Original Research Article

A COMPARATIVE STUDY OF LOW VERSUS STANDARD INTRAPERITONEAL PRESSURES IN GYNAECOLOGICAL LAPAROSCOPIC SURGERY

ABSTRACT

BACKGROND -: Laparoscopic surgery has several advantages when compared to open surgery, including faster postoperative recovery and lower pain scores. However, Increased intraabdominal pressure may also have negative implications on cardiovascular, pulmonary, and intraabdominal organ functioning. To overcome these negative consequences, several trials have been performed comparing low- versus standard-pressure pneumoperitoneum.

AIM - The aim of present study was to evaluate the effectivity of low intraperitoneal pressures in comparison with standard intraperitoneal pressure during laparoscopic hysterectomies.

STUDY DESIGN- Experimental study

MATERIAL AND METHOD– 40 cases with uncomplicated symptomatic benign uterine pathologies who were posted for laparoscopic hysterectomy were selected out of which 20-20 cases were randomized into low and standard pneumoperitoneum groups.

RESULT– in patients in whom low pressure pneumoperitoneum is employed are better recovered in terms of pain than standard pressure pneumoperitoneum. This means hospital stay can be shortened in low pressure pneumoperitoneum groups which will be more economical and comfortable for patients.

CONCLUSION–
Laparoscopic hysterectomy can be done at 10 mmhg with the benefits of :

- Optimum visualization with low pressure
- Reduction in post operative pain helping the patient for early ambulation so that patient will get back to routine work and normal life earlier, it is the main purpose of minimal invasive surgery.

KEY WORDSlaparoscopy, pneumoperitoneum, hysterectomy.

INTRODUCTION

The optimal intraperitoneal pressure during laparoscopy is not known. Recent literature found benefits of using lower pressures, but the effectivity of doing abdominal surgery with low peritoneal pressures needs to be assessed. This study compares low with standard pneumoperitoneum during gynecological laparoscopy.

Intraperitoneal pressures at or above 12 mm Hg are usually used for intra-abdominal laparoscopy.[1,2] Some authors have postulated that reducing abdominal distention might be able to decrease postoperative pain and the risk of laparoscopy-related complications such as air embolism, pneumothorax, pneumomediastinum, arrhythmia, and ventilation issues.[3–8] There is a concern of a poorer visualization of the operative field [9] and therefore an increase in the occurrence of complications. The optimal pneumoperitoneum pressure would allow proper visualization while having the fewest intra and postoperative complications.[1] Furthermore, several study highlighted the differences in patient positioning (Trendelenburg vs Fowler) and the nature of the surgeries in gynecologic laparoscopy.[10-12]

However, little data exist about the possibility of abdominal endoscopic surgery with peritoneal pressures below the standard value of 12 mm Hg.[13,14]. Hence the purpose of this study to compare the gynaecologiclaparoscopies done with low and standard Intraperitoneal pressure.

AIMS AND OBJECTIVES

- The aim of present study was to evaluate the effectivity of low intraperitoneal pressures in comparison with standard intraperitoneal pressure during laparoscopic hysterectomies.

  OBJECTIVES

  -To compare the effectivity of low intraperitoneal pressure with standard intraperitoneal pressure in terms of

1. duration of operating time related to adequate exposure

2. Intraoperative haemodynamic changes

   Postoperative pain

METHOD.

- **Study type** – Experimental study
- **Sample size –** out of total 40 cases, in which 20 were randomised in to low pneumoperitoneum pressure group and 20 patients were randomized in to standard pressure group**.**

INCLUSION CRITERIA

- All consecutive patients with uncomplicated symptomatic benign uterine pathologies posted for laparoscopic hysterectomies who gave consent for study

EXCLUSION CRITERIA

- Patients with complicated uterine pathologies, with large size masses (more than 20 weeks size), and with cancer.
- Cases with medical and surgical problems.
- Cases with acute abdomen

– Patients were randomized into two groups. One group with patients undergoing laparoscopic hysterectomy with standard pressure pneumoperitoneum at 14 mm Hg while the other group with patients undergoing laparoscopic hysterectomy with low pressure pneumoperitoneum at 10 mm Hg

– A standard laparoscopic hysterectomy was performed with the insertion of four ports at the start of surgery.

