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A PROSPECTIVE STUDY OF LOW PRESSURE VERSUS HIGH PRESSURE PNEUMOPERITONEUM FOR REDUCTION OF RIGHT SHOULDER TIP PAIN FOLLOWING LAPROSCOPIC CHOLYCYSTECTOMY

General Surgery

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ABSTRACT

Background: Laparoscopic cholecystectomy is a widely conducted surgical procedure globally. Surgeons invest considerable effort in refining this technique to achieve improved patient outcomes. Pain management is critical in all surgeries, with research indicating that minimizing postoperative pain can lead to quicker discharge and reduced hospital stays, thereby lowering healthcare expenditures. In countries like India, where many rely on public healthcare services, shorter hospital stays can significantly decrease public health costs. Furthermore, higher patient satisfaction correlates with lower pain scores **Material & Methods:** This is an prospective hospital-based study study conducted at the Department of Surgery, Mahatma Gandhi Medical College and Hospital, Jaipur, between September 2022 to March 2024 . All patients attending surgical outpatient clinic and admitted in general surgery department in Mahatma Gandhi Medical College and hospital will be studied prospectively during study period. A total of 100 patients who fulfilled the inclusion and exclusion criteria were included. **Results:** In the first 24 hours following surgery, fewer patients in group A reported shoulder tip pain compared to those in group B. The average intensity of postoperative shoulder tip pain, measured using a visual analogue scale, was also lower in group A. Additionally, the need for analgesics for shoulder tip pain was reduced in group A compared to group B. Patients in group A had shorter hospital stays and experienced earlier return of bowel sounds than those in group B. Furthermore, the average operative time for males was longer than for females in both groups. **Conclusion:** Low-pressure laparoscopic cholecystectomy significantly reduces both the occurrence and severity of shoulder tip pain after surgery. It also lowers the need for postoperative pain relief and shortens hospital stays.

KEYWORDS

Cholelithiasis, Lapraroscopic Cholycystectomy, Risght shoulder tip pain

INTRODUCTION

Laparoscopic cholecystectomy is a widely conducted surgical procedure globally. Surgeons invest considerable effort in refining this technique to achieve improved patient outcomes. Pain management is critical in all surgeries, with research indicating that minimizing postoperative pain can lead to quicker discharge and reduced hospital stays, thereby lowering healthcare expenditures. In countries like India, where many rely on public healthcare services, shorter hospital stays can significantly decrease public health costs. Furthermore, higher patient satisfaction correlates with lower pain scores.

Following laparoscopic cholecystectomy, patients typically experience three types of pain: visceral, incisional, and shoulder pain. While the precise cause of shoulder pain is not fully understood, it is generally attributed to the stretching of diaphragmatic muscle fibers due to high levels of insufflation during the procedure. Various methods have been investigated to alleviate shoulder tip pain, including low-pressure insufflation, warming of the insufflation gas, preemptive administration of anti-inflammatory medications, local anesthetic irrigation of the diaphragm prior to surgery, postoperative drains, and subdiaphragmatic suction. However, the effectiveness of these approaches varies, and studies frequently present conflicting results.(1) Some research suggests that maintaining a lower initial insufflation rate may reduce shoulder tip pain, but this hypothesis requires further validation.

Although laparoscopic cholecystectomy is the preferred method for gallbladder surgery because it typically reduces postoperative discomfort and accelerates recovery times, it is not without complications, including shoulder pain. The origin of shoulder pain is believed to be associated with nervous system stimulation caused by hypercapnia, postoperative pneumoperitoneum, and abdominal discomfort from carbon dioxide retention.(2) While various studies have examined the effects of intraperitoneal anesthesia, low-pressure pneumoperitoneum, and gradual insufflation in alleviating shoulder pain, the impact of surgical duration on shoulder pain has not been extensively investigated.

MATERIAL & METHODS:

This is an prospective hospital-based study study conducted at the Department of Surgery, Mahatma Gandhi Medical College and Hospital, Jaipur, between September 2022 to March 2024 . All patients attending surgical outpatient clinic and admitted in general surgery department in Mahatma Gandhi Medical College and hospital will be studied prospectively during study period. A total of 100 patients who fulfilled the inclusion and exclusion criteria were included.

