

Hemodynamic Stability with Intrathecal Fentanyl Alone in Laparoscopic Hysterectomies Under General Anesthesia - A Pilot Study

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Abstract

Background: Laparoscopic surgeries have become one of the most common procedures performed on an outpatient basis and for sicker patients, rendering anesthesia for laparoscopy technically difficult and challenging. This study is done to evaluate the efficacy of intrathecal fentanyl in maintaining the hemodynamics in patients undergoing laparoscopic hysterectomies under general anesthesia (GA). **Materials and Methods:** Sixty patients classified as American Society of Anesthesiologists (ASA) physical status I and II, 30-50 years of age, and posted for elective laparoscopic hysterectomies under GA were selected. Patients were randomly divided into two groups of 30 each. Group 1 received intrathecal fentanyl 25 µgm diluted to 3 mL with normal saline (NS) before GA and Group 2 received intravenous (IV) fentanyl 2 µgm/kg before GA. Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), peripheral capillary oxygen saturation (SpO₂), and electrocardiogram (ECG) were recorded before induction, after intubation, at 15 min, at 30 min, and every 30 min thereafter till the end of the surgery. **Statistical Analysis:** The results obtained in the study are presented as mean ± standard deviation (SD) in tabulated form and statistical analysis was done with SPSS software version 17 using Student's *t*-test. **Results:** In this present study, we found that HR, SBP, DBP, and MAP in both the groups were not significant after intubation for up to 15 min. Once pneumoperitoneum was achieved HR, SBP, DBP, and MAP were found to be significantly higher in Group 2 compared to that of Group 1 ($P < 0.001$). The time for first rescue medication was significantly shorter in Group 2 compared to that of Group 1. There were no side effects observed in any of the groups. **Conclusion:** From this study, we conclude that intrathecal fentanyl 25 µgm is very effective in controlling the intraoperative hemodynamics during laparoscopic hysterectomies under GA. We also observed better postoperative analgesia, with prolonged time for rescue analgesia.

Key words: Fentanyl, hemodynamics, intrathecal, laparoscopic hysterectomies

INTRODUCTION

Laparoscopy started in the mid-1950s when gynecologists declared this technique a safe way to diagnose pelvic pain while reducing hospital stay.^[1] Carbon dioxide (CO₂) is universally used to insufflate the abdominal cavity to facilitate the view.^[2] However, several pathophysiological changes occur after CO₂ pneumoperitoneum.^[3] It raises intraabdominal pressure (IAP) and can have significant cardiovascular, respiratory, and neurologic effects.

Several methods have been attempted to minimize these complications. Regional anesthesia is one such method, which offers several advantages such as quicker recovery, decreased postoperative nausea and vomiting (PONV), less postoperative pain, shorter postoperative stay, cost-effectiveness, improved

patient satisfaction, and fewer hemodynamic changes.^[4,5] However, this anesthesia technique requires a relaxed and cooperative patient, low IAP to reduce pain and ventilator disturbances, reduced tilt, and gentle surgical technique. Any compromise may result in increased patient anxiety, pain, and discomfort, necessitating supplementation with intravenous (IV) sedation. The combined effect of pneumoperitoneum and sedation can lead to hypoventilation and arterial oxygen desaturation.^[6] Thus, laparoscopic procedures that require multiple puncture sites, considerable organ manipulation, and steep tilt make spontaneous breathing difficult for the patient and should be managed with general anesthesia (GA).

Opioids when used as adjuvants with spinal bupivacaine have been effective for motor paralysis. In our study we have used spinal fentanyl without bupivacaine in laparoscopic hysterectomies under GA.

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Aims and objectives

This study was done to evaluate the efficacy of intrathecal fentanyl 25 µgm in maintaining hemodynamic stability in patients scheduled for elective laparoscopic hysterectomies under GA. Additionally, postoperative analgesic duration and the time for first rescue analgesia were studied.

