

# The Prospective Study Comparing The Post-Operative Shoulder Tip Pain (VAS) Score In Standard Pressure V/S Low Pressure Cholecystectomy.

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## ABSTRACT

**Background:** Cholelithiasis is one of the most common surgical diseases. About 1-15% adult population have gallstones. The present study is done to compare the frequency and intensity of post-operative shoulder tip pain (VAS) score in standard pressure v/s low pressure cholecystectomy. **Methods:** The Comparative, Randomized and Prospective study is conducted on 100patients' under-going Laparoscopic Cholecystectomy for Cholelithiasis with 50 patients in each group: Group A- Low pressure pneumoperitoneum at 7 to 10mm Hg, Group B- Standard pressure pneumoperitoneum at 12 to 14mm Hg in the Department of General Surgery, Muzaffarnagar Medical College and hospital. Postoperative pain was measured at 6, 12, 24, 48 hours using a Visual Analogue Scale (VAS). Statistical analysis was carried out using the chi square and independent student t tests with the help of SPSS (statistical package for social sciences, version 17.0). A p value < 0.05 was taken as statistically significant. **Results:** Low insufflation pressure reduced pain frequency as well as pain intensity after laparoscopic cholecystectomy. Analgesic requirement is also less in low pressure. **Conclusion:** Low pressure pneumoperitoneum is ideal for laparoscopic cholecystectomy for decrease frequency and intensity of postoperative shoulder tip pain.

**Keywords:** Post-operative shoulder tip pain, VAS score, Standard pressure, Low pressure, Laparoscopic Cholecystectomy.

## INTRODUCTION

Cholelithiasis is one of the most common surgical diseases. About 1-15% adult population have gallstones. In the United States, 10-20% adults have gallstones,<sup>[1]</sup> the prevalence of cholelithiasis in other Western culture is similar to that of United States but it appears in somewhat lower in Asia and Africa. The reported prevalence of gallstones in Northern India is 6.2%.<sup>[2]</sup> A gallstone survey suggests that the gallbladder stone occurred seven times more commonly in North India than South India.<sup>[3]</sup> Laparoscopic cholecystectomy is the gold standard procedure for cholelithiasis. As compared to open cholecystectomy, laparoscopic cholecystectomy becomes one of the safest and most effective operative procedures of general surgery since its introduction in 1985. It is less painful, needs shorter recovery time and shorter hospital stay. A number of complications were noted with conventional laparoscopic cholecystectomy such as post-operative

pain. This complication is due to peritoneal stretching and diaphragmatic irritation caused by high intra- abdominal pressure by CO<sub>2</sub>. Keeping this in mind, it was assumed that lower intra-abdominal pressure will decrease this complication.<sup>[3,4]</sup>

Standard pressure pneumoperitoneum for laparoscopic cholecystectomy employs a pressure range of 12-14mm Hg. An emerging trend has been the use of low pressure pneumoperitoneum in the range of 7-10 mm Hg in an attempt to lower the impact of pneumoperitoneum on the human physiology while providing adequate working space. In our study we compare the effects of low pressure pneumoperitoneum with standard pressure of pneumoperitoneum.<sup>[5-8]</sup>

During laparoscopic cholecystectomy, adequate working space is required in the abdomen for good exposure that contributes to satisfactory results and patient safety. Common methods to create working space in the abdomen are pneumoperitoneum and abdominal wall lifting methods such as laparotensor and laparolift. Pneumoperitoneum for laparoscopic cholecystectomy is most often created by insufflating carbon dioxide gas into the peritoneal cavity and then holding it at constant pressure till the end of surgery when it is released at the time of

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withdrawal of the ports.<sup>[9]</sup> Standard pressure pneumoperitoneum, employing a pressure range of 12- 14mm Hg over prolonged periods has been associated with adverse effects such as decreased pulmonary compliance, altered blood gas parameters, impaired functioning of the circulatory system, raised liver enzymes, renal dysfunction, and even increased intra-abdominal venous pressure.<sup>[10,11]</sup> The use of low pressures for pneumoperitoneum in the range of 7-10mm Hg instead of standard pressure pneumoperitoneum is made in an attempt to lower the impact of pneumoperitoneum on human physiology while providing adequate working space.<sup>[12]</sup> This method appears to have a lesser adverse effect on the cardiac and respiratory function and is suitable for the elderly and for those with chronic cardiac or respiratory diseases. Other possible advantages of low pressures during pneumoperitoneum appear to be lower incidence of shoulder tip pain in the postoperative period and also better quality of life in the week following surgery.<sup>[10]</sup>