Inclusion Criteria:

- All patient giving written and informed consent
- Age limit: 20 – 60 years
- All subjects diagnosed with cholelithiasis and undergoing laparoscopic cholecystectomy

Exclusion Criteria:

- Pregnancy
- History of Drug /alcohol abuse
- Acute cholecystitis
- Malignancy
- Severe pre-operative pain
- Abnormal liver function tests
- < 20 years & > 60 years
- Conversion from Laparoscopic to Open surgery
- Surgeries in which drains were used.
- Patient with Hypertension, Diabties Mellitus ,Asthma and Tuberclosis

RESULTS:

In the first 24 hours following surgery, fewer patients in group A reported shoulder tip pain compared to those in group B. The average intensity of postoperative shoulder tip pain, measured using a visual analogue scale, was also lower in group A. Additionally, the need for analgesics for shoulder tip pain was reduced in group A compared to group B. Patients in group A had shorter hospital stays and experienced earlier return of bowel sounds than those in group B. Furthermore, the average operative time for males was longer than for females in both groups.

Table 1: Age Distribution

Age distribution		
	Frequency	Percent
Upto 20 yrs.	2	2
21 - 30 yrs.	7	7
31 - 40 yrs.	22	22
41 - 50 yrs.	26	26
51 - 60 yrs.	43	43
Total	100	100.0

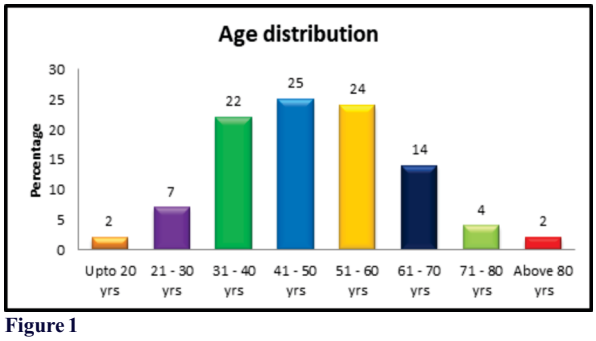

Figure 1

The above table shows Age distribution were <20 years is 2%, 21-30 years is 7%, 31-40 years is 22%, 41-50 years is 25%, 51-60 years is 24%, 61-70 years is 14%, 71-80 years is 4%, >80 years is 2%.

Table 2: Gender Distribution

Gender distribution		
	Frequency	Percent
Female	68	68.0
Male	32	32.0
Total	100	100.0

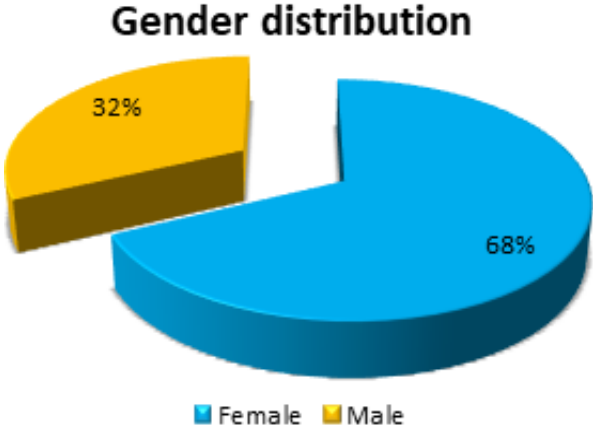

Figure 2

The above table shows Gender distribution were Female is 68.0%, Male is 32.0%.

Table 3: Comparison Of Age Between The Groups By Pearson's Chi-Square Test

			Groups		Total	χ 2 - value	p-value
			Group A	Group B			
Age	Upto 20 yrs.	Count	2	0	2	9.482	0.220 #
		%	4.0%	0.0%	2.0%		
	21 - 30 yrs.	Count	6	1	7		
		%	12.0%	2.0%	7.0%		
	31 - 40 yrs.	Count	9	13	22		
		%	18.0%	26.0%	22.0%		
	41 - 50 yrs.	Count	12	13	25		
		%	24.0%	26.0%	25.0%		
	51 - 60 yrs.	Count	12	12	24		
		%	24.0%	24.0%	24.0%		
	61 - 70 yrs.	Count	5	9	14		
		%	10.0%	18.0%	14.0%		
	71 - 80 yrs.	Count	2	2	4		
		%	4.0%	4.0%	4.0%		
	Above 80 yrs.	Count	2	0	2		
		%	4.0%	0.0%	2.0%		
Total		Count	50	50	100		
		%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level							