MATERIALS AND METHODS

This study was carried out at our institution after obtaining Ethical Committee clearance. A total of 60 patients classified as American Society of Anesthesiologists (ASA) physical status I and II, aged 30-50 years, and posted for elective laparoscopic hysterectomies under GA were selected. The exclusion criteria were classification ASA III and above, patient refusal, contraindications for spinal, hiatus hernia, gastroesophageal reflux disease (GERD), and body mass index (BMI) >30.

All patients were evaluated for fitness for anesthesia on the day prior to surgery. Clinical examination of the patient was performed, including general physical Examination and systemic examination.

All patients were given explanations of the anesthesia technique, and informed consent was taken. Patients were kept nil per oral (NPO) for 8 h prior to surgery.

All patients were given tablet diazepam 5 mg orally at bedtime on the night previous to surgery and 5 mg orally in the morning on the day of surgery.

The patients were randomly divided into two groups of 30 each. Basal heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), peripheral capillary oxygen saturation (SpO₂) and electrocardiogram (ECG) were recorded. An IV line was secured with an appropriate-sized cannula in all patients, and preloading with 500 mL of Ringer's lactate solution over 30 min was done.

Group 1 patients received fentanyl 25 µgm diluted to 3 mL with normal saline (NS) intrathecally, whereas Group 2 patients were given IV fentanyl 2 µgm/kg.

Under strict aseptic precautions, lumbar puncture was performed in the left lateral position using 25G Quinke type spinal needle at the L3-L4 space by midline approach. Fentanyl 25 µgm diluted to 3 mL with NS was injected intrathecally and the patients were made supine immediately.

All patients were premedicated with inj. glycopyrrolate 0.2 mg IV, inj. ondansetron 4 mg, and inj. midazolam 1 mg IV, and they were preoxygenated for 3 min. Anesthesia was induced with thiopentone sodium 5 mg/kg [2.5%] and vecuronium 0.1 mg/kg to facilitate laryngoscopy and intubation. Oxygenation continued via positive pressure mask ventilation using Bains circuit. At the onset of apnea, using laryngoscope with a MacIntosh blade, intubation was done with well-lubricated, appropriate-size cuffed oral endotracheal tube. After confirmation of the tube position, cuff was inflated, tube fixed

and anesthesia was maintained with nitrous oxide (N₂O), O₂, isoflurane, and controlled ventilation with appropriate fresh gas flow using Bains circuit. Anesthesia continued with N₂O, O₂, and isoflurane, and analgesics were administered based on the requirements.

Heart rate (HR), SBP, DBP, MAP, SpO₂ and end-tidal carbon dioxide (ETCO₂) were recorded soon after intubation, after 15 min, after 30 min, and every 30 min thereafter till the end of surgery. At the end of surgery, when the patients had respiratory attempts, residual neuromuscular blockage was reversed with inj. neostigmine and glycopyrrolate. Recovery was assessed and extubation was done after thorough throat suction. After complete clinical recovery, the patients were shifted to the postanesthesia care unit.

HR, SBP, DBP, MAP, and SpO₂ were recorded postoperatively at 1 h, 6 h, 12 h, and 24 h. Time for first rescue analgesia was also noted, with the severity of pain assessed through visual analog scale (VAS) scores. Inj. diclofenac was given with a VAS score of >5 and when the patient requested treatment.

Side effects such as nausea, vomiting, headache, bradycardia, and hypotension were recorded and treated postoperatively.

Statistical analysis

The results obtained in the study are presented as mean ± standard deviation (SD) in tabulated form, and statistical analysis was done with SPSS software version 17 (SPSS Inc., Chicago, USA) using Student's *t*-test. *P* < 0.05 was considered statistically significant and *P* < 0.001, highly significant.

RESULTS

A total of 60 patients were randomly assigned to two groups of 30 each. Both groups were comparable with respect to demographic profile. None of these patients were excluded from the study. Baseline hemodynamic data were recorded in both the groups and were statistically not significant.

