Shoulder Tip Pain Following the Release of Pneumoperitoneum in Supine Versus Trendelenburg Position After Laparoscopic Cholecystectomy: A Comparative Study

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ABSTRACT

Objective *To compare the intensity of shoulder tip pain and patients' satisfaction following the release of pneumoperitoneum in supine versus Trendelenburg position after laparoscopic cholecystectomy.*

Study design *Cross sectional comparative study.*

Place & Duration of study *Department of General Surgery, Pakistan Institute of Medical Sciences Islamabad, from January 2022 to October 2022.*

Methods *Patients between 25 years -75 years of age who underwent laparoscopic cholecystectomy were included. Postoperatively patients were divided into two groups. In group A, the release of carbon dioxide was done in supine and in Group B, Trendelenburg position. The shoulder tip pain was recorded at 4, 8, 12, and 24-hours after surgery by using visual analog scale (VAS). A score of < 3, at the end of final assessment of pain was considered as satisfactory. Data were analyzed using SPSS 22 software. Chi-square test was applied for statistical significance.*

Results *A total of 60 patients were included. The mean age of the patients was 47.10±14.11 years. In Group A, the mean VAS score was 2.27±1.41 and in Group B, 1.40±1.37. This was statistically significant ((p=0.019). In Group A, 13 (43.3%) and in Group B, 23 (76.7%) patients reported as being satisfied (p=0.008), an indicator of effectiveness of the position maintained for the release of pneumoperitoneum.*

Conclusion *The release of pneumoperitoneum in Trendelenburg position was found superior in comparison with the supine position as it resulted in significantly less pain in postoperative period.*

Key words *Laparoscopic cholecystectomy, Trendelenburg position, Pneumoperitoneum, Pain, Visual analog scale.*

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INTRODUCTION:

Laparoscopic cholecystectomy is the most commonly performed abdominal procedures worldwide.[1-3] Pain is the most common complaint after laparoscopic cholecystectomy resulting in prolonged hospital stay. Upper abdominal and shoulder tip pain are the common complaints in the postoperative period.[4-6] A strong association is reported between the severity of post-laparoscopic pain and the residual gas volume in abdomen. Residual carbon dioxide in the abdomen that is used to create pneumoperitoneum, irritates the phrenic nerve and diaphragm. This leads to

shoulder tip pain, a type of referred pain. The level of patients' satisfaction is thus compromised.[7]

Release of pneumoperitoneum after laparoscopic cholecystectomy in Trendelenburg position is found effective in reducing the shoulder pain.[8] However, not much work is done in this regard. This study was conducted to find out the more appropriate position that can help in reducing shoulder pain after laparoscopic surgery. This may add to the literature an evidence based that may improve clinical practices and help to achieve a higher level of patients' satisfaction.

METHODS:

Study design, place & duration: A cross sectional comparative study was conducted in the Department of General Surgery, Pakistan Institute of Medical Sciences Islamabad, From January 2022 to October 2022.

Ethical considerations: Approval from ethical review board of the institution was obtained (Letter No. F.1-1/2015/ERB/SZABMU/879, dated 27th October 2021). Informed consent was taken from all the patients.

Sample size calculations: By using the WHO calculator, a sample size of 60 cases; 30 in each group was calculated with 80% power of the study, 5% significance level, and percentage of efficacy i.e. 69% with Trendelenburg position and 37% with the supine position.[9]

Inclusion and exclusion criteria: Patients between 25 to 75 years who underwent laparoscopic cholecystectomy were included. Those with morbid obesity (BMI > 40 kg/m^2), neuropsychiatric problems and required an abdominal insufflation pressure of more than 15 mmHg at any time during the surgery, were excluded.

Study protocol: Non-probability consecutive sampling technique was used. Patients were divided into two groups; Group A (supine position group) and Group B (Trendelenburg position group) by lottery method, on the day of surgery at the end of the procedure. In Group A, the residual gas was released in supine position and in Group B, the anesthetist was asked to make Trendelenburg position of the operation table and then the residual gas was released. Patients were followed up in post anesthesia care unit (PACU) and then shifted to post-surgical ward and kept under observation for 24-hours. Routine postoperative care was provided to all the patients. They were inquired about shoulder tip pain and VAS was used for this purpose.

Data collection procedure: Demographic data (age, gender, BMI) were noted on a pre-designed form. Operative time was recorded from the time of skin incision till the closure of the wounds. Shoulder tip pain assessment was done by visual analog scale at 4, 8, 12, and 24-hours after surgery. If the score was < 3 on VAS after 24-hours of the procedure, then the position of the patient at the end of the surgery was considered as "effective".

Statistical analysis: The data were analyzed by using SPSS version 22. Variables like age, BMI, duration of surgery, and postoperative shoulder tip pain were presented as mean ± standard deviation. Variables like gender, and effectiveness were analyzed as frequency and percentages. Data were stratified for age, gender, BMI, and duration of surgery. Post-stratification, a Chi-square test was applied to compare both groups for effectiveness. A p-value was calculated at a 95% confidence level. Any value < 0.05 was considered as significant.