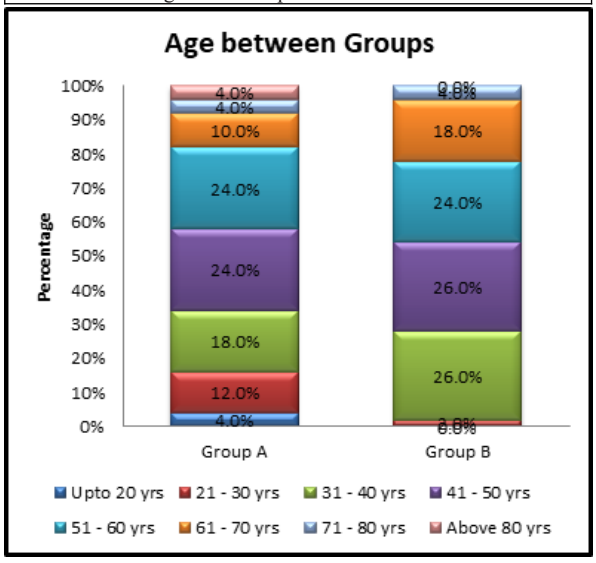

Figure 3

The above table shows comparison of Age between Groups by Pearson's Chi-Square test were $\chi 2=9.482$, $p=0.220>0.05$ which shows no statistical significance association between Age and Groups.

Table 4: Comparison Of Gender Between The Groups By Pearson's Chi-square Test

			Groups		Total	χ 2 - value	p-value
			Group A	Group B			
Gender	Female	Count	35	33	68	0.184	0.668 #
		%	70.0%	66.0%	68.0%		
	Male	Count	15	17	32		
		%	30.0%	34.0%	32.0%		
Total		Count	50	50	100		
		%	100.0%	100.0%	100.0%		
# No Statistical Significance at p > 0.05 level							

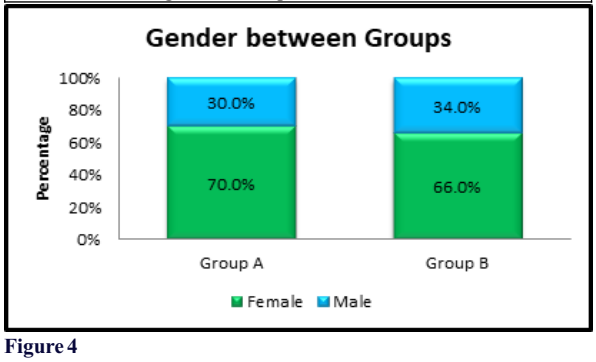

Figure 4

The above table shows comparison of Gender between Groups by Pearson's Chi-Square test were $\chi 2=0.184$, $p=0.668>0.05$ which shows no statistical significance association between Gender and Groups.

Table 5: Comparison Of Duration Of Surgery Between The Groups By Independent Sample T-test

Variable	Groups	N	Mean	SD	t-value	p-value
Duration of Surgery	Group A	50	31	7	8.686	0.0005 **
	Group B	50	45	8		
** Highly Statistical Significance at p < 0.01 level						

The above table shows comparison of Duration of Surgery between Groups by Independent sample t-test were t-value=8.686, p-value=0.0005<0.01 which shows highly statistical significance

difference at p < 0.01 level.

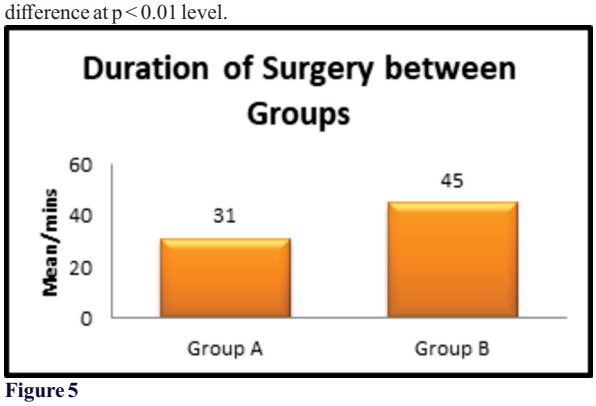

Figure 5

Table 6: Comparison Of Hospital Stay Days Between The Groups By Independent Sample T-test

Variable	Groups	N	Mean	SD	t-value	p-value
Hospital stay days	Group A	50	1	0.5	9.113	0.0005 **
	Group B	50	3	1		
** Highly Statistical Significance at p < 0.01 level						

