SHOULDER TIP PAIN IN LAPAROSCOPIC CHOLECYSTECTOMY WITH ACTIVE VS PASSIVE EVACUATION OF PNEUMOPERITONEUM - A RANDOMIZED CONTROL TRIAL

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Abstract:

Objective: The objective of the study was to compare the frequency of severity of shoulder tip pain after active (gas suctioning) and passive removal of pneumoperitoneum among patient undergoing laparoscopic cholecystectomy.

Methods: This Randomized control trial was directed in general surgery department of DOW university hospital beginning from February 2016 to February 2017. Two hundred and six patients undergoing standard 4 port laparoscopic cholecystectomy were randomly enrolled equally in either groups. The surgeon evacuated the abdomen by using a multiporous suction tube limiting the negative suction pressure to -40 mmHg for 2-5 minutes under direct vision in active aspiration group, while in control group, CO2 was removed passively. Pain scores were recorded using visual analog score at 16 hours post-operatively by residents of surgery blinded to the study.

Results: Mean VAS pain score at 16 hours in intervention group was much inferior than control group 1.00 ±2.09 vs. 3.06 ±2.58 (p < 0.001).

Conclusion: Active aspiration of CO2 is an effective method that removes most if not all gas from the abdominal cavity. This will cause statistically significant decrease post-operative discomfort, pain and decrease need of rescue analgesics.

Keywords: Laparoscopic cholecystectomy, Pneumoperitoneum, Active Aspiration, shoulder tip pain, post-laparoscopic cholecystectomy pain

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INTRODUCTION:
Laparoscopic cholecystectomy has largely replaced conventional open cholecystectomy [1]. It provides great satisfaction to patient and at the same time beneficial for the operating surgeon as well in terms of high grade visibility minimum operative time, minimum anesthesia time, less postoperative pain, early mobilization, earlier discharges, and return to activities of daily life [2,3]. Out of many reasons, patients prefer laparoscopic cholecystectomy over open cholecystectomy because of less post-operative pain most common of them are shoulder tip pain and right hypochondrium pain. Assortment of shoulder tip pain reported incidents are from 35% to 80% and may last for greater than 72 hours post-operatively [4].

Post-operative shoulder pain and abdominal pain due to residual pneumoperitoneum leads to unpleasant discomfort and delay mobilization in spite of multiple doses of analgesics [2,5]. It also leads to reduced intra operative urinary output, respiratory compliance, reduced cardiac output and decreased venous blood flow [3, 5]. The etiology of shoulder tip pain is multifactorial [2]. The shoulder tip pain due to residual CO2 is also caused by stretching of diaphragm muscles and phrenic nerve irritation [2]. Therefore reduction in post laparoscopic cholecystectomy pain can be done by multiple methods like low pressure pneumoperitoneum, instillation of NSAIDS, instillation of intraperitoneal local anesthesia, infiltration of wound with local anesthesia and removal of residual pneumoperitoneum [3,5-7]. Various methods have been introduced like pulmonary recruitment maneuver consisting of two to five insufflations at the end of procedure active suctioning of CO2 or filling the abdomen with warm saline [1,4-11]. Patient receiving abdominal filling with saline voided noticeable amount of urine following the immediate post-operative night, disposes the patient to fluid overload and its time consuming [3, 12]. Pulmonary recruitment maneuvers carries risk of pneumothorax and increased morbidity. It implies that none is proven to be as assuring to be a standard method.

Since no local data is available, and there is no standard technique, the rationale of the study was to see the effect of active aspiration of CO2 as a superior technique.

The objective of the study was to compare the frequency of severity of shoulder tip pain after active (gas suctioning) and passive removal of pneumoperitoneum among patient undergoing laparoscopic cholecystectomy.

METHODOLOGY:
This RCT was performed in general surgery department, DOW university hospital, from February 2016 to February 2017 after approval from research and training cell of CPSP. Patients of either gender, age ranged between 20 to 60 years and undergoing cholecystectomy were recruited.

The pain intensity was further characterized as no pain, mild moderate and severe pain based on Visual Analog Scale, pain intensity was further characterized as no, mild, moderate and severe pain based on Visual Analog Scale.

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The study is based on total of 206 patients and none of them were excluded. Out of them, 108 were arbitrarily allocated in either groups. Demographic variables are mentioned in table 1. It was observed that 107 (91.1%) patients in control and 28 (25.9%) patients in case developed pain. P value < 0.001 for both groups.
Analog Scale from 0 to 10. The results are as shown in graph 1. Over all Mean VAS score at 16 hours after laparoscopic cholecystectomy was 2.03 ± 2.56.