RESULTS:

A total of 60 patients were enrolled for the study. There were 25 (41.67%) male and 35 (58.33%) female patients. The mean age of the patients was 47.10±14.11 years. Patients were comparable in terms of mean age, gender, BMI and duration of surgery (table I).

The mean pain score of the patients was 5.50±1.24 at PACU, 5.37±1.23 at 4th hour, 4.40±1.11 at 8th hour, 3.30±1.03 at 12th hour and 1.83±1.45 at 24th hour. The comparison of pain score among the two groups is shown in table II.

Patients' satisfaction based upon pain score of less than 3 was achieved in 36 (60%) subjects. In Group A, it was reported in 13 (43.3%) patients and in Group B, 23 (76.7%) patients. This was statistically significant (p=0.008). Patients of Group B showed better outcome when stratified for BMI (p=0.005). Details are given in table III.

DISCUSSION:

In this study, Trendelenburg's position showed significantly better outcome when compared with supine position after laparoscopic cholecystectomy in terms of pain relief. At the 24th hour, the mean VAS score was 1.40±1.37 in the Trendelenburg group which was statistically significant along with satisfaction as a proxy of effectiveness. In literature it is reported that 35% to 70% of laparoscopic procedures result with shoulder tip pain. This typically affects the patient's right side. There seems to be a connection between irritation of the phrenic nerve

Table I: Baseline Characteristics of Study Groups (n=60)

Characteristics	Group A (n=30)	Group B (n=30)	p value
Age (years)	46.60±13.36	47.60±15.04	0.786
Gender			
Male	13	12	0.793
Female	17	18	
BMI (kg/m^2)	26.67±4.56	25.09±4.47	0.180
Duration of surgery (minutes)	40.77	39.03	0.358

Table II: Comparison of Pain Scores Between Study Groups

Pain (VAS) score	Group A	Group B	p value
PACU	5.70 ± 1.21	5.30 ± 1.26	0.215
4th hour	5.53 ± 1.25	5.20 ± 1.21	0.300
8th hour	4.87 ± 0.97	3.93 ± 1.05	0.001*
12th hour	3.73 ± 0.83	2.87 ± 1.04	0.001*
24th hour	2.27 ± 1.41	1.40 ± 1.37	0.019*

Table III: Comparison of Effectiveness Stratified by Age and BMI

	Effectiveness	Group A n (%)	Group B n (%)	Total n (%)	p value
Age (years)					
< 50	Yes	6 (31.6%)	14 (73.7%)	20 (52.6%)	0.009
> 50	N o	13 (68.4%)	5 (26.3%)	18 (47.4%)	
	Yes	7 (63.6%)	9 (81.8%)	16 (72.7%)	0.338
	N o	4 (36.4%)	2 (18.2%)	6 (27.3%)	
BMI (kg/m^2)					
= 25	Yes	4 (33.3%)	15 (83.3%)	19 (63.3%)	0.005*
> 25	N o	8 (66.7%)	3 16.7%)	11 (36.7%)	
	Yes	9 (50.0%)	8 (66.7%)	17 (56.7%)	0.465
	N o	9 (50.0%)	4 (33.3%)	13 (43.3%)	

and this sort of referred pain.[10,11]

Zeeni et al reported that after gynecologic laparoscopic surgery, the Trendelenburg position is a simple non-pharmacologic strategy that helps to reduce shoulder pain after surgery.[2] In their study pain scores were significantly lower in patients kept in the Trendelenburg position. In another trial a significant decrease in the pain score at 24-hours was reported in the Trendelenburg position group.[12] The results are similar to our observations.

Following a laparoscopy, shoulder pain is more likely to occur in patients with low body mass index, with an earlier onset and greater pain levels.[13] According to one theory, gas is likely to stay in the big space that thin people have in their upper abdomen following laparoscopic surgery, whereas obese patients have a small upper abdominal area covered by the omentum.[14] This may be the reason that patients with low BMI in our study showed significant difference in postoperative pain relief with Trendelenburg position.

Limitations of the study: The small sample size and single centre study are the limitations. Studies with the larger sample size in different settings may provide more convincing evidence about the impact of Trendelenburg position on shoulder pain after cholecystectomy.

CONCLUSION:

The Trendelenburg position showed significantly better outcome in comparison with supine position in terms of shoulder-tip pain relief and patients' satisfaction.

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Received for publication: 02-05-2024
Sent for revision: 10-06-2024
Accepted after revision: 12-06-2024

Author's contributions:
Muhammad Arslan: Concept, design of work, data analysis, drafting, final approval.
S. H. Waqar: Concept, interpretation of data, design of work, data analysis, final approval.

Both authors agreed to be accountable for the content of the article.

Ethics statement: Institutional review board permission was obtained prior to the study and informed consent were taken from the parents.

Competing interest: Authors declare that they have no competing interests.

Source of funding: None

Disclosure: This article is based on the dissertation of Dr Muhammad Arslan, a postgraduate student for FCPS in General Surgery.

Data availability: Corresponding author may provide data on requesst.

How to cite this article:
Arslan M, Waqar SH. Shoulder tip pain following the release of pneumoperitoneum in supine versus trendelenburg position after laparoscopic cholecystectomy: A comparative study. J Surg Pakistan. 2024;29 (1):24-28.