Original Research Article

To evaluate postoperative shoulder tip pain in low pressure versus standard pressure pneumoperitoneum in laparoscopic cholecystectomy

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Abstract

INTRODUCTION : Laparoscopic cholecystectomy is the gold standard treatment for gallstone disease. Laparoscopic cholecystectomy has rapidly replaced open cholecystectomy for treatment of patients with gall bladder disease especially cholelithiasis .**METHODS:** The present study was conducted to evaluate the postoperative shoulder tip pain in low pressure versus standard pressure pneumo peritoneum during laparoscopic cholecystectomy**RESULTS** : The use of low pressure laparoscopic cholecystectomy (LPLC) as compared to standard pressure laparoscopic cholecystectomy (SPLC) significantly decreases the frequency and intensity of postoperative shoulder tip pain. LPLC decreases the demand for postoperative analgesics, decreases postoperative hospital stay and hence improves the quality of life in the early stage of postoperative rehabilitation. **CONCLUSION:** On the basis of these results, the widespread use of low pressure pneumoperitoneum during laparoscopic cholecystectomy is recommended.

Keywords: laparoscopic,cholecystectomy

Introduction

Laparoscopic cholecystectomy is the gold standard treatment for gallstone disease. Laparoscopic cholecystectomy has rapidly replaced open cholecystectomy for treatment of patients with gall bladder disease especially cholelithiasis. The first cholecystectomy was performed on July 15, July 1882 by Karl Langenbuch in Berlin. Prof Dr Med Erich Mühe of Böblingen, Germany, performed the first laparoscopic cholecystectomy on September 12, 1985. Shoulder pain is a common complaint following laparoscopic surgery. Several causes of shoulder pain following laparoscopic surgery have been suggested which include the effect of CO_2 pneumoperitoneum, peritoneal stretching, diaphragmatic irritation, diaphragmatic injury and even shoulder abduction during surgery.

Aims and objectives

The study was undertaken with the following aims and objectives.

- To study the frequency and intensity of postoperative shoulder tip pain in laparoscopic cholecystectomy.
- To compare low pressure and standard pressure pneumoperitoneum during laparoscopic cholecystectomy with respect to post operative shoulder pain

Materials and methods

STUDY DESIGN: Hospital based randomized controlled study
DURATION OF STUDY: One year
This randomized controlled study was conducted in department of General surgery at Government Medical College, Jammu from 1st November 2021 to 31st October 2022. 100 patients with cholelithiasis undergoing laparoscopic cholecystectomy were recruited in study.

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Inclusion criteria:

1. Elective surgery for gallstones
2. Normal common bile duct on preoperative ultrasound.
3. Target population for this study included all patients of 18 - 75 years of age.
4. ASA physical status I and II admitted to hospital with a diagnosis cholelithiasis and who are scheduled to undergo elective laparoscopic cholecystectomy.

Exclusion criteria:

1. History of ERCP and stent in situ
2. Known shoulder disease,
3. Empyema gallbladder,
4. Prior history of pancreatitis,
5. History of multiple abdominal surgery,
6. Uncontrolled medical conditions like hypertension, coronary artery disease, diabetes mellitus, COPD, asthma
7. Previous malignancy,
8. Patients requiring other concomitant procedures,
9. Patients who do not give consent for participation in the study
10. Patient with cognitive impairments and
11. Patients on chronic analgesic use or history of addiction to alcohol.
12. Conversion to open cholecystectomy.

CONSENT-After explaining the study, a written informed consent was taken from every patients.
METHOLOGY
The eligible patients were assigned into two groups based on a confidentiallist of random allocation:
Group-1: Laparoscopic cholecystectomy done at an intra-abdominal pressure of 7-10 mmHg (Low).
Group-2: Laparoscopic cholecystectomy done at an intra-abdominal pressure of 12-14 mmHg (High).
OPERATIVE PROCDURE:
Low Pressure Laparoscopic Cholecysteectomy (LPLC): Low pressure laparoscopic cholecystectomy was performed using 4 ports, 2 ports of 10 mm diameter each in epigastrium and umbilical

regions and other two of 5 mm each in right hypochondrium and flank, respectively . Pneumoperitoneum was generated using CO_2 insufflation at a pressure of 7-10 mmHg.

Standard pressure laparoscopie cholecystectomy (SPLC): Standard pressure laparoscopic cholecystectomy was performed in the same way as low pressure laparoscopic cholecystectomy except that pneumoperitoneum was generated using CO_2 insufflations at a pressure of 12-14 mmHg.

