pain. Further to study, the safety of low pressure pneumoperitoneum in laparoscopic cholecystectomy.

Settings and design: A prospective randomized double blind study.

Materials and methods: A prospective randomized double blind study was done in 50 ASA grade I and II patients. They were divided into two groups—25 each. Group A, patients underwent laparoscopic cholecystectomy with low pressure pneumoperitoneum (7-8 mm Hg) while group B, underwent laparoscopic cholecystectomy with standard pressure pneumoperitoneum (12-14 mm Hg). Both the groups were compared for pain intensity, analgesic requirement and complications. Shoulder tip pain was recorded on a visual analog pain scale 1, 6, 12, 24 and 48 hours after operation.

Statistical analysis: Demographic data and intraoperative complications were analyzed using Chi-square test. Frequency of pain, intensity of pain, analgesics consumption and other pneumoperitoneum related complications were compared by applying ANOVA test.

Results: Postoperative pain score was significantly less in low pressure group as compared to standard pressure group. Number of patients requiring rescue analgesic doses was more in standard pressure group. This was statistically significant. Also total analgesic consumption was more in standard pressure group. There was no difference in intraoperative complications.

Conclusion: This study demonstrates the use of simple expedient of reducing the pressure of pneumoperitoneum to 8 mm results in reduction in both intensity and frequency of postoperative pain, and hence early recovery and better outcome.

This study also shows that low pressure technique is safe with comparable rate of intraoperative complications.

Keywords: Laparoscopic cholecystectomy, Low pressure pneumoperitoneum, Shoulder tip pain.

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INTRODUCTION

Carbon dioxide is the commonest means of achieving pneumoperitoneum in modern minimal access surgery worldwide and it is the same gas responsible for postoperative shoulder tip pain. The reported incidence of shoulder tip pain following laparoscopic cholecystectomy is 30 to 50%.^{1,2} Carbon dioxide is used for insufflations as it is 200 times more diffusible than oxygen, rapidly cleared by the lungs and does not support the combustion. Carbon dioxide when comes in contact with peritoneal fluid converts into carbonic acid which irritates diaphragm causing shoulder tip pain and discomfort in abdomen.

AIMS AND OBJECTIVES

The aim of this study is to see whether low pressure (10 mm Hg) laparoscopic cholecystectomy can be considered as the standard technique for uncomplicated symptomatic gall stone disease.

MATERIALS AND METHODS

The study was carried out in the Department of General Surgery, MMU Medical College and Hospital, Solan, from July 2014 to March 2015.

Inclusion Criteria

- Age 18 to 60 years
- Cholelithiasis (uncomplicated).

Exclusion Criteria

- Acute cholecystitis
- Age < 18 and > 60
- Pregnancy.

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Table 1: Frequency of occurrence of shoulder tip pain was significantly higher in group B

	Group A		Group B	
	Number	Percentage	Number	Percentage
Patient having shoulder tip pain	2	8	8	32
Patient not having shoulder tip pain	23	92	17	68
Total	25	100	25	100

Table 2: Comparison of mean VAS among two groups

Groups	Mean	SD
A	0.92	3.19
B	5.72	8.59
p-value	0.012	

Classical four port laparoscopic cholecystectomy was done in all the 50 cases. Randomization of cases was done according to randomization chart and standard statistical methods were used for analyzing the outcome of the study p-value <0.05 showed statistically significant value.

OBSERVATION AND RESULTS

The study was conducted at MMU Medical College and Hospital, Solan. Fifty patients were admitted having gall stone disease and 25 patients (group A) underwent laparoscopic cholecystectomy with low pressure pneumoperitoneum (10 mm Hg) and another 25 patients (group B) underwent the same surgery with standard pressure pneumoperitoneum (14 mm Hg). They were followed-up for postoperative shoulder tip pain, operative time, analgesic consumption, postoperative hospital course and complication rates (Tables 1 and 2).

Comparison of shoulder tip pain in two groups.

Comparison of mean visual analog score (VAS) among two groups.

Visual analog score was significantly higher in group B.

Our findings are similar to the study carried out by Khetri et al.⁴

DISCUSSION

The advent of laparoscopic cholecystectomy is a milestone achieved in the treatment of gallstones. Though there have been obvious advantages of laparoscopic cholecystectomy but postoperative shoulder tip pain is still a very common and distressing complaint. The origin of referred pain to shoulder after laparoscopic cholecystectomy is poorly understood. The tissue trauma theory is based on stretching of the peritoneum and diaphragm secondary to pneumoperitoneum⁷

resulting in release of inflammatory mediators that elicits referred pain to shoulder.^{3,8} Another theory is based on pockets of residual CO₂ gas left in the abdomen after surgery.¹ The last theory is based on the assumption that CO₂ gas is converted to carbonic acid on the moist surface of peritoneum which irritates diaphragm leading to shoulder tip pain.

In our study, the frequency of shoulder tip pain was significantly lower in the group that underwent laparoscopic cholecystectomy with low pressure pneumoperitoneum compared to standard pressure pneumoperitoneum. Only two patients (8%) in group A and eight patients (32%) in group B suffered shoulder tip pain which is statistically significant with $p < 0.05$. Our findings are similar to Khetri,⁴ Kandil,³ Barczynski et al.⁶ The intensity of shoulder tip pain was significantly lower in group A at 8, 12, 24, 48 hours than group B as recorded on VAS. In group A, the mean analgesic consumption was 123 mg as compared to group B which was 195 mg with p-value of 0.04 which is statistically significant. Joshipura et al,⁹ Kandil,³ Barczynski et al⁵ showed similar findings.

CONCLUSION

This study demonstrates that the use of simple expedient of reducing the pressure of the pneumoperitoneum to 10 mm Hg results in significant reduction in both the intensity and frequency of postoperative shoulder tip pain, had shorter hospital stay, early recovery, and hence better outcome. On the basis of these results, the widespread use of low pressure pneumoperitoneum can be used as a standard pressure for uncomplicated gallstone disease.

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