Heart rate

After intubation, the HR in Group 2 was 84.13 ± 11.56 and in Group 1 it was 81.97 ± 14.77, which was statistically not significant. At pneumoperitoneum, HR in group 2 was 83.90 ± 11.04 and in Group 1 it was 77.23 ± 11.53, which was statistically significant at *P* < 0.05 and highly significant at *P* < 0.1. HR remained highly significant till 30 min after extubation and returned to baseline values thereafter [Figure 1].

Blood pressure (BP)

SBP, DBP, and MAP showed no significant increase after intubation in both the groups. When compared to Group 1, patients in Group 2 showed an increase in SBP (13 mmHg), DBP (9 mmHg), and MAP (10 mmHg) at pneumoperitoneum, which was statistically highly significant (*P* < 0.001). BP (SBP, DBP and MAP) in Group 2 when compared to that of Group 1 was statistically significant till extubation and returned to basal values after extubation [Figures 2-4].

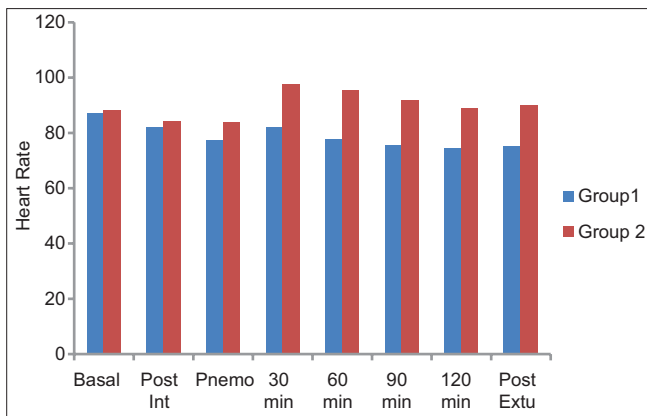


Figure 1: Heart rate changes in both the groups

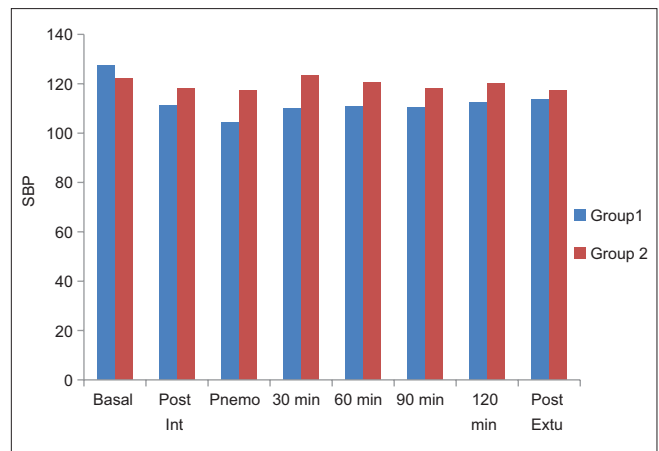


Figure 2: Systolic blood pressure changes in both the groups

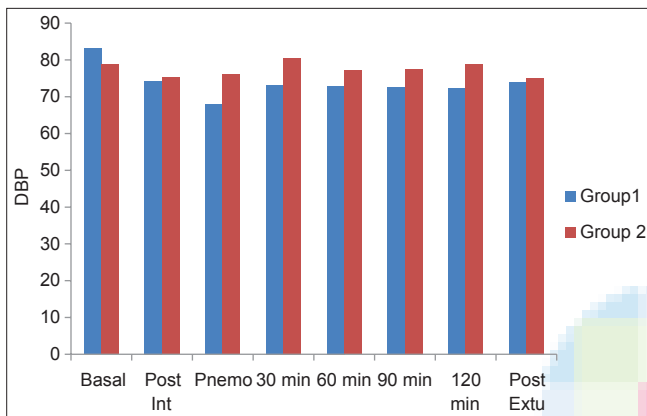


Figure 3: Diastolic blood pressure changes in both the groups

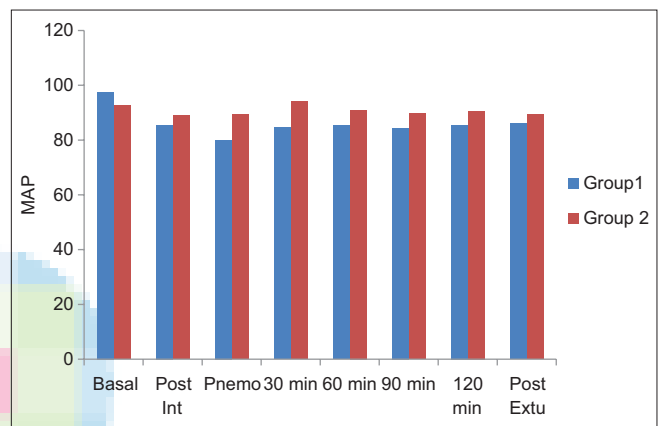


Figure 4: Mean arterial pressure changes in both the groups

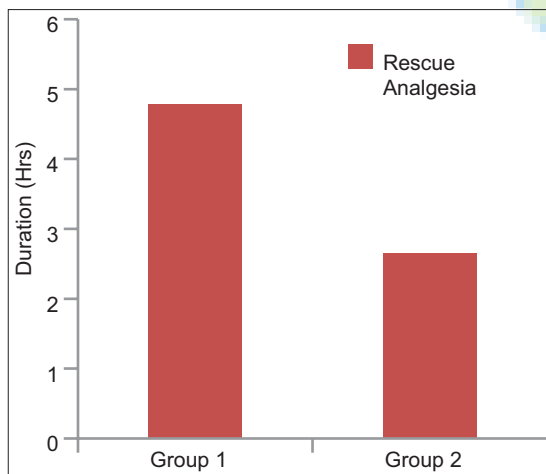


Figure 5: Time for first rescue analgesia

Time for first rescue analgesia [Figure 5] after extubation in Group 1 was 4.78 ± 1.17 h and in Group 2 was 2.65 ± 0.70 h, which was statistically highly significant ($P < 0.001$).

No side effects were observed in either of the groups.