A Visual Analogue Scale (VAS) is a measurement method that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot be measured directly. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. From the patient's perspective this spectrum appears continuous, the pain does not take discrete jumps, as a categorization of none, mild, moderate and severe would suggest.<sup>[13]</sup> It was to capture this idea of an underlying continuum that the VAS was devised. Operationally a VAS is usually a horizontal line, 100 mm in length, anchored by word descriptors at each end. The patient marks on the line the point that they feel represents their perception of their current state. The VAS score is determined by measuring in millimeters from the left hand end of the line to the point that the patient marks. Hereby, with the help of this study we have tried to compare the post-operative pain at shoulder tip due to pneumoperitoneum created by CO<sub>2</sub> during low pressure (7-10mmHg) and standard pressure (12-14 mmHg) laparoscopic cholecystectomy.<sup>[14]</sup>

There have been studies to indicate that the use of low pressure during pneumoperitoneum is associated with better intra-operative tolerance and improved post-operative recovery with reduced intensity of surgical pain.<sup>[15]</sup> Many centres have reported that laparoscopic cholecystectomy performed with low pressure pneumoperitoneum resulted in better postoperative quality of life as compared to laparoscopic cholecystectomy performed with standard pressure pneumoperitoneum. Incidence and intensity of postoperative pain were significantly lower in low pressure pneumoperitoneum groups with fewer requirements of analgesics in postoperative period.<sup>[11,16,17]</sup>

The present study is done to compare the frequency and intensity of post-operative shoulder tip pain (VAS) score in standard pressure v/s low pressure cholecystectomy.

## MATERIALS AND METHODS

The Comparative, Randomized and Prospective study is conducted on 100 patients under-going Laparoscopic Cholecystectomy for Cholelithiasis with 50 patients in each group: Group A- Low pressure pneumoperitoneum at 7 to 10mm Hg, Group B- Standard pressure pneumoperitoneum at 12 to 14mm Hg in the Department of General Surgery, Muzaffarnagar Medical College and hospital, Western U.P.

### Inclusion Criteria

Patients in age group 18-65 years, who came to Muzaffarnagar Medical College & Hospital with USG (Ultrasonography) proven diagnosis of symptomatic gallstones.

### Exclusion Criteria

Patients with BMI (Body Mass Index) >35, acute cholecystitis, previous upper abdominal surgery, suspected CBD (Common Bile Duct) stones, history of obstructive jaundice/ pancreatitis, bleeding disorder, cardio respiratory disorders, Immuno-compromised patients, Patients < 18years & > 65years, Malignancy.

The study was carried out in the Department of General Surgery in a tertiary care hospital, in India, from March 2016 to September 2017. All consecutive patients with uncomplicated, symptomatic gallstone disease tagged for laparoscopic cholecystectomy were included in the study. Ethical clearance from the Institute Ethics Committee was taken. The procedure was explained in detail to the patients and informed consent was taken.

### Standard Laparoscopic Cholecystectomy

The standard technique of performing LC is to use 4 ports. The pneumoperitoneum is achieved by either closed Veress needle technique or open technique using a blunt trocar or a Hasson's trocar. A 10 mm telescope usually a 30 degree is used at the umbilicus either infra, intra or supra umbilical depending on patient's habitus and surgeon's preference. Another 10 mm trocar is used in the epigastrium which is the main right working port for the surgeon. One 5 mm trocar in the right lumbar region is used for gallbladder fundus traction and another 5 mm trocar in the right hypochondrium is used as left hand working port for the surgeon. With left hand Hartmann's pouch is retracted and with right hand anterior and posterior dissection is done in Calot's triangle and wide window is created. Critical view of safety is of utmost importance to prevent bile duct injury. Clipping of the cystic duct and cystic artery is achieved from 10 mm epigastric port.