– At admission, the patient's blood pressure and heart rate was noted.

- Intraoperative blood pressure and heart rate was noted. The difference between the readings at admission and those taken intraoperatively was calculated.
- Postoperative analgesia was administered in the form of diclofenac 12 hourly with additional doses where necessary. Postoperative pain was assessed at 6, 12 and 24 hours using a visual analogue scale.
- Need for additional analgesia over and above the 12 hourly diclofenac and incidence of shoulder tip pain was also noted.

RESULTS

Table no 1 : Time required while using Standard pressure v/s Low pressure pneumoperitoneum

	Standard pressure	Low pressure
Average time required	139.2	147.3
Minimum time required	105	120
Maximum time required	195	180

- Laparoscopic hysterectomy with standard pressure pneumoperitoneum took an average of 139.2 ± 6.9 minutes with a minimum of 105 minutes and a maximum of 195 minutes.
- Laparoscopic hysterectomy with low pressure pneumoperitoneum took an average of 147.3 ± 5.7 minutes with a minimum of 120 minutes and a maximum of 180 minutes.
- Low pressure laparoscopic hysterectomy took on average eight minutes more than standard pressure laparoscopic hysterectomy but this difference was not statistically significant (p = 0.1).

Table no 2 : Changes in blood Pressurewhile using Standard pressure v/s Low pressure pneumoperitoneum

Average change in Blood Pressure	**Standard pressure**	**Low pressure**
Systolic**B**p	0.8 + 8.9 mm Hg	0.96 + 6.27 mm Hg
Diastolic Bp	2.8 ± 4.2 mm Hg	1.8 ± 5.2 mm Hg

- The average change in systolic BP in patients who underwent low pressure laparoscopic hysterectomy was an increase of 0.96 + 6.27 mm Hg with a maximum rise of 13 mm Hg and a maximum fall of 10 mm Hg.
- The average change in systolic BP in patients who underwent standard pressure laparoscopic hysterectomy was an increase of 0.8 + 8.9 mm Hg with a maximum rise of 18 mmHg and a maximum fall of 16mm Hg. This difference was not statistically significant.

- Average change in diastolic blood pressure in patients who underwent low pressure laparoscopic hysterectomy was increase of 1.8 ± 5.2 mm Hg with a maximum rise of 13 mm Hg and a maximum fall of 7 mm Hg.
- The average change in diastolic BP in patients who underwent standard pressure laparoscopic hysterectomy was an increase of 2.8 ± 4.2 mm Hg with a maximum rise of 10 mm Hg and a maximum fall of 7 mm Hg. This difference was not statistically significant.

Table 3 : Changes in heart rate while using Standard pressure v/s Low pressure pneumoperitoneum

	Standard pressure	**Low pressure**
Average change in heart rate	1.5 ± 6.02 beats per minute	0.5 ± 5.28 beats per minute

- The average change in heart rate in patients who underwent low pressure laparoscopic hysterectomy was a decrease of 0.5 ± 5.28 beats per minute.
- Average change in heart rate in patients who underwent standard pressure laparoscopic hysterectomy was an increase of 1.5 ± 6.02 beats per minute.

This difference was not statistically significant.