The score in control group which was much higher than case group (3.06 ± 2.58 vs. 1.00 ±2.09).

Table -1: DESCRIPTION OF PATIENT'S CHARACTERISTICS (N=206)

| CHARACTERISTICS | CONTROL | CASE | P value |
|-----------------|---------|------|---------|
| AGE GROUPS      | N (%)   | N (%)|         |
| 20 – 30         | 72 (66.7) | 12 (11.1) | <0.001 |
| 31 – 40         | 18(16.7)  | 31(28.7)  |         |
| 41 – 50         | 18(16.7)  | 65(60.2)  |         |
| SEX             |         |       |         |
| Male            | 48 (44.4) | 17(15.7)  | <0.001 |
| Female          | 60(55.6)  | 91(84.3)  |         |
| BMI             |         |       |         |
| 20-25           | 61       | 31   |         |
| 25-30           | 41       | 22   | <0.001 |
| 35-40           | 6        | 55   |         |
| DURATION OF SURGERY |     |       |         |
| < 30 mins       | 0        | 6(5.6) |         |
| 30-60 mins      | 54 (50%) | 41(38)  | <0.001 |
| 61-120 mins     | 54 (50%) | 9(8.3)  |         |
| > 121 mins      | 0        | 52(52) |         |

Graph 1: STRATIFICATION ACCORDING TO PAIN AND SEVERITY OF PAIN
VAS Score at 16 Hours Postoperatively

- **Group**
  - control
  - case

Number of Patients

- **No Pain**: 1
- **1-2 Mild Pain**: 6
- **3-6 Moderate Pain**: 18
- **7-10 Severe Pain**: 13
Table 2: DESCRIPTION OF ANALGESIC REQUIREMENT

| CHARACTERISTICS               | CONTROL | CASE | P-value |
|------------------------------|---------|------|---------|
| ADDITIONAL ANALGESICS REQUIRED |         |      |         |
| Yes                          | 54      | 15   | <0.01   |
| No                           | 54      | 93   |         |
| ADDITIONAL ANALGESICS NAMES |         |      |         |
| Not Given                     | 72      | 93   |         |
| Toradol                      | 18      | 13   | <0.01   |
| Toradol and Nalbuphine       | 18      | 2    |         |
| ADDITIONAL ANALGESICS FREQUENCY |     |      |         |
| Not Given                     | 72      | 93   |         |
| Once                         | 18      | 13   | <0.01   |
| Multiple                     | 18      | 2    |         |

After stratification in the context of effect modifiers, age, height, weight, BMI and period of surgery, it was found that all of them effect pain outcome. However it was observed that in age group between 20 – 30 years. No significant association was found with pain score (p value 0.77). Severity of pain score had significant association with age and BMI (p value <0.001). However, BMI of range between 20-25 kg/m² had no association with the severity of pain (p value 0.438).

**DISCUSSION:**

Pain after laparoscopic surgery can occur in abdomen either upper or lower, back or either shoulders [13-15]. It can be transient or lasting up to days. Shoulder tip pain was documented in 99.07% of the control group and 32.85% of case group in our study. This shows that over all pain score in case group was significantly lower (p value < 0.001).

Similar study conducted by Jasmin et al showed no pain 86.2% in the case group [4]. The results are comparable with our study in which 78.8% of intervention group had no pain. In another research done by Fredman B et al, the active aspiration (AA) group in which gas was actively aspirated by suction, while no efforts, in the non-active aspiration (NAA) group were made. Throughout the initial post-operative hour, lesser stresses were made by AA patients for morphine in comparison to those who belong to NAA group (15.3 +/- 15.7 vs 31.3 +/- 26.2) and also obtained a smaller dose of PCA morphine (2.7 +/- 1.3 mg vs 3.9 +/- 1.9 mg) P = 0.056. This concluded that residual pneumoperitoneum was one of the important contributing factor leading post-operative pain [16, 17].

In recent study, number of patients experiencing mild, moderate and severe pain were 15.5%, 49.3% and 35.2% from control group and 13.8% from intervention group experienced mild pain. However, none of the patient experienced moderate and severe pain. Whereas in our study 7.4% of Group A patient had mild pain whereas 12% and 1.9% patients moderate and severe pain.

Results of our study are comparable with study conducted by Jasmin S et al. in which rescue analgesia was required by 33.1% of population. Out of these, in contrast, requirement by control and case group were 50% and 42.3% which was significantly higher that our study [4, 17].

**CONCLUSION:**

Active aspiration of CO₂ is an effective method that removes most if not all gas from the abdominal cavity. This will cause statistically significant decrease post-operative discomfort, pain and decrease need of rescue analgesics.

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