Gallbladder extraction is generally done from either epigastric or umbilical port. This technique can be named as “10- 10-5-5” or “4 ports standard LC”. “10-10-5-5” denotes 10 mm umbilical port for camera, 10 mm epigastric port for right working instrument, 5 mm right hypochondrium port for left working instrument and 5 mm right lumbar port for fundal retraction respectively.

This study is a prospective comparative analysis with a sample size of 100 patients. Patients were randomized into two groups first 50 patients into group A and next 50 patients in group B. Group A with 50 patients underwent laparoscopic cholecystectomy with low pressure pneumoperitoneum upper limit at 10 mm Hg while the other group with 50 patients underwent laparoscopic cholecystectomy with standard pressure pneumoperitoneum upper limit at 14 mm Hg. The surgeries were performed by two experienced consultant surgeons. During the surgery, the first port was inserted at a pressure of 14 mm Hg. In the standard pressure group, the pressure was continued at 14 mm Hg while in the low pressure group, the pressure was reduced to 10 mm Hg for the remaining duration of surgery. A standard laparoscopic cholecystectomy was performed with the insertion of four ports at the start of surgery. Intra- operative monitoring was performed by monitoring heart rate and blood pressure and ETCO2 invasively every 5 minutes. Closure of the rectus sheath was done at 10 mm ports at the umbilicus site and at the epigastric site using absorbable sutures. Skin was approximated at all the port sites using staples.

Postoperative pain was measured at 6, 12, 24, 48 hours using a Visual Analogue Scale (VAS). Postoperative analgesia was administered in the form of Diclofenac 12 hourly. Need for additional analgesia over and above the 12 hourly diclofenac and incidence of shoulder tip pain was also noted.

Statistical analysis was carried out using the chi square and independent student t tests with the help of SPSS (statistical package for social sciences, version 17.0). A p value < 0.05 was taken as statistically significant.

**RESULTS**

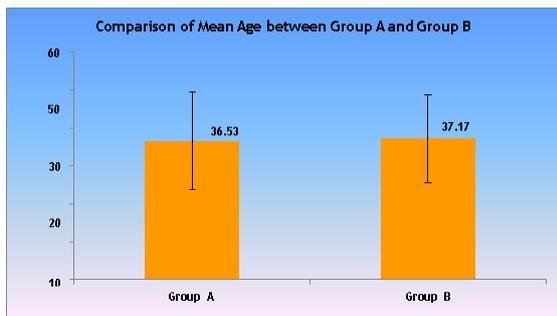


Figure 1: Comparison of mean age (yrs) between two groups.

The above diagram shows comparison of mean age distribution in two groups under the study. It observed that group A have mean age 36.53 and group B have 37.7 [Figure 1].

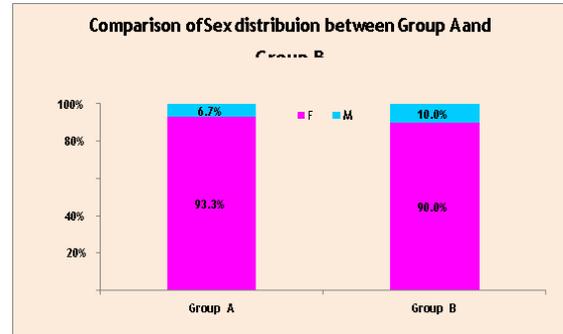


Figure 2: Comparison of the Sex distribution in two groups.

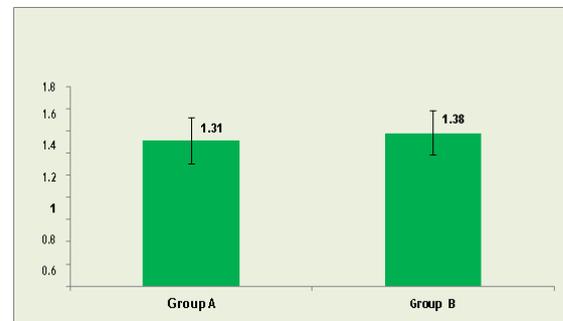


Figure 3: Comparison of Duration (hours) of Surgery in two groups.

Table 1: Comparison of shoulder tip pain at various time interval in two groups.