Table 4 : Pain Score noted while using Standard pressure v/s Low pressure pneumoperitoneum

	Standard pressure	Low pressure
Average pain score at time interval		
6 hours	59.1	62.2
12 hours	62.2	54.2
24 hours	5.2	4.6

- The average pain score at 6 hours for patients who underwent low pressure laparoscopic hysterectomy was 62.2 ± 11.7 with a minimum of 36 and a maximum of 82. The pain score at 6 hours for standard pressure laparoscopic hysterectomy was 59.1 ± 18.0 with a minimum of 35 and a maximum of 100. This difference was not statistically significant (p = 0.4).
- The average pain score at 12 hours for patients who underwent low pressure laparoscopic hysterectomy was 54.2 ± 8.5 with a minimum of 38 and a maximum of 69. The average pain score at 12 hours for patients who underwent standard pressure laparoscopic hysterectomy was 62.2 ± 12.0 with a minimum of 35 and maximum of 100. This difference was statistically significant.(p = 0.04)
- The average pain score at 24 hours for patients who underwent standard pressure laparoscopic hysterectomy was 5.2 ± .8 with a minimum of 3.5 and a maximum of 10. Average pain score at 24 hours for patients who underwent low pressure laparoscopic hysterectomy was 4.60 ± .81 with a minimum of 3.6 and a maximum of 8.2. This difference was not statistically significant.

Table 5: Shoulder Tip Pain noted while using Standard pressure v/s Low pressure pneumoperitoneum

	Standard pressure	**Low pressure**
No. of cases	18	17
Shoulder tip pain present	2(11.1%)	1(5.8%)
Shoulder tip pain absent	16(88.8%)	16(94.2%)

- One (5.8%) of the 17 patients who underwent low pressure laparoscopic hysterectomy and two (11.11%) of the 18 patients who underwent standard pressure laparoscopic hysterectomy had post operative pain referred to the tip of the right shoulder. This difference was not statistically significant (p = 1.0).

DISCUSSION

CO2 is the insufflation gas of choice in laparoscopy. It ispreferred over air insufflation, which affects the systemic andperitoneal response to a larger degree than CO2.[15] The usageof CO2 has some important advantages. It is transparent,non-inflammable, and well dissolvable in blood. There are,however, some disadvantages associated with its usage. Theincreased intra-abdominal pressure increases the absorptionof CO_2, causing hypercapnia and acidosis, which has to beavoided by hyperventilation.[16] It also pushes the diaphragmupwards, decreasing the pulmonary compliance,[16,17] andincreases the peak airway pressure.[17,18] Pneumoperitoneum also increases systemic vascular resistance[18,19] and pulmonaryvascular resistance.[18] CO2 pneumoperitoneum alsopredisposes the patient to cardiac arrhythmias.[20] Duringthe early phase of pneumoperitoneum, there is a reductionin the cardiac output[17,18] by decreasing the venous return.[21]Although these cardiorespiratory changes may be toleratedby healthy adults with adequate cardiopulmonary reserve,people with cardiopulmonary disease may not be able to tolerate these cardiopulmonary changes. Abdominal wall lift,using a special device, e.g., Laparolift)[20] or Laparo-tensor,[17]introduced through a port in the abdominal wall has been applied to decrease the cardiopulmonary changes.[22]

Randomised clinical trials have shown that using a lower pressureof pneumoperitoneum decreases the cardiac changes,[23] thenumber of people complaining of shoulder-tip pain,[24] the intensity of pain,[25] and the analgesic requirement.[24-27]Low intra-abdominal pressure may prevent mortality dueto CO2 embolism.[28] Moreover, Schwarte *et al*.[29] found thatincreasing intra-abdominal pressure decreased gastric mucosalO2 saturation. The European Association for EndoscopicSurgery (EAES) guidelines[21] also recommend use of thelowest intra-abdominal pressure rather than a routine pressure(14 mmHg) to allow adequate exposure of the operative field.

Conclusion

- Both groups are equally comparable in almost all above parameters. There is no significant differences in both groups, this means low pressure pneumoperitoneum can be used as effectively as standard pressure pneumoperitoneum.
- In patients in whom low pressure pneumoperitoneum is employed are better recovered in terms of pain than standard pressure pneumoperitoneum. This means hospital stay can be shortened in low pressure pneumoperitoneum groups which will be more economical and comfortable for patients.
- Impact of low pressure pneumoperitoneum on intra-operative hemodynamics is not significant. This needs to be examined through a more complex set up and probably a

larger sample size that includes a significant numbers of patients with cardiovascular comorbid conditions.

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