Postoperative shoulder to pain was assessed at 4, 8, and 24 hours after operation by the visual Analogue Scale of Pain (V.A.S). The pain scale , with scores ranging from 0 (no pain) to 10 (agonizing pain) was used, allowing patients to mark a point along the scale that best represented their shoulder tip pain at that time . Patients were aware that the scale served to analyse the presence and intensity of shoulder tip pain alone and was not a representation of generalized postoperative discomfort .Analgesic requirement of all the patients in the postoperative period and length of hospital stay very were also recorded.After the study, all the data was analyzed statistically using specific statistical tests. Significance was defined as $P<0.05$. All the information and results thus obtained lead to the conclusion of the study.

Observations

The present study "To evaluate post-operative shoulder tip pain in low pressure (10mm of Hg) versus standard pressure (14 mm of Hg) pneumoperitoneum in laparoscopic cholecystectomy'' has been conducted from 1st November 2021 to 31st Oct 2022 in the Department of Surgery, GMC Jammu. In this study 100 patients with cholelithiasis were admitted to the hospital for elective surgical management. The patients were allocated to two groups of 50 patients each group A and group B on the basis of randomization list done with the help of computer software. In order to keep number equal in both groups permuted block randomization was performed. Group A patients were subjected to low pressure laparoscopic cholecystectomy (LPLC) and group B patients were subjected to standard pressure laparoscopic cholecystectomy (SPLC) . The outcomes of the two study groups was assessed and following observation were made:

Table -1Gender Distribution in Group A and Group B

Sex	No of Patients		
	Group A	Group B	Group C
Male	10	12	22
Female	40	38	78
Total	50	50	100

The majority of the patients in both the groups are females 78% and males constituted 22% of the total group (Table-1). The number of males and female in group A were 10 and 40 respectively (1:4) and in group B the number of males are females were 12 and 38 respectively (1:3.1).The difference between the two being statistically insignificant.

Table-2A Age Distribution in the Group A and Group B

Age (years)	Group A (n=50)	Group B (n=50)
25-35	10	6
36-45	11	9
46-55	10	12
56-65	16	18
66-75	3	5
Total	50	50

The patients include in the Group A were in the age range of 25-73years and in the Groups B the age of the patients ranged from 25-72 years. The youngest patients in Group A is 25 years and the oldest patients is 73 years old . The youngest patients in Group B is 25 Years and the oldest patients is 72years old (Table 2 A).

Table -2B Distribution of mean age in two Groups

Group	Group A			Group B		
	No of patients	Mean age of year	S.D.	No of patients	Mean Age in Years	S.D.
Total	50	49.78	12.96	50	51.92	11.73

The mean age of the patients in Group A is 49.78 ±12.85 years and the mean age of the patients in Groups B is 51.921±1.63 years (Table 2 B) . There is no statistically significant difference in the mean age of the two groups ($p = 0.253$).

Table 3.Clinical presentation of the patients with gallstone disease include in the two study groups

Clinical feature	Group A n= 50	Group B n=50
Pain right upper quadrant of abdomen	42	44
Nausea	38	40
Vomiting	12	20
Flatulent dyspepsia	34	40

The majority of the patients in Group A and Group B presented with pain in right upper quadrant of the abdomen , nausea and flatulent dyspepsia. Most of the patients in both groups are having more than one clinical feature (Table 3)

Table -4 Ultrasonographic finding in two Groups (size of gallbladder)

Size of gall bladder	Group A (n=50)	Group B(n=50)
Normal size	24	28
Shrunken size	10	10
Distended	16	12
Total	50	50

Ultrasonographic finding in two Groups (size of gallbladder)

Table -4BComparison of number of gallstones in two groups

Number of gallstones	Group A (n=50)	Group B (n=50)
Single stone	10	12
Multiple stones	40	38
Total	50	50

Table -5Operative finding in two study groups

Intra operative finding	Group A (n=50)	Group B (n=50)
Normal gall bladder	24	28
Distended gall bladder	12	12
Contracted gall bladder	14	10
Adhesions of gall bladder	22	32
Gall bladder stone	50	50
Single stone in gall bladder	10	13
Multiple stone in gall bladder	40	38
Cholesterosis	5	6
Biliary sludge	9	14

The majority of the patients were having multiple gallstones in both the groups. Other intra operative finding were gall bladder distention, adhesions of the gall bladder, cholesterosis and biliary sludge.

Table -6 Distribution of mean operative time in two groups

Group A			Group B		
No. of patients	Mean (Minutes) XI	S.D.	No. of patients	Mean (Minutes) XI	S.D.
50	34.38	5.31	50	31.52	4.72

The mean of operative time in group A was more as compared to group B but the difference between the mean operative times of the two groups was statistically insignificant ($p<0.05$).

The mean operative time in the group A is 34.38+5.26 minutes and the mean operative time in group B is 31.52+4.68 minutes(table 6) .The mean operative time in group A (LPLC) , but the difference between the mean operative times of the two groups was statistically insignificant [p=0.396).