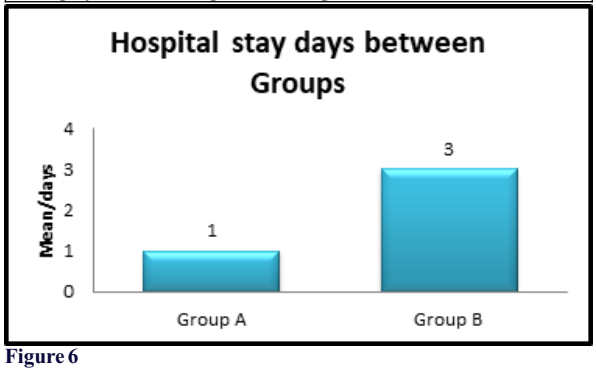

Figure 6

The above table shows comparison of Hospital stay days between Groups by Independent sample t-test were t-value=9.113, p-value=0.0005<0.01 which shows highly statistical significance difference at p < 0.01 level.

Table 7: Comparison Of VAS between the Groups by Mann-Whitney U Test

VAS	Groups	N	Mean	SD	Median	IQR	Z-value	p-value
8 hrs	Group A	50	1.1	0.8	1.0	1.3	3.909	0.0005 **
	Group B	50	1.9	1.0	2.0	1.3		
12 hrs	Group A	50	3.3	1.2	3.0	1.3	6.831	0.0005 **
	Group B	50	5.6	1.5	5.0	2.0		
24 hrs	Group A	50	1.5	0.9	1.0	1.0	5.215	0.0005 **
	Group B	50	3.0	1.4	3.0	2.0		
** Highly Statistical Significance at p < 0.01 level								

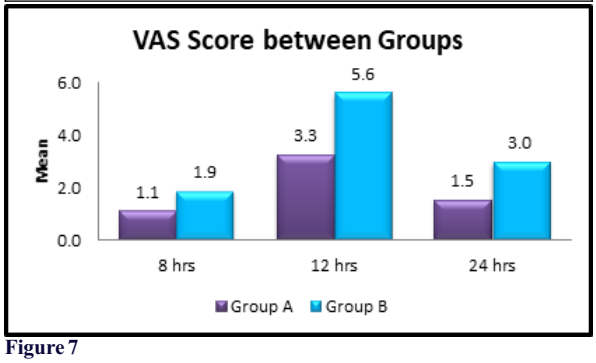

Figure 7

The above table shows comparison of VAS between the Groups by using Mann-Whitney U test, were 8 hrs Z-value=3.909, p-value=0.0005<0.01, 12 hrs Z-value=6.831, p-value=0.0005<0.01, 24 hrs Z-value=5.215, p-value=0.0005<0.01 which shows highly significance difference at p <0.01 level.

DISCUSSION:

The saying " Pressure comes from within and so must be mastered from within " by Ed Jacoby . [3]

In Laparoscopic cholecystectomy high pressure has benefit of good visibility however maintained high pressure could to lead to right shoulder tip pain in post operative period .

In our study a total of 100 patients were admitted for lap cholecystectomy based on inclusion and exclusion criterion out of which 34 complained right shoulder tip pain in high pressure group and 16 patient in low pressure group also the study done by M.Barczynski et al[4], showed that out of total 74 patients 8 in low pressure group and 18 in high pressure group complained for right shoulder tip pain, which were almost similar and comparable to our study.

The study carried out by by Sarli L et al, Faisal Bilal Lodhi et al and Sandhu T et al [5] showed low pressure cholecystectomy group patient had nearly 0 score in VAS at 24 to 48 hours as compared to high pressure, which was also comparable to our study which shows 2 times reduction in pain in low pressure group from standard pressure group.

CONCLUSION:

In our present study, mean age study sample was between 51-60 years. Maximum patients belongs to 5th decade of life. Among 100 patients ,68% were females and 32 % were male. In our study , mean hospital stay in low pressure group was 1 day as compared to standard pressure group of 3 days. In our present study the Right shoulder tip pain in low pressure group according to VAS scale in 8 hours was 1.1, 12 hours was 3.3 and 24 hours was 1.5 and in high pressure 8 hours was 1.9, 12 hours was 5.6 and 24 hours was 3.

Based on these outcomes, we recommend use of low pressure pnemoperitonium (10-11 mmhg) during laparoscopic cholecystectomy as this reduces right shoulder tip pain , shortens hospital stay and hence improves quality of life of patients. So we conclude that low pressure pneumoperitonium during laparoscopic cholecystectomy results in lesser side effects , improves quality of life in concerned patients. Hence, on the basis of our study , we recommend use of low pressure pnemoperitonium (10-11 mmhg) during laparoscopic cholecystectomy as compared to standard pressure laparoscopic cholecystectomy (12-14 mmHg)

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