Shoulder Tip Pain	Group A			Group B			p value
	Mild	Moderate	Severe	Mild	Moderate	Severe	
6 hrs number of patients	26	23	1	2	35	13	<0.001*
	52.0%	46.0%	2.0%	4.0%	70.0%	26.0%	
12 hrs number of patients	24	26	0	2	22	26	<0.001*
	48.0%	52.0%	0.0%	4.0%	44.0%	52.0%	
24 hrs number of patients	40	10	0	5	45	0	<0.001*
	80.0%	20.0%	0.0%	10.0%	90.0%	0.0%	
48 hrs number of patients	50	0	0	18	32	0	<0.001*
	100.0%	0.0%	0.0%	36.0%	64.0%	0.0%	

The above chart shows the comparison of sex distribution between the two groups under the study. It was observed that under both the groups 90% of the patients were females while 10% were males [Figure 2].

The above chart shows the comparison of duration of surgery between the two groups. It was observed that there was no significant difference in duration of surgery between both the groups (p value of > 0.001).

The above table shows the comparison of shoulder tip pain of various time intervals between two groups at 6 hrs, 12 hrs, 24 hrs, 48 hrs [Table 1], post-operative pain after laparoscopic cholecystectomy is less both in frequency and intensity in low pressure group p value is < 0.001 .

## DISCUSSION

The advent of Laparoscopic Cholecystectomy was a milestone achieved in both the treatment of gallstones and in the evolution of minimal access surgery. The aim was to reduce the trauma during access and maintain appropriate exposure of the surgical field during surgery. The creation of the pneumoperitoneum is the essential component for laparoscopic procedures. To achieve this, surgeons have traditionally created a pneumoperitoneum of up to 14-15mmHg by insufflating carbon dioxide gas into the peritoneal cavity at the time of insertion of ports.<sup>[18-20]</sup>

The major benefit of the laparoscopic cholecystectomy is the avoidance of upper abdomen incision resulting in less post-operative pain and early recovery. But even laparoscopic cholecystectomy is not free from discomfort and pain. Patients usually have abdominal pain and shoulder tip pain after laparoscopic cholecystectomy. Various cause of the pain are peritoneal stretching and diaphragmatic irritation by high intra-abdominal pressure caused by pneumoperitoneum or by co2 absorption from the peritoneum cavity. Several research studies are done to find out the way to reduce frequency and intensity of postoperative pain after laparoscopic cholecystectomy.<sup>[21]</sup>

Intraperitoneal anaesthetic instillation, removal of residual co2 before closure, peritoneal wash out with saline, ultrasound guided transverse abdominal plane block with local anaesthetic are the various techniques that have been studied.<sup>[22]</sup>

Many postoperative analgesics eg, diclofenac sodium, fentanyl, morphine, ibuprofen, have been studied but none of them showed sufficient positive results for complete analgesia. Pain after laparoscopic cholecystectomy needs multimodal analgesia for complete pain relief.<sup>[14]</sup>

This study has been done to compare the effects of different intra-abdominal pressure on post laparoscopic cholecystectomy pain. It has been shown that low insufflation pressure reduced pain frequency as well as pain intensity after laparoscopic cholecystectomy. Analgesic requirement is also less in low pressure. There are other advantages of low pressure technique such as less hemodynamic

variations which is especially beneficial in patients having cardiac disease. The increase in intra-abdominal pressure increases the absorption of co2 causing hypercapnia and acidosis which has to be avoided by hyperventilation. It pushes the diaphragm upward decreasing the pulmonary compliance and increase the peak air way pressure. During the early phase of pneumoperitoneum there is a reduction in the cardiac output by decrease in the venous return. While these cardio respiratory changes may be tolerated by healthy adults with adequate cardio pulmonary reserve, people with cardio pulmonary disease may not tolerate these changes.

Result of our study shows that post-operative pain after laparoscopic cholecystectomy is less both in frequency and intensity in low pressure group p value is < 0.001 at 6 hour, 12 hour, 24 hour, the same was observed by many researchers. According to the study done in 2016, the mean visual analogue pain score of postoperative shoulder tip pain was significantly less intense in the low pressure group at 6, 12, 24 hours than that recorded for the normal pressure group (P < 0.001 by unpaired t-test).

## CONCLUSION

Low pressure pneumoperitoneum is ideal for laparoscopic cholecystectomy for decrease frequency and intensity of postoperative shoulder tip pain.

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