DISCUSSION

Laparoscopic surgery induces intraoperative stress during pnemoperitoneum by increasing the systemic vascular

resistance and blood pressure, at the same time producing nociception.^[7] The introduction of intrathecal opioids into clinical practice has been very beneficial. Initial reports of their efficacy were based largely on anecdotes.^[8-15]

The present pilot study was done among 60 patients, in two groups, posted for elective laparoscopic hysterectomies under GA. Patients in Group 1 received 25 µgm fentanyl intrathecal and Group 2 received IV fentanyl 2 µgm/kg. Many studies have been conducted with opioids as adjuvants to spinal lignocaine and bupivacaine, but there were no studies comparing opioids alone given intrathecally in laparoscopic surgeries. Intrathecal fentanyl was chosen in our study because of its rapid clearance from spinal cord sites^[16] and no motor paralysis, being thus helpful for early ambulation of the patient.^[17-20]

The HR changes observed were highly significant once CO₂ was insufflated (pnemoperitoneum), and remained significantly high till extubation in the IV group. Intrathecal fentanyl proved to be efficacious in maintaining intraoperative HR.

BP changes were also significantly higher in the IV group compared to the intrathecal group.

CONCLUSION

From our study, we conclude that intrathecal fentanyl is far superior to IV fentanyl in maintaining hemodynamic stability in patients undergoing laparoscopic hysterectomies under GA.

Limitations of the study

There were no references pertaining to the present study. Further studies are required to validate the results.