POST OPERATIVE SHOULDER TIP PAIN:In our study post operative shoulder tip pain was assessed using visual analogue score (V.A.S) at 4 hours , 8 hours and 24 hours. The number of patients that complained of shoulder tip pain presenting at any time during the first 24 hrs after operation was lower in group A than in group B. In group A 6 out of 50 patients complained of shoulder tip pain in the post operative period while as in group B 12 out of 50 patients complained of shoulder tip pain (Table 7). The difference between the two was statistically significant(p=0.001).

Table-7No. of patients with post operative shoulder tip pain in each group

Group	Group A (n=50)	Group B (n=50)
post operative shoulder tip pain	6 (12%)	12(24%)

12 patients (24%) in group B complained of post operative shoulder tip pain as compared to only 6 patients (12%) in group A.The results are statistically significant with P <0.05.

Table -8No. of patients and timing of post operative shoulder tip pain

Time of the surgery	Group A (n=50)	Group B (n=50)
4hrs	6 (12%)	12 (24%)
8hrs	6 (12%)	12 (24%)
24hrs	1 (2%)	6(12%)

Table 9:Mean scores of post Operative Shoulder tip pain on V.A.S

Time after surgery	Group A		Group B	
	Mean	Standard Deviation	Mean	Standard Deviation
4 hrs	4.2	0.45	4.43	1.4
8 hrs	2.2	1.1	3.5	0.76
24 hrs	0.2	0.45	0.64	0.74

The mean intensity of post operative shoulder tip pain at 4 hours was 4.20±.45 in group A and 4.431. ±4 in group B. The difference between the two is statistically significant (p=0.039).

The mean density of post operative shoulder tip pain assessed by visual analogue scoring scale at any time was less in group A as compared to group B (Table 9).

The mean intensity of post operative shoulder tip pain at 4 hours was 4.2±0.45 in group A and 4.431±.4 in group B(Table 9). The difference between the two is statistically significant (p=0.039).

The mean intensity of post operative shoulder tip pain at 8 hours was 2.2±1.1 in group A and 3.50±.76 in group B(Table 9). The difference between the two is statistically significant (p=0.762).

The mean intensity of post operative shoulder tip pain at 24 hours was 0.20±0.45 in group A and 0.64±0.74 in group B(Table 9). The difference between the two is statistically significant (p=0.068).

Table- 10 Use of injectable analgesic (dielofenac) in patients with shoulder tip pain

Group	Group A (n=6)	Group B (n=12)
Total no. of analgesic injections	11	38
Mean	2.2	2.71
Standard deviation	0.45	0.5

Analgesic requirements for shoulder tip pain were less in group A as compared to group B. The mean number of analgesic injections was 1.6±0.45 in group A and 2.80±.5 in group B (Table 10). The difference between the two is however statistically insignificant (p=0.156).

Table- 11Length of postoperative hospital stay (days)

Group	Group A (n=6)	Group B (n=12)
Post operative hospital stay (Mean)	1.1	1.21
Standard deviation	0.45	0.36

The length of post operative stay in the hospital was 1.1≠0.45 and 1.21≠0.36 in group A and group B respectively (Table 11). However, these difference between the two groups did not reach statistical significance (p=0.589).

Summary and conclusion

The following observations and conclusions were drawn from the present study :-

- Majority of patients in both groups were females, constituting 80% of group A and 76% of group B. while the male patients constituted about 20% of group A and 24% of group B.
- Pain in the right upper quadrant of the abdomen, nausea and flatulent dyspepsia were the main presenting features in most of the patients in group A as well in group B.
- The mean operative time was more in group A as compared to Group B although the difference did not reach statistical significance (p=0.396).
- 12 patients (24%) in group B complained of post operative shoulder tip pain as compared to only 6 patients (12%) in group A. The results are statistically significant with P<0.05.
- The mean intensity of post operative shoulder tip pain assessed by visual analogue scoring scale at 4 hours, 8 hours and 24 hours was less in group A as compared to group B. However, statistically significant difference was found only at 4 hours (p<0.05).
- Analgesic requirements for shoulder tip pain were less in group A as compared to group B. However, the results were not statistically significant (p<0.156)
- The mean length of post operative stay in the hospital was less in group A as compared to group B, although the difference did not reach statistical significance (p=0.589).

To conclude, the use of low pressure laparoscopic cholecystectomy (LPLC) as compared to standard pressure laparoscopic cholecystectomy (SPLC) significantly decreases the frequency and intensity of postoperative shoulder tip pain. LPLC decreases the demand for postoperative analgesics, decreases postoperative hospital stay and hence improves the quality of life in the early stage of postoperative rehabilitation. On the basis of these results, the widespread use of low pressure pneumoperitoneum during laparoscopic cholecystectomy is recommended.

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