REFERENCES

1. Gonzalez R, Smith CD, McClusky DA 3rd, Ramaswamy A, Branum GD, Hunter JG, *et al.* Laproscopic approach reduces likelihood of perioperative complications in patients undergoing adrenalectomy. *Am Surg* 2004;70:668-74.
2. Menes T, Spivak H. Laproscopy: Searching for the proper insufflations gas. *Surg Endosc* 2000;14:1050-6.
3. Gutt CN, Oniu T, Mehrabi A, Schemmer P, Kashfi A, Kraus T, *et al.* Circulatory and respiratory complications of carbon dioxide insufflations. *Dig Surg* 2004;21:95-105.
4. Mazdisnian F, Palmieri A, Hakakha B, Hakakha M, Cambridge C, Lauria B. Office microlaparoscopy for female sterilization under local anaesthesia. A cost and clinical analysis. *Reprod Med* 2002;47:97-100.
5. Collins LM, Vaghadia H. Regional anaesthesia for laproscopy. *Anesthesiol Clin North America* 2001;19:43-55.
6. Haydon GH, Dillon J, Simpson KJ, Thomas H, Hayes PC. Hypoxemia during diagnostic laparoscopy: A prospective study. *Gastrointest Endosco* 1996;44:124-8.
7. Buell JF, Thomas MJ, Doty TC, Gersin KS, Merchen TD, Gupta M, *et al.* An initial experience and evolution of laproscopic hepatic resectional surgery. *Surgery* 2004;14:804-11.
8. Cousins MJ, Glynn CJ, Wilson PR, Graham JR. Selective spinal analgesia. *Lancet* 1979;1:1141-2.
9. Cousins MJ, Mather LE. Intrathecal and epidural administration of opioids. *Anesthesiology* 1984;61:276-310.
10. Malinow AM, Mokriski BL, Nomura MK, Kaufman MA, Snell JA, Sharp GD, *et al.* Effect of epinephrine on intrathecal fentanyl analgesia in patients undergoing post partum tubal ligation. *Anesthesiology* 1990;73:381-5.
11. Green DW. The clinical use of spinal opioids. In: Kaufman L, editor. *Anesthesia Review*. Vol. 9. London: Churchill Livingstone; 1992. p. 80-111.
12. Honet JE, Arkoosh VA, Norris MC, Huffnagle HJ, Silverman NS, Leighton BL. Comparison among intrathecal fentanyl, meperidine, and sufentanil for labor analgesia. *Anesth Analg* 1992;75:734-9.
13. Varrassi G, Celleno D, Capogna G, Costantino P, Emanuelli M, Sebastiani M, *et al.* Ventilatory effects of subarachnoid fentanyl in elderly. *Anaesthesia* 1992;47:558-62.
14. Gielen MJ. Spinal anesthesia. *Curr Opin Anaesthesiol* 1993;6:803-7.
15. Rawal N. Spinal opioids. In: Raj PP, editor. *Clinical Practice of Regional Anesthesia*. New York: Churchill Livingstone; 1993. p. 107-34.
16. Reuben SS, Dunn SM, Dupart KM, O'Sullivan P. An intrathecal fentanyl dose-response study in lower extremity revascularization procedures. *Anesthesiology* 1994;81:1371-5.
17. Sudarshan G, Browne BL, Matthews JN, Conacher ID. Intrathecal fentanyl for post-thoracotomy pain. *Br J Anaesth* 1995;75:19-22.
18. Seewal R, Shende D, Kashyap L, Mohan V. Effect of addition of various doses of fentanyl intrathecally to 0.5% hyperbaric bupivacaine on perioperative analgesia and subarachnoid-block characteristics in lower abdominal surgery: A dose-response study. *Reg Anesth Pain Med* 2007;32:20-6.
19. Gupta S, Sampley S, Kathuria S, Katyal S. Intrathecal sufentanil or fentanyl as adjuvants to low dose bupivacaine in endoscopic urological procedures. *J Anaesthesiol Clin Pharmacol* 2013;29:509-15.
20. Nayagam HA, Singh NR, Singh HS. A prospective randomised double blind study of intrathecal fentanyl and dexmedetomidine added to low dose bupivacaine for spinal anaesthesia for lower abdominal surgeries. *Indian J Anaesth* 2014;58:430-5.

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